NERA
ECONOMIC CONSULTING

Approach to calculating average wholesale prices for Sydney Water and Hunter Water

A report for IPART

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Contents

List of Tables

Table of Figures

List of Boxes

Executive summary

Introduction

IPART has engaged NERA Economic Consulting (NERA) and Strategy, Infrastructure and Planning Advisory (SIPA) to develop a method for the calculation of system-wide average or typical wholesale prices and net facilitation costs for the determination of wholesale prices for Sydney Water and Hunter Water using a retail-minus approach. This report sets out our consideration of the appropriateness of the different approaches that may be utilised to calculate wholesale prices and provides an analysis of the advantages and disadvantages of each option. This report also sets out NERA and SIPA's preferred approach and outlines the wholesale prices that would apply if this approach was adopted.

Our approach

We are proposing that Option 1: a wholesale price based on a system wide average or typical minus and net facilitation costs, be defined as follows:

Wholesale price = retail price ***less*** reasonably efficient competitor costs ***plus*** facilitation charge

- **Retail price** — the retail price is determined by the wholesale service being sought and the tariff structure for the wholesale price is to be consistent with that adopted for the retail price. Retail prices are averaged by definition as they are applied uniformly by Sydney Water and Hunter Water.

- **Reasonably efficient competitor costs** — these costs are to be determined via the adoption of a distributed cost based approach which utilizes Sydney Water's and Hunter Water's costs to determine the efficient competitor costs. Costs are adjusted to account for potential economies of scale or scope through the application of an efficiency factor.

  These costs relate to average prices as we are proposing to calculate the reasonably efficient entrants cost based on Sydney Water's and Hunter Water's whole of service level. Whole of service is defined as all activities across the water businesses associated with that particular level of service. By definition the costs will reflect Sydney Water and Hunter Water's average costs associated with the provision of services.

  Given that IPART is seeking to adopt a reasonably efficient competitor based standard for the measurement of costs, and that we are calculating average prices to be applied across the water businesses, we recommend that both an allocation of common costs and costs associated with existing assets be included in the calculation of the minus on the basis that the inclusion of these costs will lead to prices that are more reflective of the costs that a reasonably efficient competitor would incur than would be the case if they were excluded.

  However, we do recognise that regulators in other jurisdictions and sectors have adopted a variety of approaches to the inclusion of these costs and that the decision regarding their

inclusion requires a degree of regulatory discretion. If included in the minus calculation, these costs will lower the wholesale price.

Accordingly we have generated different prices for the inclusion and exclusion of both existing assets and common costs to quantify their materiality in terms of a wholesale price (see chapter 6 for the price impact impacts associated with the exclusion of these factors from the minus).

- **Net facilitation charges** — a framework for determining net facilitation charges when setting average wholesale prices has been outlined in this paper. This framework is conceptual in nature. Its validity and practicality in relation to calculating average net facilitation charges is assessed against the available data and the current planning framework.

  We recommend that the facilitation charges account for administrative costs incurred in the provision of wholesale services.

One of the fundamental aspects of the approach that we have proposed is the utilisation of existing data from the 2016 price reviews for both Sydney Water and Hunter Water. Given the timeframes associated with this project, we considered it important to utilise the cost and demand data that was available and had been subject to IPART review, rather than seek entirely new data from Sydney Water and Hunter Water.

While we were able to utilise the existing price review data for Sydney Water and Hunter Water, there was a need to request further information from both businesses in order to correctly allocate the cost data to individual levels of service. By utilising existing data, and constraining further data collection to issues of clarification (cost allocation to service levels) our approach is less burdensome in terms of the collection, collation and regulatory review of data than the other approaches to calculate average retail minus prices considered in this report.

Our approach is pragmatic in nature and was developed to provide IPART with the most robust calculations of a retail-minus prices within the time frames associated with the project.

Data

A central task of the project was consultation with Sydney Water and Hunter Water to distribute the costs from their respective price reviews to the appropriate levels of service for the purpose of calculating the retail-minus wholesale price. The outcomes of consultation and implications for the methodology and prices that were calculated are described in detail in Chapter 5.

As part of the project we reviewed the data in terms of its robustness through a process of consultation, assessment of the source of the data and review of the data against our industry experience in assessing expenditure associated with utilities providing similar services.

Assessment of Sydney Water data

The key issues in relation to Sydney Water's data were:

- Common costs for retail and reticulation operating expenditure for water and wastewater – Sydney Water has included common divisional overheads in the direct retail and reticulation operating expenditure figures. Information on indicative common corporate overhead costs to retail and reticulation activities was also provided. The model requires this information to be considered separately.
- Common costs for retail and reticulation capital expenditure for water and wastewater - Sydney Water provided both direct capital expenditure, as requested, and information on other related capital expenditure that could potentially be common to retail and reticulation functions. The model requires this information to be considered separately.
- Existing assets – common for retail and reticulation for water and wastewater. Sydney Water has stated that they do not have such assets.
- Existing assets – direct for reticulation for water and wastewater. Sydney Water was unable to segregate the component value (for either RAB or MEERA) for renewed reticulation assets.
- The use of operating expenditure data from 2013-14 and 2014-15 as the basis for current and projected costs and the inability to derive current component based cost data. Sydney Water does not maintain cost-component structured financial systems that align with retail and local reticulation functions.

Assessment of Hunter Water data

The key issues in relation to Hunter Water's data were:

- There is a material difference in the values for existing assets (RAB) based on the method of valuation adopted, particularly in the reticulation system. This issue requires more assessment to resolve. We recommend a methodology consistent with the retail price review be agreed and applied for both Sydney Water and Hunter Water.
- The seemingly high proportion of common/corporate costs which appeared to represent up to 38% of the individual service (water, wastewater) specific expenditure. This issue requires some more detailed analysis of the common costs and corporate overheads to ensure the categories and assessment process are correct.
- Costs related to facilitation charge – administration costs and in particular the legal fees. Given the relative differences between Hunter Water and Sydney Water we see value in further review of these costs to identify the drivers behind the differences between the two water utilities.

Findings

Presented in tables A through to D are the minus percentages and associated costs for water and wastewater at both a retail and retail + local reticulation level. The reported results are based on the costs associated with a reasonably efficient competitor and exclude the costs associated with existing assets.

Based on the data that was available to NERA and SIPA and our confidence in the associated cost allocations adopted by Sydney Water and Hunter Water we have out necessity made a number of amendments to the method that we proposed and these are:

- We were unable to provide minus estimates for a level of service of that included lead in mains (with the wholesale point of connection being at the trunk main). Neither Sydney Water nor Hunter Water was able to extract the necessary cost data within the time frame associated with this study. The issue being that their accounting systems do not distinguish between trunk and lead in mains infrastructure. Both Sydney Water and Hunter Water also believed that it was not feasible for wholesale service providers to own and operate such infrastructure and as such it should not form part of a likely wholesale supply scenario.

- We excluded working capital on the basis that the data provided didn't allow for consistent treatment of the cost across both Sydney Water and Hunter Water. Of the water businesses that did provide us with working capital data, the associated costs were immaterial and their exclusion is not expected on impact on the wholesale price.

We note that Hunter Water's minus for reticulation exceeds our expectations and is largely driven by allocation of common costs — 38% of the individual service (water, wastewater) specific expenditure that exceeds that which we would typically expect to observe in similar water utility. While Hunter Water's total common costs are consistent with that adopted in its retail price review we recommend that this issue be pursued further by IPART in its regulatory review of expenditure were it to adopt a average based approach to wholesale pricing.

Whilst we have been able to develop indicative wholesale prices based on the method we developed and the data we received, it is our opinion, based on the assessment of data, that the prices are indicative only and should not be directly translated to a determination of wholesale prices. We are of this opinion for two key reasons:

1. The variability in the data provided and questions around the robustness and applicability of the information provided to determining wholesale prices.
2. The data collection process has been necessarily less structured than the process which would be expected in an equivalent retail pricing review which then leads to the determination of applicable prices.

While we believe that these prices should be treated as indicative, based on our experience over the course of the project we believe IPART could develop prices suitable for a regulatory determination were it to pursue the major data gaps that we have identified.

If these issues are resolved then IPART should be in a position to undertake a robust regulatory determination.

We also note that the approach we adopted was relatively less data intensive than alternative approaches, as it mainly required allocation of existing price review cost data (with the exception of facilitation costs). Our experience with this project confirms that the proposed approach was appropriate given data availability. Were alternative approaches to cost measurement to be adopted, IPART would need to obtain significantly more data (including long term expenditure forecasts).

In relation to facilitation charges, we recommend that the net facilitation charge for average wholesale prices only reference administrative costs and that planning and infrastructure costs are excluded. These administrative costs are additional costs incurred by Sydney Water and Hunter Water in the administration of its contracts with wholesale customers and, as such, should be included in the wholesale price. The administrative costs that we were able to obtain from Sydney Water and Hunter Water were based on the actual costs incurred by Sydney Water and Hunter Water in the administration of current wholesale service arrangements. We did not find sufficient data for the establishment of bring forward estimates or deferral values. We also had a number of in principle concerns about the inclusion of bring forward valuations and deferrals in an average based pricing approach, that are outlined in Chapter 4.

Table A - Sydney Water – Reasonably efficient minus (%)

		Minus (%, reasonably efficient)			
Product	Level of service	2017	2018	2019	2020
Water	Retail	2.9%	3.1%	3.3%	3.5%
	Retail and retic	6.7%	7.1%	7.5%	7.9%
Wastewater	Retail	1.7%	1.8%	1.9%	2.0%
	Retail and retic	4.7%	4.9%	5.1%	5.2%

Table B - Sydney Water – Minus cost ($000)

		Minus cost (2015-16$, reasonably efficient)			
Product	Level of service	2017	2018	2019	2020
Water	Retail	$32,211	$35,357	$38,123	$40,687
	Retail and retic	$75,150	$81,099	$86,407	$91,579
Wastewater	Retail	$20,354	$22,010	$23,389	$24,649
	Retail and retic	$57,405	$60,506	$63,247	$65,907

Table C – Hunter Water – Reasonably efficient minus (%)

		Minus (%, reasonably efficient)			
Product	Level of service	2017	2018	2019	2020
Water	Retail	4.9%	5.1%	5.2%	5.4%
	Retail and retic	15.5%	15.7%	15.7%	15.9%
Wastewater	Retail	5.6%	5.9%	6.0%	6.2%
	Retail and retic	10.2%	10.4%	10.5%	10.6%

Table D - Hunter Water – Minus cost ($000)

		Minus cost (2015-16$, reasonably efficient)			
Product	Level of service	2017	2018	2019	2020
Water	Retail	$6,616	$7,026	$7,407	$7,774
	Retail and retic	$20,982	$21,609	$22,209	$22,798
Wastewater	Retail	$8,247	$8,850	$9,146	$9,505
	Retail and retic	$14,855	$15,558	$15,955	$16,416

1. Introduction

Over the last decade the NSW water sector has seen the entry of a number of new service providers. These providers purchase wholesale products from Sydney Water or Hunter Water and on this basis provide end use (or 'retail') customers with services for water, wastewater and recycled water.

The Independent Pricing and Regulatory Tribunal (IPART) has a mandate to regulate government monopoly services supplied by government agencies in NSW. IPART stated in its *Discussion Paper on the Prices for Wholesale Water and Sewerage Services* (the Discussion Paper) that:

> *There is an in-principle need for us to regulate Sydney Water's and Hunter Water's wholesale prices. Both utilities are the monopoly supplier of wholesales water and sewerage services in their areas of operations, so regulation is needed to protect wholesale customers from potential abuses of this monopoly power.* [1]

IPART has engaged NERA Economic Consulting (NERA) and Strategy, Infrastructure and Planning Advisory (SIPA) to develop system-wide average or typical minus and net facilitation costs for the determination of wholesale prices for Sydney Water and Hunter Water, using a retail-minus pricing approach. This report sets out our consideration of the appropriateness of the different approaches that may be utilised to calculate system-wide average or typical wholesale prices and provides an analysis of the advantages and disadvantages of each option. This report also sets out NERA and SIPA's preferred approach and outlines the wholesale prices that would apply if this approach was adopted.

As noted in this report, some aspects of a retail-minus a reasonably efficient competitor cost approach to wholesale price require regulatory discretion, these include:

- The inclusion of common costs in the retail-minus approach
- The inclusion of costs associated with existing assets in the retail-minus approach.

This report presents IPART with a schedule of average wholesale prices that account for the exclusion and inclusion of such costs. NERA and SIPA have made recommendations regarding each of these options.

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[1] IPART (2016) Prices for wholesale water and sewerage services, Discussion Paper April 2016.

1.1. Purpose of the study

The primary purpose of the study was to develop a schedule of prices (or minuses) that would be appropriate if IPART determined to implement the first option outlined for the implementation of wholesale prices in the Discussion Paper. This option is broadly defined as:

- Option 1: a wholesale price based on a system wide average or typical minus and net facilitation costs to be used for all schemes.

The basic formula set out for Option 1 is:

Wholesale price = **retail price** *less* **reasonably efficient competitor costs** *plus* **facilitation charge**

This formula comprises of three main components:

1. The retail price
2. The costs of service associated with a reasonably efficient competitor
3. Facilitation charges.

Developing a method for calculating Option 1 necessitates the identification of preferred approaches to each of the components of the formula noting the requirement to develop a system-wide average or typical values. Where appropriate, we have identified a preferred method for calculating wholesale prices consistent with Option 1. Our assessment of the various options for each component of the wholesale price is based on our understanding of regulatory best practice and references IPART's stated pricing objectives.

In addition to the individual components of Option 1's retail-minus formula the defining aspect of the option relative to the others put forward by IPART in their Discussion Paper is that Option 1 is based on a system wide average or typical cost based approach. The Discussion Paper notes that in considering the options for setting wholesale prices, the ability to reflect scheme specific characteristics and facilitate efficient entry to the market will be key considerations.

Included in our assessment is:

- An approach for determining the costs associated with retail services and those associated with service delivery based on a 'reasonably efficient wholesale customer'.
- The definition of, and approach to determining the costs of, a 'reasonably efficient competitor', outlining the different options, including the option to calculate these costs using the building block approach and the consultant's preferred option with reasoning.
- The definition and approach to estimating net facilitation costs.
- Consideration for when the 'minus' and 'facilitation' components of the price are charged (e.g., lump sum, over time).

- A schedule of potential wholesale charges.
- An assessment of the feasibility and likely accuracy of the wholesale charges.

We note that one of the aims of the project is an assessment of the degree to which a system wide average approach to wholesale pricing is reflective of the geographical dispersion of costs associated with wholesale service delivery. This issue is discussed further in section 2.2.2. We note upfront that this issue relates primarily to the broader decision of adopting a system wide average approach to wholesale prices and less directly to the decision on which technical approach to take to measure costs.

A discussion of the cost reflectivity of system wide average based prices is set out in chapter 7.

1.2. Structure of the report

This report has been structured to be consistent with the stages of a process for developing system-wide average retail-minus wholesale prices.

- Chapter 2 sets out the context of wholesale prices and services in the case of Sydney Water and Hunter Water.
- Chapter 3 provides a broad overview of the retail-minus approach to pricing and the treatment of costs under this approach.
- Chapter 4 outlines the approach adopted in the development of average wholesale prices and sets out the process and analysis undertaken to arrive at our preferred approach.
- Chapter 5 sets out the modelling and data collection process. It also includes a critical review of the data that was collected.
- Chapter 6 reports the schedule of minuses and average wholesale prices.
- Chapter 7 discusses the likely degree to which the average wholesale prices are cost reflective.

2. Wholesale services for Sydney Water and Hunter Water

2.1. Likely wholesale service provision

Based on consultation with IPART, we have identified a number of scenarios regarding the potential provision of wholesale services. These scenarios are intended to reflect the most likely circumstances in which customers may seek wholesale services from Sydney Water and Hunter Water.

In deriving a wholesale price using a retail-minus approach, one of the foundational issues that need to be addressed is defining what a wholesale service is and by extension what constitutes the service the wholesale customer is providing. In its Discussion Paper, IPART defines wholesale services broadly as those services (both water and sewerage) provided to wholesale customers in that customers capacity as an on-supplier of the service. For Hunter Water, this definition explicitly excludes bulkwater services supplied under the Hunter/Central Coast Pipeline Agreement.

The Discussion Paper defined wholesale customers as:

- Public water utilities.
- Licensed retailers.
- Licensed network operators.
- Local Councils.
- Service providers that have license exemptions under the WIC Act.

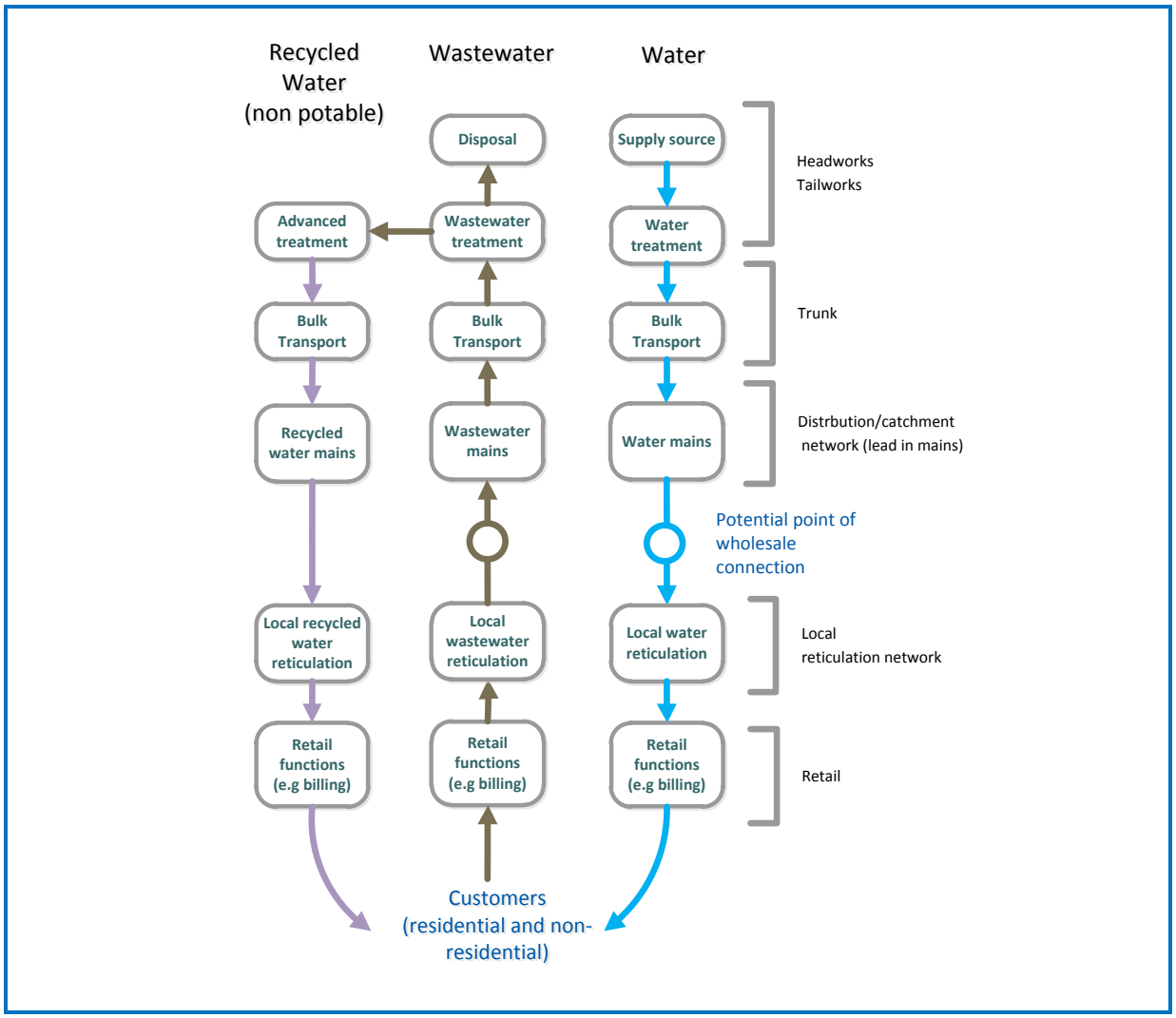
This definition by IPART provides for a range of potentially different services to be captured under the nomenclature of retail services (these being the services that the wholesale customer provides) and includes licensed network operators.

Figure 1 (on the following page) provides a simplified taxonomy of water, wastewater and recycled water service provision from headworks or tailworks through to the final customer. Typically the term retail services refers to those services that are provided to retail customers (residential and non-residential) that are purely retail in nature, the most common being meter reading and billing and account functions. This definition of retail services is consistent with that widely adopted in the energy sector.

However, the definition of wholesale customers included in IPART's Discussion Paper provides for licence network operators, and this implies that wholesale customers may be providing local reticulation services and potentially other network components of the water and wastewater supply chain. This is reflective of the nature of customers that are purchasing water from Hunter Water and or Sydney Water to on-sell to end-use customers. In Figure 1 the wholesale connection point is assumed to be above the local reticulation networks (local distribution or

collection networks).[2] This distinction is important as it dictates the type of costs that are included in the estimate of retail-minus prices.

Figure 1: Taxonomy of water and wastewater services



In order to provide a degree of clarity regarding how levels of service are accounted for in the wholesale price, we have developed the following definitions.

- Retail — Retail services are those services provided directly to the end users of water and wastewater services. These services relate primarily to billing and management of customers and exclude the operation and maintenance of network infrastructure associated with the

[2] Under the WIC Amendment Act section 20 p makes it a license condition that to sell water or sewerage you must have infrastructure (be a Category A Scheme).

physical delivery of water and recycled water and the physical collection of wastewater from end users. Our definition of retail services is guided by the cost allocation framework developed by Ofwat (see table 5 for a description of the activities included by Ofwat in its definition of retail service function).

- Reticulation — Reticulation refers to the local network infrastructure used to physically distribute either water or recycled water to, or physically collect wastewater from, end users. The reticulation network is defined as that infrastructure that exists within the boundary of the development up to the point of connection to the end users property and is used solely for the provision of water, recycled water and wastewater services to end users within the development. This is also infrastructure that would typically be constructed by the wholesale service provider or developer.

- Lead in mains — Lead in infrastructure is all the infrastructure associated with the distribution of water, recycled water and collection of wastewater necessary to link the incumbent's nominated point of connection to the boundary of the development. This infrastructure may include, but is not limited to, mains, reservoirs and pumping stations. In Sydney this infrastructure is typically constructed by Sydney Water (unless the development is out of sequence), while in the Hunter, this infrastructure is typically constructed by the developer and gifted to Hunter Water.

- Trunk mains —Trunk infrastructure refers to the infrastructure required to distribute water and recycled water to multiple service regions and collect wastewater services from multiple catchments. This infrastructure is typically constructed and owned by Sydney Water or Hunter Water only.

The following scenarios were developed in consultation with IPART. These scenarios represent the most likely outcomes in terms of wholesale water and waste water service provision over the forthcoming regulatory period for both Sydney Water and Hunter Water. The approach developed by NERA and SIPA has been tailored to best meet the requirements of each of these scenarios. Our focus has been on identifying the relevant costs for retail, local reticulation and lead in mains and on developing minus for each of these levels of service (data permitting).

Its worth noting that the likely services offered by wholesale customers that were considered did not extend to instances where there is only partial service provision — for example, instances where full retail services are not provided by the wholesale customer (such as excluding the operating, maintenance and renewal of meters). This means that the minus estimates outlined in this report are based on the wholesale customer fully providing the relevant retail services.

2.1.1. Likely water wholesale service provision

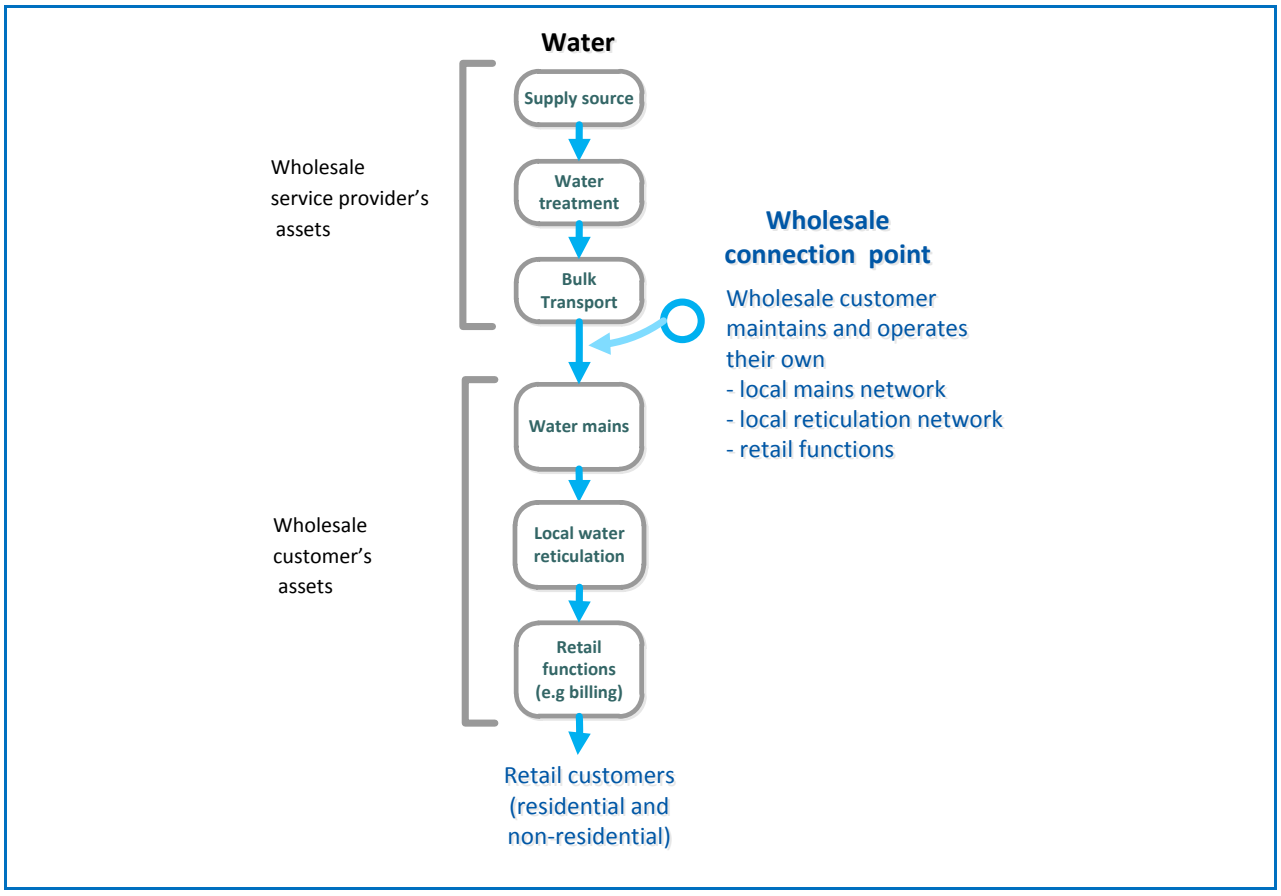
Scenario 1: Wholesale customer seeking wholesale potable water services to retail water services to their own large local reticulation network. The wholesale customer is also using their own network and pumping and reservoir assets to connect to the wholesale service provider's trunk infrastructure (as illustrated in Figure 2).

Under this scenario a wholesale customer is looking to retain ownership of the local reticulation network in a new development. The wholesale customer is intending to provide ongoing potable water services to connections (residential or non-residential) within the footprint of their reticulation network.

In order to connect to the wholesale service provider's trunk infrastructure the wholesale customer has constructed mains pipes, pumping and reservoir assets. The wholesale customer retains ownership of these assets and is responsible for their ongoing operation and maintenance.

- The wholesale connection point would be to the wholesale service provider's trunk network.
- The wholesale service is provision of bulk/wholesale potable water.
- The service the wholesale customer is providing its end use customers is the provision of billing and account management and the operation and maintenance of local reticulation and associated mains assets (mains pipes, pumping and reservoir).
- The form of competition is for connections and not for ongoing services. Ongoing competition would require access arrangements in order for competitors to access the wholesale customer's mains based assets and their local reticulation network.

Figure 2: Scenario 1

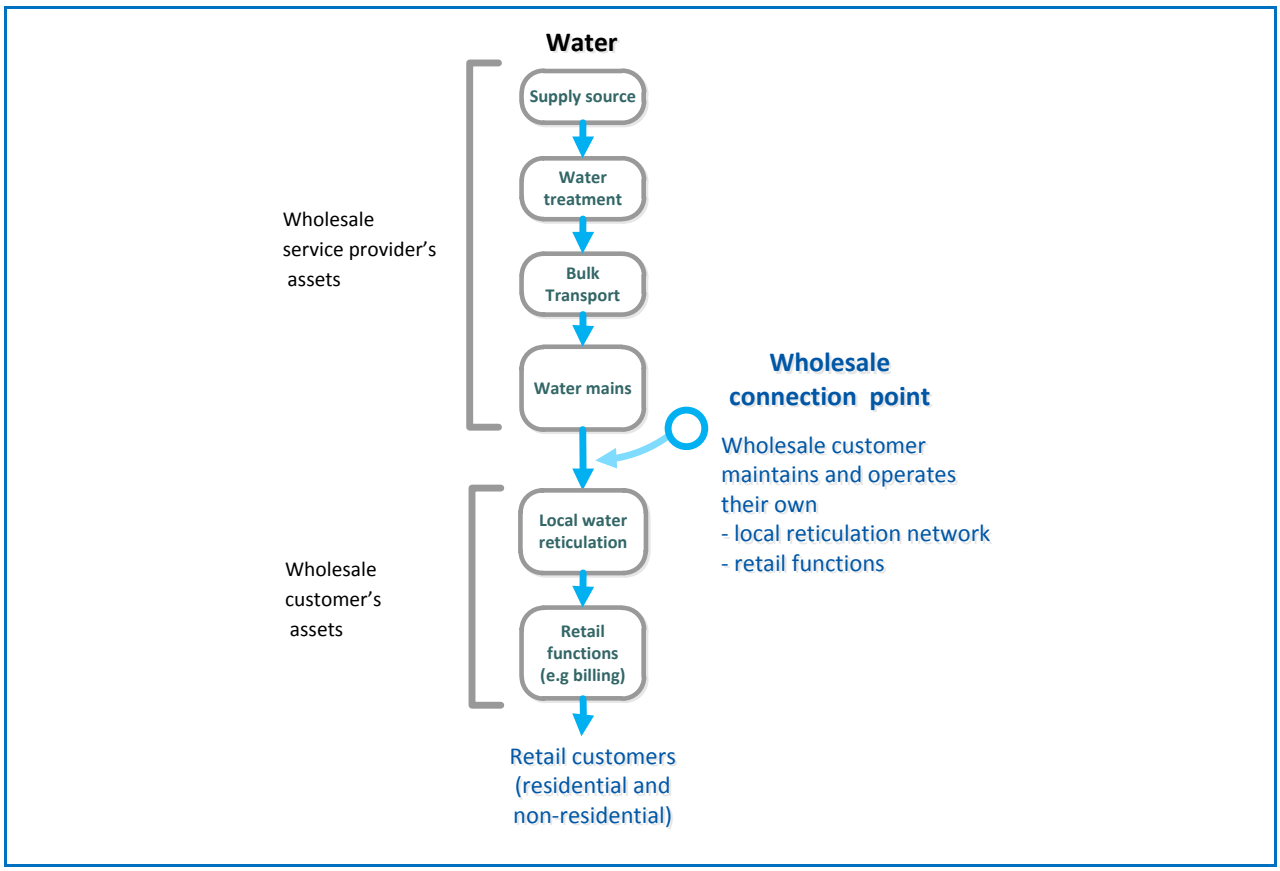


SCENARIO 2: Wholesale customer seeking wholesale potable water services to retail water services to their own small local reticulation network (as illustrated in figure 3).

Under this scenario a wholesale customer retains ownership of the local reticulation network in a new development. The wholesale customer is intending to provide ongoing potable water services to connections (residential or non- residential) within the footprint of their reticulation network.

- The wholesale connection point would be to the wholesale service provider's reticulation mains.
- The wholesale service is the provision of wholesale potable water.
- The retail service is the provision of billing and account management and is accompanied by the operation and maintenance of local reticulation.
- The form of competition is for connections and not for ongoing services. Ongoing competition would require access arrangements in order for competitors to access the wholesale customer's local reticulation network.

Figure 3: Scenario 2



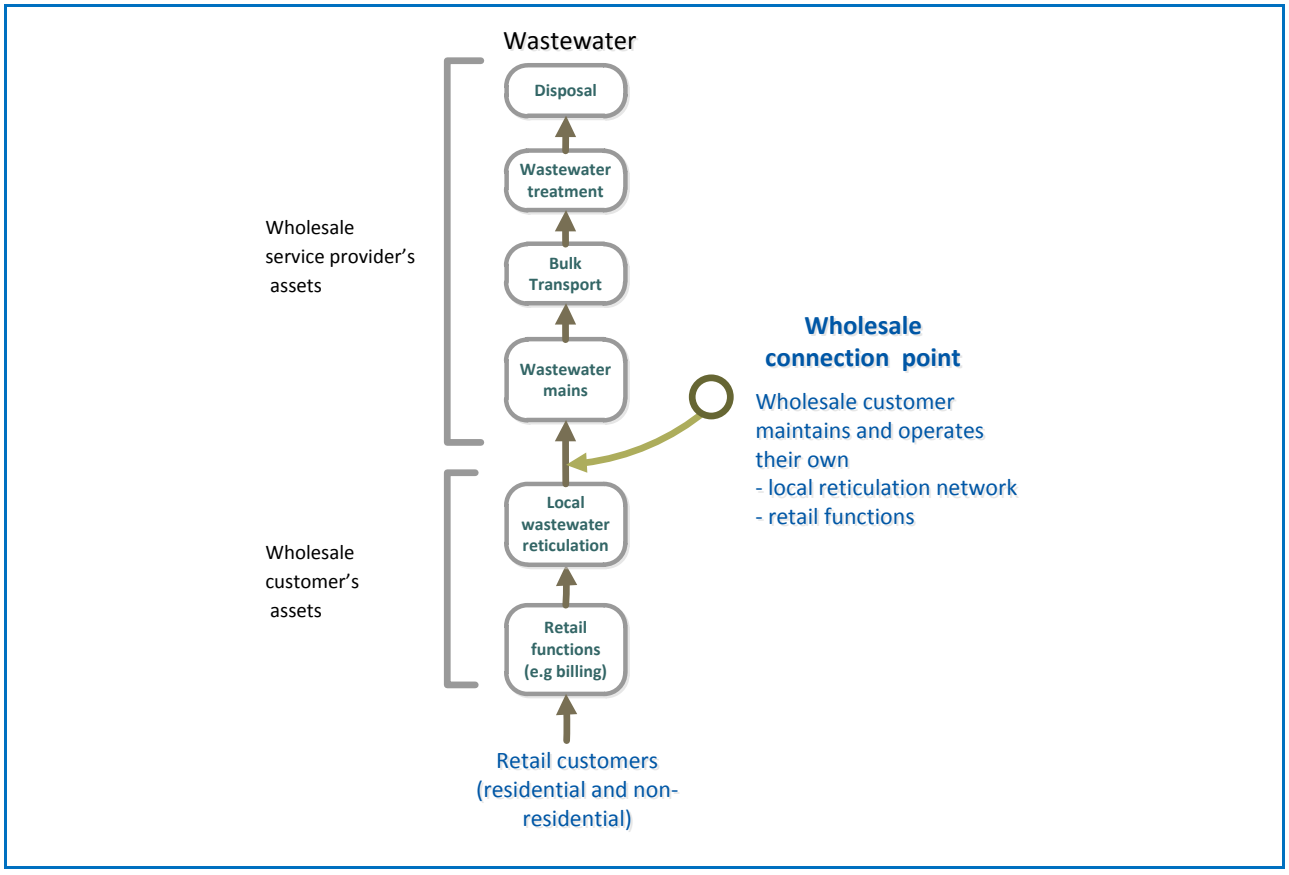
2.1.2. Likely wastewater wholesale service provision

SCENARIO: 3 Wholesale customer is seeking to on-sell wholesale sewerage services to retail customers via their own large local reticulation network (as illustrated in figure 4).

Under this scenario a wholesale customer retains ownership of the local reticulation network in a new development. The wholesale customer is intending to provide ongoing wastewater services to connections (residential or non-residential) within the footprint of their reticulation network. The wholesale connection point would be to the wholesale service provider's reticulation mains or trunk network.

- New entrant is undertaking retail activities and operating and maintaining local reticulation for collection.
- The wholesale product is a bulk sewage service.
- Competition is for connections (on going competition would require access arrangements for entrants local reticulation network).

Figure 4: Scenario 3



2.2. Wholesale service cost drivers

The ultimate aim of a retail minus approach is to derive a wholesale price. This wholesale price should be reflective of the costs associated with wholesale service provision. There are a multitude of potential cost drivers associated with the provision of water and wastewater services, including (but not limited to) water availability, patterns of population growth, changes in water use behavior, government and environmental regulations and obligations. In relation to wholesale services the two most pertinent drivers of costs that need to be considered in the development of an averaged or typical retail-minus based wholesale price are the:

- Level of service – the level of service being provided will have a direct impact on wholesale costs.
- Geographical location — potential variation in cost across geographical areas will undermine the cost reflectivity of an averaged or typical based approach.

2.2.1. Level of service as a driver of costs

One of the distinguishing aspects of wholesale service provision for Sydney Water and Hunter Water is that it relates to wholesale customers who may be doing more than simply retailing services by on-selling potable water or sewerage services. These customers may potentially operate and maintain their own local reticulation services (water, recycled water, and/or wastewater) and in some cases operate and maintain water or sewerage mains (lead in services). This aspect distinguishes Sydney Water and Hunter Water from other established wholesale frameworks such as in the UK where wholesale prices are based on a relatively simple delineation between wholesale and retail services based on pure retail activities (see Box 1).

Box 1: UK definitions of retail and wholesale costs

Retail services

Retail services include all customer-facing activities: billing, account handling (payments, debt management, meter reading), customer queries, as well as water-efficiency advice and tackling leaks on customers' pipes. Business customers in England and Wales using five million litres of water a year or more can choose their provider for these 'retail' services. They are known as 'contestable' customers. Meanwhile in Scotland all commercial customers can choose, regardless of water use.

Wholesale services

Wholesale services are the physical delivery of water via networks of pipes to and from customers' property boundaries, including abstracting, treating and transporting water, as well as collecting, treating and disposing of wastewater. All this activity requires fixed infrastructure (or assets) – pipes and treatment works – that cannot be 'contestable' (open to competition). Water and sewage pipe networks therefore remain natural monopolies within existing companies' regions, which Ofwat will continue to regulate.

Source: (Thames Water, 2015)[3]

[3] Thames Water. (2015, 09 23). *How the water retail market works*. Retrieved 06 30, 2016, from Thameswater.co.uk: http://www.thameswater.co.uk/about-us/16104.htm

Under a retail-minus based approach the focus, in the first instances, is on the identification of retail (and in this case potentially reticulation) related costs. However, the overall objective of a retail-minus based approach to pricing is to derive wholesale prices that are reflective of the costs involved in the provision of wholesale services. In the case of Sydney Water and Hunter Water the services that the wholesale customer will be offering their retail customers (end users) extends beyond pure retail activities and incorporates local reticulation operating and maintenance (and potentially construction where the wholesale customer is the developer), potentially lead in mains, and could extend to trunk infrastructure. The nature and type of service being provided by the wholesale customer to end users will dictate the wholesale point of connection.

The implication is that the cost of wholesale service provision is not simply all those costs associated with providing water or wastewater services with the exception of retail activities, rather it is all those costs associated with providing water and wastewater services to the wholesale point of connection. This means that wholesale costs will vary directly with the level of service provided by the wholesale service provider. The simplest way to appreciate this is to consider the supply chains associated with water, recycled water and wastewater services.

If the wholesale point of connection is to the wholesale service providers water mains network then the costs involved in providing wholesale services will include, in the case of water, source related costs (dams, desalination plants, other storages), treatment cost (in some instances these costs will be imbedded in the bulk water charges paid by the wholesale service provider), water transport (trunk mains) and water distribution (lead in mains and associated works like pumps and reservoirs). This cost will be materially greater than would be the case if the wholesale point of connection sat outside the wholesale service provider trunk and distribution systems and the wholesale customer was able to directly access a water treatment facility.

The primary way in which to account for level of service in the wholesale price is to ensure that the calculation of the costs associated with a reasonably efficient competitor is set at an appropriate level such that it only references those particular levels of service that are being provided by that competitor. For example, if the wholesale customer is providing retailing services and local reticulation services, it is only these services that are included in the calculation of the cost associated with a reasonably efficient competitor.

The nature of costs and specific examples of costs at each level of service are set out in Tables 1 and 2.

Table 1: Costs and the water supply chain

Level of supply	Nature of costs	Examples
Supply source	• Large costs associated with large long lived sunk assets • Fixed operating and maintenance costs (labour/system costs, preventative maintenance) • Variable operating and maintenance costs proportional to the asset age and level of use (volumetric based costs, reactive / preventative maintenance) • Such costs may be embedded in bulk water charges where the wholesaler is not vertically integrated	• Headworks • Dams • Desalination plants • Groundwater extraction • Large trunk mains • Large pump stations
Water treatment	• Medium-large level costs associated with medium sized / medium lived assets • Fixed operating and maintenance costs (labour/system costs, preventative maintenance) • Variable operating and maintenance costs proportional to the asset age and level of use (volumetric based costs, reactive / preventative maintenance)	• Water Treatment Plant & related assets
Bulk transport	• Medium level costs associated with medium-large sized / medium-long lived assets • Fixed operating and maintenance costs (labour costs, preventative maintenance) • Variable operating and maintenance costs proportional to the asset age and level of use (volumetric based costs, reactive / preventative maintenance)	• Medium pump stations • Medium sized trunk mains • Reservoirs / storage tanks • Supplementary treatment • Valves
Water mains	• Small level costs associated with small sized / medium-short lived assets • Fixed operating and maintenance costs (labour costs, preventative	• Reticulation mains • Booster pumping • Meters

	maintenance) • Variable operating and maintenance costs proportional to the asset age (reactive / preventative maintenance)	
Local water distribution	• Small level costs associated with shared assets	• Fixed operating costs (labour, preventative maintenance)
Retail service	• Small level costs associated with shared assets	• Customer service centers • IT Systems

Table 2: Costs and the wastewater supply chain

Level of supply	Nature of costs	Examples
Disposal	• Medium-large costs associated with medium-large sized / medium-long lived assets • Fixed operating and maintenance costs (labour costs, preventative maintenance) • Variable operating and maintenance costs proportional to the asset age and level of use (volumetric based costs, reactive / preventative maintenance)	• Outfall pipes • Large pump stations • Recycled water treatment facilities
Wastewater treatment	• Medium-large costs associated with medium-large sized / medium-long lived assets • Fixed operating and maintenance costs (labour/system costs, preventative maintenance) • Variable operating and maintenance costs proportional to the asset age and level of use (volumetric based costs, reactive / preventative maintenance)	• Wastewater Treatment Plant and ancillary assets
Bulk transport	• Medium level costs associated with medium-large sized / medium-long lived assets • Fixed operating and maintenance costs (labour costs, preventative	• Medium pump stations • Medium sized trunk mains • Pre-treatment • Valves

	maintenance) • Variable operating and maintenance costs proportional to the asset age and level of use (volumetric based costs, reactive / preventative maintenance)	• Emergency relief assets
Wastewater mains	• Small level costs associated with small sized / medium-short lived assets • Fixed operating and maintenance costs (labour costs, preventative maintenance) • Variable operating and maintenance costs proportional to the asset age (reactive / preventative maintenance)	• Reticulation network • Small pump stations
Local wastewater Collection	• Small level costs associated with shared assets	• Fixed operating costs (labour, preventative maintenance)
Retail service	• Small level costs associated with shared assets	• Customer service centers • IT Systems

2.2.2. Geographical location

Another potential driver of costs is geographical location.

Geographical location affects cost estimations in a number of ways. One of the costs associated with network infrastructure for water and wastewater is the digging of trenches for the laying of trunk and lead in mains. These costs relate to average wholesale prices in that they are a cost driver of wholesale service provision (as it relates to trunk and lead in mains) and to the calculation of the minus which may include costs associated with local reticulation.

In relation to local reticulation, currently the initial costs associated with new or growth customers are gifted to Sydney Water and Hunter Water, however, the renewal and replacement of local reticulation will result in Sydney Water and Hunter Water incurring such costs. These costs can potentially vary greatly depending on the soil types and the general geography of different areas or on the state and capacity of existing assets.

Sydney Water in their response to the Discussion Paper put forward the view that an average based approach would be inappropriate due to significant variations in expenditure associated with lead in mains and trunks mains across different growth areas.

> *Where schemes involve a significant amount of infrastructure, a system-wide average for infrastructure costs is not appropriate. If IPART were to set a system-wide average that was not based on the services the wholesale customer provides,*

> *there is a potential for arbitrage. This would occur if there was an average price based on an average level of infrastructure provision by all entrants and an entrant only provided minimal services such as retail and reticulation.* [4]

Sydney Water stated that:

> *A single average deduction also would not provide any signals to the market of where it is efficient to invest. This would promote inefficient entry. It would also be unfeasible to develop a schedule of location based EEC minus costs relating to the provision of significant infrastructure. This is because these types of EEC minus costs relate to unknown future scenarios involving augmentation of infrastructure delivered by the wholesale customer. This type of entry has not yet been experienced in the Sydney market.* [5]

While Sydney Water was not supportive of an average based approach, where that approach sought to incorporate significant amounts of infrastructure with varying costs, it was supportive of an average based approach for retail, reticulation and (potentially) lead in infrastructure

> *We believe Option 1 would be suitable as a default wholes ale price based on set deductions for cost components that could be reasonably averaged, and a schedule of values for facilitation savings that are more varied. These cost components would relate to the service components provided by the wholesale customer, such as retail and reticulation. We do not support this option where the customer will be providing services beyond this, such as large trunk infrastructure,*[6]

Hunter Water in its response to the Discussion Paper expressed a different preference:

> *Hunter Water favours IPART's Option 1 proposal out of the three implementation models detailed in the Discussion Paper. Under this arrangement, IPART would determine a standard, system -wide average minus and net facilitation costs to apply to all schemes within Hunter Water's area of operations. A separate wholesale price would apply for water services and wastewater services ……*
>
> *Hunter Water favours a simple, uniform approach because it does not see a need for anything more complicated. This reflects the reality that there are a small number of wholesale customers in the Lower Hunter and each wholesale supply arrangement is limited to the provision of a drinking water service at the boundary of the new development.*[7]

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4 Sydney Water (2016) Sydney Water's response to IPART's Wholesale Pricing Discussion Paper, 31 May 2016

5 Sydney Water (2016) Sydney Water's response to IPART's Wholesale Pricing Discussion Paper, 31 May 2016

6 Sydney Water (2016) Sydney Water's response to IPART's Wholesale Pricing Discussion Paper, 31 May 2016

7 Hunter Water (2016) Hunter Water Response to IPART , prices for wholesale water and sewerage services, May 2016

We acknowledge that this aspect of geographical location as a cost driver is problematic under an averaged or typical based wholesale pricing regime. The most obvious way in which to account for any potential cost differences of this type would be to include in the wholesale price a schedule of prices based on observable differences across different (and identifiable) network systems focussed on mains costs (lead in mains and associated works). The systems themselves would need to be defined in an engineering manner based on areas of homogenous cost. For example, Sydney Water may have a number of readily identifiable systems for wastewater collection and treatment that differ materially from each other. While the costs of service provision are reasonably homogenous within the system they are materially different from the costs associated with the neighbouring systems.

There is a direct trade-off between the number and degree to which individual system costs are recognised and the degree to which the proposed approach is consistent with the objective of being an averaged or typically approach. While four or five different system prices may be accommodated in an averaged approach, large numbers of systems would be more consistent with a site specific pricing approach.

Another potential impact of geographical location relates to the forward looking nature of some of the approaches to cost calculation (such as long run marginal cost (LRMC) and long run incremental costs (LRIC)). Under these approaches the existing capacity across various supply networks will have a direct impact on the future costs associated with service provision. In areas where there are large or material levels of excess capacity, future cost will be relatively lower (in NPV sense) as the need to augment capacity is not pressing. However, in systems that are operating at capacity or near capacity, forward looking approaches may result in material cost. Where systems have potentially large economies of scale the avoided cost will be low.

We also acknowledge that while there may be valid arguments for the application of a schedule of charges to reflect geographical cost of service differences, the practicality of doing so is solely reliant on the ability of both Sydney Water and Hunter Water to provide data that allows for the identification and quantification of such cost differences.

3. Retail-minus pricing

In its Discussion Paper, IPART expressed a preliminary view for adopting a retail-minus approach to determining the wholesale price. The retail-minus approach has a long history in economic regulation and is most often accredited to Baumol and Willig, who (in the early 1980s) proposed a well-known rule, called the Efficient Component Pricing Rule (ECPR).[8] The ECPR rule was aimed at facilitating competition in downstream markets and avoiding margin squeezes by the monopoly incumbent.[9]

The ECPR or retail-minus approach as originally stated was aimed at enabling an as efficient competitor to enter the downstream market. The rule itself was that the access price charged to competitors should not exceed the price charged by the integrated firm on the competitive segment, minus the incremental cost of that firm on the competitive segment. Typically the cost is measured as an avoided or avoidable cost, that is, the cost that the incumbent does not incur as a result of the new entrant.

As stated by IPART in its Discussion Paper, retail-minus is based on the retail charges (as determined by IPART for Sydney Water and Hunter Water) minus the costs of the contestable service. This approach to pricing is typically characterised as a top down approach, as opposed to a cost of service approach which would be categorised as a bottom up approach.

The retail-minus approach has been widely adopted to determine access prices across a number of different sectors. The approach has a compelling logic. For example, an access scenario where an entrant seeks to supply an existing water company's customer using its own groundwater abstraction facilities but seeks access to the incumbents' treatment and distribution system. Under retail-minus, the access charge is calculated by starting with the retail tariff that the customer is currently paying and deducting (or providing an entrant with a rebate) for the costs that the existing company can avoid after losing this customer. These costs may include operating costs or abstraction facilities, abstraction licenses, and capital costs if the new entry makes downsizing of abstraction pipes feasible.

The entrant will only be able to offer a lower final price to its consumer if its own total costs are lower than the costs of the incumbent incurred in providing the same services. By pricing in this manner, retail-minus seeks to ensure that entry will only result if it leads to lower total costs of overall supply to the customer. In other words, retail-minus seeks to ensure that entry is efficient. We note that the effectiveness of retail-minus is largely dependent on the level of contestability of the services. If the services offered by the new entrant were not contestable, then there is no certainty that the approach will lead to lower final prices to consumers.

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8 *The ECPR was first proposed by Willig (1979) and Baumol (1983).*

9 Geradin, D., & O'Donoghue, R. (2004). The concurrent application of competition law and regulation: the case if margin squeeze abuses in the telecommunications sector. *Margin squeeze under EC Competition Law with a special focus on the Tellecommunications Sector.* London: Global Competition Law Centre and British Telecom.

3.1. Types of costs

There are a range of different cost standards that could be applied to help answer the question of "what costs" are being assessed to determine the 'minus' component of retail-minus prices. In considering these cost standards, it helps to start by categorising the nature of the costs that a firm incurs operating in a specific market. There are a number of different ways in which to consider costs.

Costs may be categorised as either fixed or variable.

- Variable costs are costs that vary directly with the level of output (for example, volumes of water transported).
- Fixed costs are costs that don't vary directly with the level of output. These costs may be:
  - Fixed but non-sunk costs, which are costs that do not vary with the level of output but are recoverable in an alternative use.
  - Fixed sunk costs, which are fixed costs associated with any irrecoverable investment in specific equipment that is not transferable to an alternative use, such as trenching and laying a water pipeline.
  - Fixed common costs, which are fixed costs that are incurred in providing services across a firm's multiple business units (such as overhead costs for a firm that provides more than one service). Such costs are incurred if any one of the goods is provided. For instance, the costs of telephone lines to a house remain unchanged whether they are used for local or long distance calls.

The importance of common costs in the water industry means that it may be difficult to attribute costs to the particular facility to which access is being provided.

This distinction between costs, particularly those that are fixed and variable is important in determining costs based on forward looking approaches such as LRMC and LRIC (these approaches are discussed below).

Costs can also be categorised as either direct or indirect:

- Direct costs are those which can directly and unequivocally be attributed to an activity. They include labour (including on-costs) and materials used to produce the good or service.
- Indirect costs are those which are not directly attributable to an activity and are often referred to as overheads. They can include 'corporate services' costs such as the Chief Executive Officer's salary costs, financial services, human resources, records management, and information technology.

This distinction between costs is also important given that Sydney Water and Hunter Water provide multiple services and potentially multiple wholesale services.

Another common distinction is between capital costs and operating and maintenance costs:

- Capital costs are the returns a business must earn to justify retention of the assets in the business in the medium to long term. Capital costs are usually expressed as a rate of return on assets and may relate either to assets directly involved in producing the output or indirectly associated with production.

- Operating and maintenance costs are those costs associated with the operation and maintenance of the assets used to deliver services.

None of the different cost categories outlined above are mutually exclusive.

One aspect of costs that can complicate the approach to pricing is that in most practical cases there will be substantial sunk, long-lived investment required by businesses to provide services. These assets can potentially generate substantial economies of scale or scope. It is important to emphasise that in the presence of sunk costs, and/or economies of scale or scope, there is no unique measure of the "cost" of providing service in a particular period of time. [10]

Both sunk costs and economies of scale and scope can complicate cost allocation: The presence of sunk costs gives rise to a problem of allocating costs over time. Economies of scale and scope relate to fixed costs and common costs, which give rise to a problem of allocating costs across services which share economies of scope at the same point in time. The allocation (whether across services or over time) is typically carried out in a manner which is arbitrary, so that there is no economic significance to the resulting estimate of cost.

3.2. The treatment of sunk costs

Under a retail-minus approach costs that are typically forward-looking in nature and are considered avoidable are excluded. Sunk costs are (by definition) not avoidable because they have already been sunk and incurred. The implication is that value of avoided costs does not include a return on and of existing assets.[11]

Indeed, the economics literature on ECPR finds that if entrants require sunk costs to be deducted from the retail-minus price, so that they can fund their own sunk costs, then it is inefficient from

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[10] Directorate for Financial and Enterprise Affairs. (2010, September 09). *www.oecd.org*. Retrieved June 29, 2016, from OECD: http://www.oecd.org/regreform/sectors/46048803.pd

[11] The terms avoided costs and avoidable costs can have different interpretations. Some retail-minus based approaches to pricing subtract only those costs that the wholesale service provider will actually avoid as result of a new wholesale customer undertaking retail activities and supplying water users in downstream markets. These approaches typically refer to the minus component as avoided cost. An alternative approach, such as that adopted by the ACCC is the Services Sydney Determination, require those costs that the access provider (in this context wholesale service provider) could avoid in the long-run (that is avoidable costs) be subtracted from retail prices. Prices (in this context wholesale price) are therefore lower than if only costs actually avoided are subtracted from retail prices.

society's perspective to allow for the "wasteful duplication and incurrence" of fixed and sunk costs that are already incurred by the incumbent.[12]

However, the exclusion of these costs has often been levied as a criticism of the retail-minus based approach to pricing. For example, in a decision by the UK Competition Appeal Tribunal (CAT) regarding the use of ECPR for pricing wholesale water services, the CAT rejected the use of ECPR, in part because it requires the entrant to be "super-efficient" to support the fixed costs of the incumbent as well as its own.[13] A similar issue arises in respect of cost-based pricing, and this was one of the primary reasons the ACCC recently shifted from total service long-run incremental cost (TSLRIC+) based pricing principles to building block model pricing principles in the telecommunications sector.

> *These views support the ACCC's current review of access pricing for the declared fixed line services. In recent times, a consensus appears to have been reached among industry participants that a BBM (building block model) should replace TSLRIC+ as the pricing approach to telecommunications services. All submissions to the Discussion Paper were in favour of moving to a BBM.* [14]

The ACCC in its 2010 review of access charges for fixed lines in telecommunications also assessed the economic robustness of inclusion of sunk costs under a building block approach see Box 2 below.

Box 2: ACCC assessment of a building blocks based approach

By locking-in a value for the RAB, the BBM will improve certainty for both the access provider and access seekers. This will enable them to make efficient decisions regarding their future investment patterns and general business plans, thereby promoting economically efficient investment in infrastructure. Locking-in a value for the RAB will promote predictable revenue and price paths and minimise the prospect of windfall gains or losses. It will reduce the risk that efficient expenditure will not be recovered, which will in turn promote efficient investment in infrastructure and promote competitive entry and competition in the relevant markets.

The ACCC considers that the BBM pricing approach meets the objective of ensuring that the access provider is adequately compensated for its costs over time. As noted above, the BBM calculates the revenue required to cover the access provider's efficient costs, including a commercial return on investments. This is also consistent with the general regulatory principle that a regulated business should expect to receive sufficient revenue to allow it to cover all expected prudent expenditure necessary to maintain a given level of service at each period into the future.

Source: (ACCC, 2010)[15]

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[12] Alfred E. Kahn and William E. Taylor (1994), "The Pricing of Inputs Sold to Competitors: A Comment", *Yale Journal on Regulation*, 11, 225-240 at p.238.

[13] Albion Water Limited v. Water Services Regulatory Authority, Competition Appeal Tribunal, Case No. 1046/2/4/04, 6 October 2006, at paragraph 32.

[14] ACCC. (2010). *Review of the 1997 telecommunications access pricing principles for fixed line services, Draft Report.* Canberra: Commonwealth of Australia

[15] ACCC. (2010). *Review of the 1997 telecommunications access pricing principles for fixed line services, Draft Report.* Canberra: Commonwealth of Australia.

This move towards building blocks is also consistent with the approach adopted by the ACCC in the Services Sydney access determination. In its determination, the ACCC adopted a building block approach that included the operating and capital costs associated with the provision of the contestable components of providing sewerage services. The building block was used for the purpose of calculating avoidable costs and included existing assets in its calculation.

The Services Sydney determination adopted a building block approach to determining the avoidable treatment and disposal costs. Under the determination capital expenditure is recoverable through a 'lock-in' and roll forward approach. This approach is similar to a Regulatory Asset Base (RAB) and 'line in the sand approach" that IPART has adopted for water more generally, in that an initial valuation of assets is rolled forward over time to incorporate future capital expenditure less any depreciation applicable to these assets. The primary difference between the ACCC approach and a RAB approach is that the existing assets were revalued by the ACCC at a depreciated optimised replacement cost (DORC) on the basis of:

- A partial optimisation, with the optimisation constrained to the current site of Sydney Water's relevant facilities.
- Using modern equivalent assets that meet all relevant standards and Sydney Water's license conditions at the time of entry by Services Sydney.
- That they provide the capacity required to meet estimated demand for the duration of the determination, including capacity sufficient to manage peak sewage flows.

There are number of issues in relation to sunk costs that the adoption of averaged wholesale price based on the retail-minus a reasonably efficient competitor's costs needs to consider.

The first is that the reasonably efficient competitor approach is focused on building up a minus by looking at the costs the entrant would need to incur in order to provide the contestable services. It is reasonable to assume that to do so they will need to invest in assets equivalent in nature to the current asset base in order to deliver services. If the wholesale price did not reflect these costs then the new entrant is effectively paying for them twice and a reasonably efficient competitor may not enter. These costs can be accounted for under a retail minus based approach by measuring avoidable cost over a long enough time frame that it includes the capital expenditure related to renewal and replacement of existing assets. However, if (as we are recommending) existing price review data be utilised to generate estimates of avoidable costs then the time frame under consideration is constrained to the current regulatory period and it is unlikely to capture fully the associated renewal or replacement capital expenditure. If IPART's objective is to foster competition through new entrants then the exclusion of existing assets would not be consistent with this objective.

The second consideration is that IPART's Option 1 is an averaged based approach. Under this approach we are proposing average prices be achieved by setting them at a whole of business level for particular levels of service. Under the averaged approach an entrant providing purely retail services would face a wholesale price that was based on the avoidance by Sydney Water and Hunter Water of all retail activities.

Given that existing assets are included in the retail price, if they are excluded from the minus component then the wholesale customer will face a wholesale price that incorporates a return on and of the wholesale businesses existing retail assets. On the basis of these two issues NERA recommends that IPART include existing assets in the costs associated with a reasonably efficient competitor. Data permitting, these assets may be valued on a DORC basis to ensure that the costs associated with a reasonably efficient entrant are optimised and forward looking (consistent with the ACCC's Services Sydney decision). In the absence of DORC values the next best approach would be to allocate values from the existing regulatory asset base accordingly.

We acknowledge that existing assets are typically excluded from a retail minus based price calculation on the basis that they do not provide for economically efficient prices, however given the concerns raised by us we believe that there is room for regulatory discretion. IPART may, after consideration of the impact of existing assets, seek to either include them or exclude them from the calculation of wholesale prices.

3.3. The treatment of common costs

Common costs differ from sunk costs in that they may be forward looking in nature but are shared between different services. Unlike sunk costs, common costs may not be purely avoidable in a nature. A pure avoidable cost approach would include those common costs that are avoided by the entry of a reasonably efficient competitor. However, in practice the determination of what component, or to what extent, common costs are avoidable can be problematic and different regulators and sectors have taken different approaches. In the ex post antitrust analysis of a price squeeze the economics literature finds that common costs should be excluded from the minus.

For example, Biro, Houpis and Hunt note that the calculation of the incremental downstream cost of a single product would exclude common costs.[16] Hovenkamp and Hovenkamp argue that common costs should not be allocated to the particular product or products in a price squeeze test, because it is only incremental costs (and incremental revenue) that a firm takes into account when considering an increment to production.[17] Similarly, Grout states that "economic sense suggests that retail incremental cost is the appropriate measure" because a firm can trade profitably if the price covers incremental cost.[18]

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[16] Z. Biro, G. Houpis, and M. Hunt (2011), *op cit.* Biro et al note that if the calculation is across a range of products over which the common costs are incurred, then the price squeeze test would include these common costs.

[17] Erik N. Hovenkamp and Herbert Hovenkamp (2009), "The Viability of Antitrust Price Squeeze Claims", *Arizona Law Review*, 51, 273-303.

[18] Paul A. Grout (2003), "Defining a price squeeze in competition law", in Swedish Competition Authority, "The Pros and Cons of Low Prices", Konkurrensverket, Stockholm.

A similar issue to that identified above regarding fixed costs is also identified in the literature, where it is deemed inefficient from society's perspective if there is duplication of common costs.[19]

However, in the case of ex ante regulation (as is the case with Sydney Water and Hunter Water) it would appear that regulators tend more towards including a share of common costs in the minus.[20] While it is difficult to ascertain why ex ante regulation tends to include common costs, Sidak notes that exclusion of common costs can be distortionary:

> *It may be said that pricing at incremental cost without joint and common costs is economically inefficient because it enables competitors to offer the incumbents' services without considering the common costs that the incumbents incur. Thus, technological decisions will be distorted: the incumbent is encouraged in less efficient technologies that have higher incremental costs and lower common costs, which would tend to reduce economies of scope. Moreover, due the fact that the firm cannot break even, reduce the quality of service.*[21]

A number of regulators (including the ACCC) have adopted LRIC and TSLRIC based approaches that include an allowance for common costs. These approaches are usually distinguished by being labelled LRIC+ or TSLRIC+. Examples of approaches that allow for common costs include the ACCC's previously mentioned use of TSLRIC + based pricing for fixed line access in the telecommunications sector.

There are a number of different ways in which to allocate common costs. One example is given by Royal Mail that typically uses mark-up rules based on Ramsey pricing methods (recovering a greater proportion of common costs through the most inelastic products), or an equivalent proportional mark-up approach (EPMU), where the allocation is based on the incremental costs of different products and services. Currently Royal Mail's FAC product costing system applies an EPMU rule for common costs as proposed in the Third Postal Services Directive of the European Union.[22]. In New Zealand, the approach to setting wholesale prices for access to the copper telecommunications network using TSLRIC+ allocates common costs using an EPMU approach.[23]

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19 Kahn and Taylor (1994), *op cit*.

20 See Table 2.11 of Copenhagen Economics (2010), "Applied margin squeeze study", Final report for Post-Og Teletilsynet, 19 January, setting out the cost standards used in various price squeeze guidelines and cases across Europe. See also Germain Gaudin and Claudia Saavedra (2014), "Ex ante margin squeeze tests in the telecommunications industry: What is a reasonably efficient operator?", *Telecommunications Policy*, 38, 157-172

21 dak, J. G. (1997). *Deregulatory Takings and Regulatory Contract, The Competitive Transformation of Network Industries in the United States.* Cambridge Universtiy Press.

22 Royal Mail. (2010). *The development of long run incremental cost estimates in teh postal sector by Royal Mail.* London: Royal Mail.

23 Commerce Commission (2015), "Final pricing review determination for Chorus' unbundled copper local loop service", NZCC 37 final determination, 15 December 2015, at paragraph 520.2.

As with the treatment of existing assets, NERA believes that there is a strong case for regulatory discretion. The reasonably efficient competitor approach is focused on building up a minus by looking at the costs the entrant would need to incur in order to provide the contestable services. It is reasonable to assume that to do so they will need to incur costs similar in nature to the common costs incurred by the wholesale businesses. If the wholesale price did not reflect these costs then the new entrant is effectively paying for them twice and a reasonably efficient competitor may not enter. NERA recommends that common costs be included in the calculation of the minus for wholesale prices.

4. Developing an approach to calculating retail-minus prices

4.1. Overview of approach developed by NERA and SIPA

We are proposing that Option 1: a wholesale price based on a system wide average or typical minus and net facilitation costs, be based on the following approach as outlined in Box 3 below.

Box 3: Proposed approach to average wholesale prices based on option 1.

Wholesale price = retail price *less* **reasonably efficient competitor costs** *plus* **facilitation charge**

Retail price — the retail price is determined by the wholesale service being sought and the tariff structure for the wholesale price is to be consistent with that adopted for the retail price. Retail prices are averaged by definition as they are applied uniformly by Sydney Water and Hunter Water.

Reasonably efficient competitor costs — these costs are to be determined via the adoption of a distributed cost based approach which utilizes Sydney Water and Hunter Water's costs to determine the efficient competitor costs. These costs are calculated using a distributed cost based approach. The costs are then adjusted to account for potential economies of scale or scope through the application of an efficiency factor.

These costs relate to average prices as we are proposing to calculate the reasonably efficient entrants cost based on the Sydney Water and Hunter Waters whole of service level. By definition the costs will reflect Sydney Water and Hunter Water's average costs associated with the provision of services. This will allow for the reasonably efficient competitor to enter either in a new (greenfields or infill) system or to enter via transfer of existing systems.

Given that IPART is seeking to adopt a reasonably efficient competitor based standard for the measurement of costs, we recommend that both an allocation of common costs and costs associated with sunk assets be included in the calculation of the minus on the basis that the inclusion of these costs will lead to prices that are more reflective of the costs of a reasonably efficient competitor than would be the case if they were excluded. However, we do recognise regulators in other jurisdictions and sectors have adopted a variety of approaches to the inclusion of these costs and that the decision regarding their inclusion requires a degree of regulatory discretion. If included, these costs will lower the wholesale price marginally.

Accordingly we have generated different prices for the inclusion and exclusion of both existing assets and common costs to quantify their materiality in terms of a wholesale price.

Net facilitation charges — a framework for determining net facilitation charges has been outlined in this paper. This framework is conceptual in nature. Its validity and practicality is assessed against the available data and the suitability of the current planning framework.

Facilitation charges account for administrative costs incurred in the provision of wholesale services.

One of the fundamental aspects of the approach that we have proposed is the utilisation of existing data from the 2016 price reviews for both Sydney Water and Hunter Water.

Given the timeframes associated with this project, NERA's view was that it was important to utilise the cost and demand data available, rather than seek new cost and demand data from Sydney Water and Hunter Water. Our approach involved seeking clarification of existing price review data by Sydney and Hunter Water in terms of the allocation of price review cost data to different levels of service.

We also note that the price review cost and demand data has been subject to independent prudency and efficiency reviews, extensive consultation both with the water businesses and other stakeholders and as such is the most reliable readily available measure of costs over the forthcoming period. We were also cognisant of the need to ensure that the wholesale prices that were developed were consistent with the Tribunal's decisions regarding the costs as expressed in its determinations for Sydney Water's and Hunter Water's retail prices.

Option 1 in IPART's Discussion Paper requires the development of an approach that calculates average or typical wholesale prices. There are a number of ways in which average costs may be calculated. These range from determining the costs associated with each potential provision of wholesale service and determining a mean or median price (depending on the distribution of individual service costs) through to the adoption of a service based approach that determines the total costs associated with different levels of service and uses these to calculate an avoidable cost.

We are proposing a service level based approach. Under this approach the cost of a reasonably efficient competitor will be the cost associated with the level of service that the wholesale customer intends to provide. For example, if the wholesale customer was intending to provide retail and reticulation services to end users, the avoided cost would be based on the calculation of costs associated with Sydney Water or Hunter Water undertaking all retail services (billing, customer service etc.) and the costs associated with operating, maintaining and replacing all local reticulation networks.

This approach will ensure that the wholesale price is reflective of the level of service being provided. This approach avoids the need to undertake extensive consultation with Sydney Water, Hunter Water, and more ideally with potential wholesale customers aimed at identifying an adequate basis for an average using actual or anticipated instances of wholesale service provision — either the full suite of potential instances of wholesale service provision or alternatively a representative suite of wholesale service provision. Such consultation would not have been achievable within the timeframes for this project.

4.2. Our analytical framework for developing an averaged retail-minus approach

The analytical framework developed by NERA and SIPA to identify a proposed approach to calculating retail-minus prices is based on a structured and logical assessment of each of the principal components of the retail-minus formula within the context of the most likely form of wholesale service that Sydney Water and Hunter Water may be required to provide.

A broad outline of the approach is the following:

- Step 1 — define scenarios of potential wholesale service. These scenarios have been developed based on consultation with IPART and are outlined in Section 2.
- Step 2 — outline assessment criteria to help guide the identification of the preferred approach.
- Step 3 — assess options for each component of the retail-minus formula against the criteria (retail price, avoided cost, efficiency factor and the facilitation charge).

One of the principal considerations in developing an approach to wholesale prices is a comprehensive consideration of the costs of water, wastewater and recycled water service provision. How prices reflect costs and the incentives that prices provide to customers and to water businesses is as relevant to wholesale services as it is to retail services. This consideration of costs is undertaken in Step 3 during the assessment of the different approaches to calculating the minus or avoided cost component of the pricing formula. A discussion of the resulting cost reflectivity of our proposed approach is provided in section 7.

This chapter also sets out the scenarios that we have identified and the assessment criteria that we have developed. The assessments of the different components of the pricing formula are addressed in separate chapters. Collectively the preferred approach to each component forms our preferred approach to wholesale pricing. This approach is then applied to the scenarios, in order to provide an indication of the likely outcomes of the approach if it was implemented. Our approach is summarised in Chapter 7.

4.2.1. Assessment criteria

The next stage in our analytical approach involved the development of a set of criteria to guide our assessment of the different options for implementing a retail-minus (plus net facilitation costs) approach to develop system-wide average minus and net facilitation cost approach. In developing these criteria we have given consideration to IPART's main objective in regard to wholesale pricing, the matters to which IPART must have regard to when undertaking a price review (as set out in section 15 of the IPART Act), and our own general experience with regulatory best practice. IPART has stated that its main objective in relation to wholesale pricing is create a level playing field, so that new entry to the water and sewerage services markets occurs where it is efficient.

> *That is, that new entrants or alternative suppliers to Sydney Water and Hunter Water can compete where they are efficient, leading to overall least cost supply, enhanced service levels and efficiency gains in the water and sewerage markets.*[24]

[24] IPART (2016) Prices for wholesale water and sewerage services, Discussion Paper April 2016

The OECD has developed a set of pricing principles specific to access pricing (see Box 4).

Box 4: Summary of OECD access principles

There is a large literature in the economics of regulation on the efficient determination of access prices.

Importantly, this theory provides guidance as to when there should be a relationship between the downstream or retail price and the upstream access or wholesale price, and if so, what that relationship should be. Some of the key results of that literature are as follows:

- First, a distinction is made between "one-way" and "two-way" access problems. "Two-way" access problems (where each firm provides essential inputs to the other) are quite different in nature from the classic or "one-way" access problem and should be handled separately.
- The pricing of "one way" access problems is very similar in principle to the classic problem of efficient pricing of the output of a monopoly. The principles that have been developed for efficient monopoly pricing also apply to access pricing. These principles include, amongst other things, the relevance of marginal cost as a starting point, the possible efficiency benefits of using two-part tariffs and other forms of price discrimination, and the possible use of "Ramsey-Boiteux" tariffs to efficiently allocate joint and common costs across different services.
- Importantly, where the access product is used by rivals to produce a downstream product that is a substitute for the downstream product sold by the incumbent firm, the extent of that substitution should be taken into account when setting the access price. At one extreme, when the rival's downstream product is only a poor substitute for the incumbent's downstream product in the eyes of consumers, the access price can be set largely independent of the incumbent's downstream price. In this case, the access price is usually set on the basis of so-called "cost-based" factors (such as marginal cost, or incremental cost, with or without a share of the joint and common costs) At the other extreme, when the rivals' downstream product is a perfect substitute for the incumbent's downstream product in the eyes of consumers, the access price must be set so as to allow an appropriate margin between the incumbent's downstream price and the access price. In this case (under certain specific further assumptions) it is possible to show that the efficient access price is given by the well-known "efficient component pricing rule", which states that the access price should be set equal to the incumbent's downstream price less the marginal cost (or, sometimes, the incremental cost) of the incumbent in transforming the upstream product into the downstream product.
- Where the access price is tightly regulated and the downstream price lightly regulated or not regulated at all, the integrated firm retains strong incentives to deny access by delaying or degrading the quality of access. Preventing this behaviour is time and resource intensive. On the other hand, where the downstream price of the integrated firm is tightly regulated and the upstream price only lightly regulated the integrated firm may choose to withdraw from provision of the downstream service. One tool that has been proposed to ensure the correct "balance" between the regulation of access prices and final prices is the so-called "global price cap" which imposes a cap on a basket of prices including both access and final prices. The regulated firm is given discretion to alter both access and final prices provided a cap on the weighted average of both access and final prices is not violated. A cap of this kind, although having certain desirable theoretical properties, has not yet been adopted in practice.
- Where the rivals' downstream product is a close substitute for the downstream product of the incumbent, any price discrimination that is present in downstream prices of the incumbent should be reflected in the access prices. For example, if the incumbent uses a two-part tariff at the downstream level, this should be reflected at the access level. If the incumbent discriminates on price across different groups of customers or geographic areas at the downstream level, this should be reflected at the access level. If the incumbent offers bulk discounts at the downstream level, the same discounts should be reflected at the access level. This approach assumes that the access price can be set differently depending on the characteristics of the final downstream customer to which the final product is sold.

Source: (Directorate for Financial and Enterprise Affairs, 2010)[25]

[25] Directorate for Financial and Enterprise Affairs. (2010, September 09). *www.oecd.org*. Retrieved June 29, 2016, from OECD: http://www.oecd.org/regreform/sectors/46048803.pd

These principles were developed for access where there in on-going competition in the downstream market (i.e. that the services the wholesale customer was providing are contestable). The OECD principles are clearly based on the assumption that the new entrant or wholesale customer will be providing services that are contestable.

It is worth noting that the OECD principles require the wholesale tariff to be consistent with the wholesaler's retail tariff. For example, if the wholesaler uses a two-part tariff at the downstream level, this should be reflected at the access level. This approach assumes that the access price can be set differently depending on the characteristics of the final downstream customer to which the final product is sold.

NERA's experience in developing, implementing and operating regulatory models along with consideration for IPART's objective and legislative pricing principles have led us to identify what we believe are a common set of characteristics that any retail-minus pricing method should exhibit if it is to be ultimately successful in providing usable, robust and cost reflective prices. These characteristics are outlined below.

- **Accurate** — the method needs to correctly represent the cost associated with the provision of wholesale services. We are mindful that there is an inherent trade-off between accuracy and simplicity in the development of an average or typical based pricing approach. In general it is difficult under an average based pricing approach to account for locational differences. In the context of this report we have taken accurate to mean that the prices charges will be reflective of the costs associated with different levels of service.

- **Applicable** — the method needs to be applicable in that it is consistent with regulatory objectives and can be readily implemented given the context. In particular we note that IPART's broader approach to pricing is to allow for prices that ensure businesses can earn a return on and off their existing and new assets, and recover the costs associated with operating and maintaining those assets to deliver services. Applicability also refers to ensuring that the pricing method is consistent with the matters outlined in section 15 of the IPART Act.

- **Doable** — the method needs to be practical, in the sense that it is not overly resource intensive given the time constraints of this project and can be readily undertaken given the level of existing data in IPART, Sydney and Hunter Water. The method also needs to be deliverable within the timing constraints associated with IPARTs wholesale price review process.

- **Defendable** — the method needs to be defendable in a regulatory context. In order to achieve this we need to be conscious of not contradicting previous regulatory decisions, ensuring that the method is based on sound economic considerations and that to the extent possible the data is robust, publicly available (observable) and reliable. The defendable criteria are related to making the method transparent and replicable by third parties.

- **Cost effective** — the benefits of regulation should exceed the costs. The method developed should where possible seek to minimise the burden of regulation. For example if the costs associated with establishing sophisticated linear programming based optimisation models

exceeds the materiality of the benefits that would accrue from having a better understanding of marginal costs over the long run, IPART would need to consider the appropriateness of such approaches.

4.3. Identifying the retail price

The retail price is the first component of the retail-minus formula that needs to be defined. The retail price is the price charged to retail or end use customers. However, the consideration of what the retail price is can raise a number of issues that IPART will need to consider when implementing retail-minus pricing. These could include the following:

- On what basis should the retail-minus be applied. Should it be applied on a particular level of service or should it be applied on a bundle of services?
- How to match wholesale and retail services?
- How to align wholesale tariffs with retail tariffs?

Another issue that has arisen in other sectors that have retail-minus frameworks is how to treat discounts and temporary promotions. However, we note water and wastewater services provided by Sydney and Hunter Water are considered to be monopoly services and that discounting and temporary promotions are not a characteristic of the service offering.

The retail price is the price currently charged by either Sydney Water or Hunter Water to retail customers. One of the benefits of the current regulatory arrangements for Sydney Water and Hunter Water is that retail prices are readily observable as part of the determined schedules of prices set by IPART during price reviews. As mentioned above, discounting and bundling for promotional purposes are not a characteristic of the NSW metropolitan water and wastewater sector. Identifying the appropriate retail price will not involve accounting for these behaviours.

4.3.1. Should retail-minus be applied on a product-by-product basis or to a set of products?

An issue that often arises in other sectors (particularly telecommunications) is whether it is appropriate for the retail-minus method to calculate the wholesale discount for individual products or for a group of products (portfolio approach).

On one extreme, setting wholesale price using retail-minus on a product-by-product basis could be seen as unnecessarily burdensome. At the other extreme, if retail-minus were applied to the entirety of all wholesale and retail products, then the notified operator would have scope for cross-subsidisation within the bundle.

This issue is not as pressing in the water and wastewater sector. Water and wastewater are typically not bundled by service providers and although included on the same bill are offered and charged for separately. Bundling services of this nature would unnecessarily complicate the pricing framework.

The exception to this may be recycled water services, where wholesale service providers could conceivably bundle sewerage services with recycled water treatment services. Bundling of services for a wholesale pricing purpose would be most appropriate where the nature and level of cost associated with different services are relatively similar. We do not believe that this is the case with water, wastewater and recycled water service provision.

Bundling services for pricing purposes where costs are heterogeneous may allow scope to wholesale service providers or retailers to pursue opportunities to cross subsidise particular services within the wider group of services offered in the bundle. For this reason we do not recommend IPART consider bundling services for pricing purposes. A further option available is for IPART to apply retail-minus on a product-by-product basis initially, but as more evidence becomes available, to review the possibility of moving to or allowing Sydney Water and Hunter Water to bundle services under the retail-minus framework.

4.3.2. Matching wholesale and retail services

It may not always be the case that wholesale services will have a corresponding retail service. That is, the associated retail product will not necessarily involve "re-selling" of a wholesale product. This will be the case where the service provided at the wholesale level is purchased in order to provide a different service at the retail level.

Given that the primary purpose of the retail-minus pricing approach is to generate a price for wholesale services (that is the price that it is reasonable to expect a wholesaler would levy in a competitive market) the focus on identifying the relevant retail price must be based on or guided by the nature of the wholesale service being offered.

This is relatively straight forward where wholesale potable water or wastewater products are being offered to customer for resale to residential and non-residential users. However, there is a potential, particularly in wastewater to confuse wholesale services with commercial or industrial services. For example, in the case of recycled water, it may be more appropriate to recognise that the owner of the recycled water plant is both sourcing their own sewage for treatment and undertaking treatment of that sewage to produce a commercial product being recycled water. Sludge is the resulting waste produced by the treatment process and its disposal is for all intents and purposes similar to that of any other commercial trade waste customer disposing of waste of the same parameters. Currently , the trade waste prices determined by IPART and charged by Sydney Water or Hunter Water do not differentiate between trade waste customers on the basis of the retail or wholesale product that the customer themselves produces.

In the case of recycled water and trade waste, NERA would suggest that the collection and treatment of sludge is most consistent with a trade waste service. Given that the customer is not on-selling trade waste the service is not a wholesale service but rather is seeking collection of waste product generated by their own commercial activity, the customer should be treated as a commercial sewerage and trade waste customer.

Where the customer is seeking to on-sell trade-waste services, it would be appropriate to levy a wholesale price based on retail-minus (in this case the retail would be the trade waste price and

the minus would be the cost avoided in the retailing and local collection of trade waste services to commercial customers).

4.3.3. Matching wholesale tariffs to retail tariffs

The ability to implement retail-minus on a product-by-product basis will need to take into consideration the nature of the tariff structures associated with retail services. Retail tariffs may contain different price elements, such as fixed charges and volume based charges.

One of the benefits of adopting a service by service based approach is that it allows the businesses to maintain their retail tariff structures across their wholesale services. This is particularly important for water services where businesses have set fixed and variable components to economic efficiency and help manage water scarcity issues.

As a general rule, any price discrimination which is present in final prices should be reflected in access prices and vice versa. Where it is not possible to price discriminate in the same way in access prices as in final prices, there may be a trade-off between efficiency and downstream competition. [26]

Associating wholesale tariff structures to retail tariff structures is also consistent with the rules or principles for access developed by the OECD (see Box 3). These principles clearly state that where the wholesale customers' downstream product is a close substitute for the downstream product of the wholesaler, any price discrimination that is present in downstream prices of the wholesaler should be reflected in the access prices. For example, if the wholesaler uses a two-part tariff at the downstream level, this should be reflected at the access level. If the incumbent discriminates on price across different groups of customers or geographic areas at the downstream level, this should be reflected at the access level.

The application of retail-minus to fixed and variable charging components is materially different. A minus based on a cost can be readily applied to a fixed charge. For example, if there is only one wholesale customer and one retail customer then the calculation of a wholesale price is relatively simple. For example, if the cost is $5 and the fixed retail price is $20 the wholesale fixed price will be $15.

This simple example becomes slightly more complicated when you take into consideration the difference between a fixed retail price, which is levied over multiple customers (end users), and a fixed wholesale price, which is levied over one customer (the wholesale customer). Applying a fixed price to the wholesale customer based on the retail fixed price would not be appropriate as it would not allow for enough revenue to compensate Sydney Water and Hunter Water for the provision of its wholesale services. Ideally the revenue generated by the fixed wholesale price should be consistent with the revenue associated with the fixed retail price less the avoidable costs associated with the provision of retail services.

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[26] Biggar, D. (2001). Access pricing and competition. *ACCC conference on Regulation and Investment.* Sydney: ACCC.

The most appropriate approach is to base the fixed charge on the number of retail connections and not the number of wholesale connections. For example, a wholesale customer seeking wholesale potable water to service 1000 retail connections on their own reticulation network will need to face a fixed wholesale charge that is based on the 1000 individual retail connections (consistent with how prices would have been levied in the absence of the retail service provider).

For a variable component the charging parameter is applied on a per unit consumed basis and therefore the minus must be applied in a manner consistent with the variable nature of the retail price. Simply applying the cost to the variable price is not a valid approach. The application of the minus will need to reference the volumes of demand associated with the variable price.

4.3.4. Timing issues associated with the retail price

An issue may arise in relation to the timing of charges. This is particularly important where wholesale customers are servicing new developments that may be being released on a staged basis.

Where wholesale customers are partially servicing a reticulation network (for example, due to staged releases of developments, new retailers at any given time may only be servicing that proportion of newly released developments that contained connected properties) the fixed charge levied by the wholesaler is the retail fixed charge (less avoidable costs) by the average number of connections serviced during the billing period.

The other aspect of timing is associated with when the wholesale price is levied. We would suggest that with the exception of the facilitation charge (which may be an upfront charge) the wholesale price should be levied overtime consistent with the timing associated with the retail price.

4.3.5. Summary: retail price

- The retail-minus price should be applied on a product-by-product basis. For example the relevant retail price for wholesale trade waste services is the retail price for trade waste services.
- The focus on identifying the relevant retail price should be based on the nature of the wholesale service being offered.
- The wholesale prices tariff structure should be consistent with the identified retail price. For example, if the retail price is a two part tariff the wholesale price should also be a two part tariff.
- For two part tariffs the fixed component will need to be aggregated based on the number of connections the new entrant is seeking to service.

4.4. Identifying a reasonably efficient competitors costs

The second component of the retail-minus pricing formula is the calculation of the costs associated with a reasonably efficient competitor. In its Discussion Paper, IPART defines these costs as the total costs that a reasonably efficient business would incur between the wholesale connection point and serving end users (retail customers).

The concept of the costs associated with a reasonably efficient competitor is distinct from the common regulatory approach of adopting avoidable costs. Avoidable costs are typically the costs that the wholesale service provider would otherwise have incurred had the wholesale customer not entered the market.

IPART's Discussion Paper identified the reasonably efficient competitor approach in preference to the alternative approach of adopting an as efficient competitor approach. This alternative approach is also in principle distinct from the avoidable cost approach. However, in practice the adoption of an as efficient approach inevitably leads to a calculation of total costs that equates to avoidable costs (given that the wholesaler and the wholesale customer are deemed to be as efficient).

There are a number of potential approaches that could be adopted to determining the costs associated with a reasonably efficient competitor. These include:

- Undertaking a benchmarking exercise to identify the costs associated with a reasonably efficient competitor.
- Generating an engineering based estimate of the costs associated with a reasonably efficient competitor.
- Adjusting the costs incurred by both Sydney Water and Hunter Water in providing retail services to account for a lack of economies of scale or scope in the wholesale customers. Under this approach the reasonably efficient competitor's costs would be calculated by applying an efficiency factor to the avoidable costs.

4.4.1. Benchmarking approach

The first option, and the one most likely to deliver an accurate outcome if undertaken correctly, is the adoption of a benchmarking based approach.

This may be achieved through benchmarking similar activities across jurisdictions and water utilities or alternatively undertaking cost benchmarking against similar service providers in other utility sectors (such as electricity and gas). While such benchmarking should be relatively straight forward for pure retail activities such as the operation of billing centres, benchmarking costs for other system specific activities such as the establishment and operation of local reticulation networks or lead in mains may be more problematic and will depend on the availability of data.

The major drawback associated with this approach is the likelihood of being able to identify an appropriate sample of benchmarking partners. Based on our experience with benchmarking exercises the robustness of the approach depends on the ability to identify and obtain data from a sample of comparable businesses.

The benchmarking partners need to be providing the same or very similar services and have a comparable cost base to that of a reasonably efficient competitor. This means we would need to be able to identify an adequate sample of service providers that do not have the same economies of scale and scope that Sydney Water and Hunter have. This requirement would rule out most, if not all, of the large water utilities providing similar services in other jurisdictions.

This approach would most likely require the benchmarking partners to participate in a detailed costing survey. It would also require detailed consultation with Sydney Water and Hunter Water in order to identify comparable businesses.

A further drawback to this approach is that, to the extent that identified benchmarking partners are privately owned, there will inevitably be sensitivities associated with using their cost data. Many will elect not to participate and those that do may require commercial in confidence arrangements which would make the benchmarking exercise non transparent in a regulatory setting.

The subjectivity in assumptions regarding appropriate benchmarking partners and the regulatory discretion that is invariably required during a benchmarking process mean that this approach will be relatively difficult to defend in a regulatory context. An assessment of benchmarking is provided in Tables 3 and 4 below.

Table 3: Assessment of benchmarking approaches

Approach	Accurate	Applicable	Doable	Defendable	Cost effective
Benchmarking	✓	✓	✘	✘	✘

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Table 4: Benchmarking advantages and disadvantages

Approach	Advantages	Disadvantages
Benchmarking	▪ A benchmark calculation is generally a more straightforward and transparent approach, relative to methods utilising cost data	▪ Can be difficult to find data to act as benchmarks, particularly for costs of local reticulation networks ▪ Data can be commercially sensitive and difficult to obtain ▪ The need to ensure comparability can limit the benchmark sample size ▪ Requires some regulatory discretion as to what potential benchmarks are or are not comparable

Note: This table summarizes the pros and cons associated with individual assessment criteria. The assessment may be qualitative in nature where this is the case we have endeavored to provide text supporting the assessment.

4.4.2. Engineering approach

This approach would involve defining a hypothetical representative retail service provider and then adopting a building block based approach to estimate the associated cost of service. The appropriateness of the approach would rely on the ability of NERA and SIPA to adequately define what constitutes a reasonably efficient wholesale customer providing retail services and their associated costs in a manner that is representative of the average costs associated with their level of service.

Adopting an engineering based approach would require a large number of reasonably subjective assumptions relating to the scale of the services being provided, the technologies employed to deliver these services and the costs associated with those technologies.

In terms of scale, one of the major issues associated with this approach is determining what constitutes a reasonably efficient competitor. Given that Option 1 is an averaged based approach this definition of a reasonably efficient competitor needs to be representative of what on average would constitute a reasonably efficient competitor. That is, as an average it could not be defined based on the circumstances of any one wholesale customer. This issue is relevant for any approach under an averaged pricing regime, but is particularly important under an engineering based approach.

We note that IPART gave an example in its issues paper that a wholesale customer providing retail water or waste water services to a community with a population 50,000. However, we also note that the scenarios provided by IPART for this project and those considered in IPART's Discussion Paper refer, in some instances, to wholesale customers providing services in single developments. We are also conscious that in brownfield or infill situations a wholesale customer

may be providing services in a single building or high density development. Such developments are unlikely to service 50,000 people.

In order to define a reasonably efficient competitor, NERA and SIPA would need to have a detailed understanding of all the likely and potential wholesale service customers over the regulatory period and their likely scale of operations. This information is not currently available.

In addition to scale, an engineering approach would also require assumptions regarding the technology, capital and processes employed by wholesale customers in order to generate a representable cost profile. This task would be relatively complex. For example, Ofwat in its recent direction for cost allocation in the 2014 price review for wholesale price controls listed the number of activities that are either wholly or partially retail in nature (note that Ofwat's definition of retail only extends to pure retail services and does not include local reticulation).[27] There are a total of 25 separate cost activities identified by Ofwat (see Table 5). Not all of these would be applicable, but it should give some indication of the number of cost based assumptions that would need to be made.

If the wholesale customer is delivering local reticulation services and main services (such as lead in mains), the number of assumptions would need to increase to incorporate the technologies utilised for these services and the associated cost.

An engineering approach, while executable, would ordinarily require a large degree of consultation with both the wholesale service providers and the potential wholesale customers in order to ensure the assumptions made in the calculation are truly representative of the scale and service solutions that wholesale customers intend to adopt over the regulatory period. It would be impractical within the timeframes of this project to undertake this consultation. However, IPART may wish to consider the development of a detailed engineering based approach as part of its forward work program.

As with benchmarking, the subjectivity in assumptions regarding the definition of a representative service provider and the regulatory discretion that would be required to build a cost profile of the representative service providers mean that this approach will also be relatively difficult to defend in a regulatory context. An assessment of the engineering approach is outlined in Tables 6 and 7.

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[27] Ofwat 2014 *Price review cost allocations for retail and wholesale price controls,* March 2014

Table 5: Ofwat retail cost types

Customer service	Other operating costs	General and support	Local authority
Billing	Disconnections and reconnections	IT costs	Local authority rates
Payment handling, remittance and cash handling	Demand side water efficiency initiatives	Motor vehicle costs	Cumulo rates
Vulnerable customer schemes	Customer-side leaks	Finance, HR, payroll, executive team, general management	
Non-network customer enquiries and complaints	Charitable trust donations	Facilities, buildings/grounds maintenance	
Network customer enquiries and complaints	Other operating costs	Insurance costs	
Other customer services	Other direct costs	Other general and supportive costs	
Debt management		Other business activities (regulation costs)	
Customer doubtful debts		Developer services	
Meter reading			

Source: Ofwat 2014 Price review cost allocations for retail and wholesale price controls

Table 6: Assessment of engineering approaches

Approach	Accurate	Applicable	Doable	Defendable	Cost effective
Engineering	✓	✓	≈	✘	✘

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Table 7: Engineering approaches advantages and disadvantages

Approach	Advantages	Disadvantages
Engineering	▪ Provides the best conceptual approach for reasonably efficient operator, as it is explicitly based on an assumption of such a hypothetical efficient firm	▪ Bottom-up cost modelling can be complex, information-intensive, and difficult to implement in a timely manner ▪ Requires a high degree of regulatory discretion regarding the structure and efficiency of the hypothetical retail service provider ▪ An engineering approach is more suited to a case by case determination of wholesale prices where the cost characteristics of service provision may be better defined. Under an average based approach to pricing the hypothetical service provider will need to be representative of the average retail service provider.

Note: This table summarises the pros and cons associated with individual assessment criteria. The assessment may be qualitative in nature where this is the case we have endeavored to provide text supporting the assessment.

4.4.3. Efficiency adjusted cost approach

The final alternative is to adjust the costs incurred by both Sydney Water and Hunter Water in providing retail services to account for a lack of economies of scale or scope in the wholesale customers. Under this approach the reasonably efficient competitor's costs would be calculated by applying an efficiency factor to the avoidable costs (that is those costs associated with provision of the level of services that Sydney Water and Hunter Water are no longer providing).

Under this approach the formula for wholesale price as proposed by IPART as:

Wholesale price = retail price – reasonably efficient competitor costs + net facilitation charges

Would become

Wholesale price = retail price – (efficiency factor x *costs of service provision) + net facilitation charges*

This approach is consistent with suggestion made by IPART in its Discussion Paper that costs of a reasonably efficient competitor could be defined as:

> *The costs of Sydney Water or Hunter Water in the area plus a percentage to reflect the smaller scale of a relatively new entrant, for example a five*

> *percent addition to Sydney Water's or Hunter Water's costs of servicing the area.*[28]

It is difficult to ascertain the degree of regulatory precedent for this approach. The similarly efficient operator (SEO) test is a variant on the "as-efficient" operator (AEO) and "reasonably efficient" operator (REO) tests. (Although often the terminology used is a bit loose, and it appears that regulators in the literature often don't distinguish between the REO and SEO approaches). Gaudin & Saavedra refer to regulators making adjustments to the costs and economic conditions of the incumbent to account for new entrants' disadvantages", and they go on to note that this approach has the practical benefit that regulators can use incumbent's data provided in a framework of accounting separation and cost accounting remedies.[29] Some regulators call this approach an 'adjusted equally efficient operator' test or a 'similarly efficient operator' test.[30]

Ofcom use what they refer to as the SEO approach, and state that the similarly efficient operator shares the same cost function as BT's own downstream business but which does not yet necessarily enjoy the same economies of scale and scope as BT's business currently does.[31]

Wik Consult refers to three approaches, SEO, REO and "EEO" (equally efficient operator, which is equivalent to the AEO approach noted above) — in the context of Sydney Water and Hunter Water an EEO is refereeing to an as efficient competitor cost standard. WIK state that the basic difference between the REO test and the EEO test relates to the relevant cost. While the EEO test rests on the downstream cost of the dominant operator, the REO test relies on the altnet's (alternative network operator's) cost. WIK go on to state that The SEO test considers a hypothetical operator which shares the same basic cost function as the incumbent operator but does not enjoy the same economies of scale and scope.[32] In practical terms the costs of the incumbent operator are being used as in the EEO test and modified according to scale. Conceptually the SEO test is similar to the REO test but it solves the information problem of relevant data in a different way.

The SEO approach is essentially an efficiency adjusted cost approach.

ComReg also refers to its approach as an SEO approach, defined as an operator which shared the same cost function as Eircom's own downstream business but which did not yet necessarily enjoy the same economies of scale and scope as Eircom's overall business. ComReg notes that

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[28] IPART 2016 Prices for wholesale water and sewerage services, Discussion Paper, p.35

[29] Gaudin, G., & Saavedra, C. (2014). Ex ante margin squeeze tests in teh telecommunications industry: What is a reasonably efficient operator. *Telecommunications Policy, 38,* 157-172.

[31] Ofcom. (2004). *Direction Setting the Margin Between IPStream and ATM Interconnection Prices.* London: Ofcom.

[32] Wik Consult. (2013). *The future margin squeeze approach for Luxembourg .* Luxembourg: Institute Luxembourgeois de Regulation.

Eircom's own costs and revenues are used, but modified to take account of differences between the entrant and Eircom.[33]

This approach is similar to that adopted in the telecommunications sector, where a number of telecommunication regulators have adopted assumptions or approaches based on the concept of a reasonably efficient competitor. These regulators typically develop a cost function for a retail entrant and then impose a market share assumption to provide or account for an initial lack of opportunity for the entrant to exploit economies of scale. For example Ofcom utilised BT's actual cost data to determine the costs of retail service provision then adjusts this data to account for an entrant's smaller scale. A list of comparative assumptions is outlined in table 8.

Table 8: Market share assumptions

Regulator/country	Assumed market share of reasonably efficient operator
Ofcom, UK[34]	20%-30%
ComReg, Ireland[35]	25%
European Regulators Group, Europe[36]	20%-25%
NKOM, Norway[37]	20%
EETT, Greece	13.5%
HAKOM, Croatia	20%
BIPT, Belgium	20%-25%

However, the nature of competition in water and waste water services is markedly different for that in telecommunications. Competition in water and wastewater as it currently applies to Sydney Water and Hunter Water is characterised as competition for connections or competition for the market, and not the ongoing competition that is evident in the Telecommunications sector. In water and wastewater a wholesale customer is likely to own and operate the local reticulation network and, in the absence of two way access arrangements, any likelihood of ongoing

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33 ComReg. (2006). *Retail-minus wholesale price control for the WBA market, Decsion Notice.* Dublin: Commission for Communications Regulation.

34 Ofcom (2004), "Direction Setting the Margin between IPStream and ATM interconnection prices", Consultation, 26 August.

35 ComReg (2012), "Further specification to the price control obligation and an amendment to the transparency obligation", Decision D06/12, 5 April.

36 ERG (2004), "ERG Common Position on the approach to appropriate remedies in the new regulatory framework", ERG (03) 30rev1.

37 Axon Consulting (2016), "Public consultation on the methodology for cost modelling in Cyprus", prepared for Office of the Commissioner for Electronic Communications and Postal Regulations.

competition in retail services is very low. This aspect of water and wastewater competition makes a market share based assumption unsuitable.

A more appropriate approach may be to adopt a proxy for efficiency. The proxy should be reflective of the scale or scope economies that Sydney Water and Hunter Water currently experience.

We note that the premise that the wholesaler has access to greater economies of scale in relation to retail services than the new entrant may not hold, at least in the short to medium term. For example, Sydney Water is proposing to spend over $328m in the period 2016-2020 on total IT expenditure, including a unified Enterprise Resource Planning (ERP) system and new customer billing system that will replace current billing and other customer contact and customer information management related business systems.[38] This planned investment would suggest that the current retailing systems are either at capacity or beyond.

This proposed program is a significant spend over the period with further expenditure required post 2020 to complete the integration of the new customer focused systems. The program represents a greater than normal spend on IT infrastructure with expenditure not expected to return to more typical levels till post 2024. It is reasonable to expect that Sydney Water will not be capable during the implementation of its capital expenditure program to realise material economies of scale.

We are proposing that the proxy for economies of scale reference the assumed operating expenditure efficiencies recommended to IPART in its recent 2016 Price Reviews of Sydney Water and Hunter Water and the operating expenditure efficiency assumptions adopted by regulators in other jurisdictions for similar businesses. These efficiency assumptions are outlined in table 9. We note that the Sydney Water efficiency assumptions were not ultimately adopted by IPART as the regulator accepted Sydney Water's revised expenditure forecasts. The efficiency assumptions associated with the revised forecasts are imbedded in Sydney Water's response to IPART's draft decision. Table 10 outlines recent efficiency assumptions in other jurisdictions.

[38] Sydney Water 2015, Our plan for the future: Sydney Water's prices for 2016-20, published 30 June 2015

Table 9: IPART Controllable opex efficiency assumptions

Regulator	Year			
IPART	2017	2018	2019	2020
Sydney Water Continuing efficiency	0.25%	0.25%	0.25%	.25%
Sydney Water Catch up efficiency	0.50%	0.75%	2.00%	2.00%
Hunter Water Continuing efficiency	0.25%	0.25%	0.25%	0.25%
Hunter Water Catch up efficiency	0.17%	1.46%	1.57%	2.48%

Source: JACOBS 2016 Hunter Water Expenditure Review, ATKINS Cardno 2015 Sydney Water Corporation – Expenditure review.
Note: We note that the assumptions for Sydney Water were not adopted by IPART as it accepted Sydney Water's revised bottom up operating expenditure forecasts in its response to IPART's Draft Determination.

Table 10: Efficiency assumptions other jurisdictions (%pa)

Regulator	Expenditure	Price review	Efficiency
Ofwat	Wholesale opex	2004	0.3 to 0.5
Ofwat	Capex	2004	0.5 to 0.88
Ofwat	Wholesale opex	2009	0.25
Ofgem	Capex	2006	1.5 to 3
ERA	Controllable opex	2012	2.0
ESC	Opex	2013	1.0
QCA	MAR	2015	0.25
ESCOSA	opex	2016	1 to 1.5

Source: JACOBS 2016 Hunter Water Expenditure Review. ESC Greater Metropolitan Water Price Review 2013-18. ESCOSA SA Water Regulatory Determination 2016.

We propose that a cumulative efficiency assumption of 1.5% be adopted. Based on the assumptions adopted by IPART and other regulators for similar businesses 1.5% would appear to be a reasonable proxy.

We acknowledge that these efficiency assumptions are not necessarily confined purely to scale or scope efficiencies but are also intended to capture dynamic efficiencies and productive efficiencies resulting from better processes. We also acknowledge that they are assumptions that have been applied to large utilities, however, on balance we believe that, they may be the most appropriate to act as proxies on the basis that:

- Uncertainty regarding of Sydney Water's ability to deliver significant economies of scale for retail services over the immediate period.
- The efficiency assumptions have also been subject to consultation and are based on work by IPART's consultants during the course of the price review.
- The interjurisdictional efficiency assumptions are also subject to rigorous review and consultation.
- The adoption of a proxy based on these assumptions is practicable within the timeframe of the current wholesale price review.

We acknowledge that the proxy based approach does not represent a technical estimate of economies of scale or scope nor do we expect it to represent a highly accurate estimate of economies of scale and scope. Rather they have been adopted on the basis that they represent the most reliable publicly available alternatives. IPART may wish to consider adopting these proxies as interim measures. Ideally, the efficiency measure should directly reference the costs incurred by a wholesale customer accounting for the scale or scope of their service provision. This information is not publicly available and would require extensive consultation with willing wholesale customers.

An assessment of an efficiency adjusted cost approach is provided in Tables 11 and 12.

Table 11: Assessment of adjusted cost approaches

Approach	Accurate	Applicable	Doable	Defendable	Cost effective
Adjusted cost	≈	✓	✓	≈	✓

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Table 12: Adjusted cost advantages and disadvantages

Approach	Advantages	Disadvantages
Proxy	▪ Proxies are readily available and have been subject to regulatory scrutiny.	▪ Efficiency factor may encapsulate other efficiencies not attributable to scale. ▪ The use of the incumbent's data may lead to some inefficiencies being incorporated into the calculation (although this would lead to a larger "minus" and favors competitors)

Note: This table summarises the pros and cons associated with individual assessment criteria. The assessment may be qualitative in nature where this is the case we have endeavored to provide text supporting the assessment.

4.4.4. Summary: reasonably efficient competitor costs

- The costs associated with a 'reasonably efficient competitor' approach should be calculated as the wholesaler's avoidable costs adjusted by an efficiency factor.
- The efficiency factor should be based on a proxy that utilises the efficiency assumptions approved by IPART and imbedded in Sydney Water's and Hunter Water's approved revenue requirement
- The averaging of wholesale prices is achieved by calculating the wholesale price at the whole of business service level.

4.4.5. Consideration of the as efficient competitor

In the Discussion Paper, IPART outlined two major approaches for determining the minus component of the price control mechanism. These were:

- An approach based on the assumption that the new retail entrant would be as efficient as the incumbent in providing retail services. As stated by IPART, this approach would reflect the total costs the incumbent would incur between the wholesale connection point and serving end users. The resulting wholesale price would in effect be a retail-minus avoidable cost price.
- An approach based on the assumption that the new retail entrant would be reasonably efficient. This approach would reflect the total costs a reasonably efficient business would incur between the wholesale connection point and serving end users. IPART have a stated preference for the adoption of this approach, the primary reason being that it recognizes that

it may be unrealistic for a new entrant to achieve the scale economies of the incumbent utility immediately.

We note that IPART has not yet completed its consultation on the approach to wholesale pricing. While IPART has expressed a preference for adoption of a 'reasonably efficient competitor' this position may change in response to feedback from stakeholders. We have drafted this report to consider both an 'as efficient competitor' approach and a 'reasonably efficient competitor' approach.

The rational for the different approaches

The 'as efficient competitor' approach, assumes that a wholesale customer at the retail level would be as efficient as the wholesaler in providing retail services. The 'reasonably efficient competitor approach' differs from the as efficient competitor approach as it assumes a lack of economies of scale or scope in the provision of the retail services.

A reasonably efficient competitor standard has the advantage of allowing wholesale customers to enter on a smaller scale than, but still compete with, the wholesaler. However, it can allow wholesale customers that are less efficient than the wholesaler (including efficiencies that arise from scale and scope economies) to enter and compete in the market. By definition, the as efficient competitor approach does not allow such inefficient entry. It may be, however, that there is a trade-off to be made between encouraging additional entry (albeit potentially inefficient) in the short-term, so as to increase competition and provide stronger incentives for investment and innovation in the longer-term.

The nature of competition

One of the principal issues involved in developing a method for wholesale prices is referencing the type or nature of competition that is associated with the entry of the new or alternative retail supplier. The nature of this competition will have a particular impact on the appropriateness of such elements of the retail-minus framework as the efficiency mechanism.

In other retail-minus frameworks, such as those associated with telecommunications the application of "reasonably efficient" assumptions for competitors are predicated on the assumption that the retail services they provide will be subject to on-going competition and that this competition over time will allow new entrants to pursue economies of scale and scope and for consumers to benefit through eventual competition driven price decreases.

It is inappropriate to assume this type of ongoing competition will manifest in the water, wastewater and recycled water sector. Current requirements under the Water Industry Competition Act obligate new entrants to procure additional sources of water. In most cases this has involved new entrants investing in network infrastructure (typically recycled water works).

Where new entrants invest in their own treatment works or distribution/collection assets the concept of ongoing competition becomes problematic. In these instances, anybody wishing to compete with the new entrant (once they are established) will need to procure access arrangements in order to utilise the new entrant's networks (two-way access arrangements).

Under this context, the type of competition that will practically be achieved is more in line with competition for the provision of service to local networks. In the absence of two-way access arrangements, once the local service provider is established they will effectively be incontestable.

4.4.6. Summary: efficiency factor

- Given the likely lack of economy of scale issues and the likely lack of ongoing competition associated with the entry of wholesale customers, NERA recommends that the 'as efficient competitor' approach continue to be considered by IPART.

4.5. Measuring cost

Our proposed approach to measuring the cost associated with a reasonably efficient competitor requires the calculation of the cost associated with the provision of the wholesale customer's services based on those costs incurred by the wholesale service provider. In other words, the cost the wholesale service provider would have incurred had they provided the service that the wholesale customer is providing. Given that we are pursuing an average based approach, this cost is measured at the whole of business level.

The approach calculates wholesale prices by subtracting from retail prices the cost of activities associated with the supply of the product or service in the downstream market by a 'reasonably efficient competitor'. In order to calculate these costs we are utilising Sydney Water and Hunter Water's cost data to form a base cost and then adjusting this base cost for scale and scope efficiencies.

Although conceptually, calculating such a cost appears to be straightforward, experience has shown that the application of retail-minus in other sectors (such as telecommunications) is far from simple and may raise many implementation challenges. A number of these challenges were raised by IPART in its Discussion Paper.

Some of the issues canvased by IPART include:

- What timeframe to use in assessing retail costs?
- What time frame to apply in applying wholesale prices?
- How to address additional cost incurred in the provision of wholesale services?

This section identifies the different approaches that can be taken in measuring the costs avoided by the wholesaler and it also undertakes an assessment of these options based on the criteria established in Chapter 4.

The differences between the methods broadly reflect different approaches to the allocation of indirect and joint costs and, to a lesser extent, different data requirements.

An assessment of costs could be based on, at one extreme, short-run marginal cost, which reflects only those costs that vary with a single unit of output. At another extreme are stand-alone costs, which reflect all of the costs (including fixed, sunk and common costs) associated with providing a service on a stand-alone basis.

A cost standard that is often used in regulatory price setting is that of incremental cost. This approach measures the costs that are incremental to (i.e., vary with) a particular volume of output over a given time period. At a practical level, this gives rise to the need to assess the timeframe over which costs are considered to be incremental. For example, over a very short time period (e.g. one hour) most costs would be considered fixed. For example, payment of salaries would be considered a fixed cost over a short time period because if output varies, staff are unable to be laid off or taken on in such a short period. However, over a longer time period (e.g. one year) salaries may be considered variable costs. Indeed, economists typically define the "long run" as a period of time in which all costs, including sunk costs, are considered to be variable costs.[39]

We have identified four alternative approaches to the calculation of avoidable cost that may be adopted:

- A distributed cost based approach (similar to a building block based approach).
- A long run marginal cost based approach.
- A long run incremental cost based approach.
- A short run incremental cost based approach.

4.5.1. A distributed cost based approach (building blocks)

The distributed cost approach is best described as determining cost based on an allocation or distribution of costs incurred in the provision of services to their relevant levels of service within the supply chain. In this case it would involve identifying all of the costs associated with retail activities.

This approach would utilise the building block data used in setting prices for the recent retail price review for Sydney Water and Hunter Water. The primary exercise would then be allocating the building block expenditures to specific levels of service (such as all retail based costs, all reticulation based costs etc.). This approach is similar to the building block approach adopted by the ACCC in its Services Sydney determination.

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[39] See, for example, William Baumol (1977), *Economic Theory and Operations Analysis*, Fourth Edition, Prentice Hall, New Jersey, p.290.

Direct costs are allocated to their respective output, while indirect and joint costs are averaged across all outputs. Thus, the cost base for each output will include a proportion of the direct capital costs, and those used indirectly to produce the output. These latter costs may include, for instance, a proportion of the capital costs of the water business's corporate services areas.

These indirect costs or common costs should be allocated in a manner consistent with regulatory best practice. Ideally the allocation can occur based on activity based costing approaches. Activity based costing is a more sophisticated method of allocating the indirect cost pool, and is used widely by private enterprises to more accurately cost their outputs. Under the approach, categories of indirect cost are identified, and these costs are allocated to products using criteria (often called 'drivers') which most closely reflect usage by each product.

An assessment of this approach against the criteria is outlined in Tables 13 and 14. The primary benefit of this approach is that it is consistent with retail price and utilises the expenditure approved by the Tribunal as prudent and efficient in the price review.

One of the downfalls of this approach is that it is not a marginal approach and therefore might include costs that exceed those that would be considered marginal (such as those associated with existing assets or common costs). The implication of this is that the wholesale price would be set lower than it would be otherwise. This could potentially encourage inefficient entry of wholesale customers.

One of the concerns raised during the course of this project was the potential for a distributed cost based approach to include costs that are not avoidable in nature. This is potentially true where the distributed costs include shared costs. As discussed in section 3, we believe that this is one area that may be subject to regulatory discretion by IPART. From a principled based approach common costs should be included to the extent that they are avoidable. We also note that there are a number of regulators that have developed approaches that included common costs (such as TSLRIC + and LRIC + based approaches).

Aside from common costs, the other costs that are included which may not be avoidable in nature relate to the existing assets used by Sydney Water and Hunter Water. The return on and of these assets although directly attributable to the wholesale service are not avoidable given that they are already sunk. However, given that IPART is seeking to impose a 'reasonably efficient competitor' standard on costs the focus should be on seeking to calculate the costs associated with a reasonably efficient entrant providing the services. These cost would include a return on and of assets need to provide an equivalent service as that provided by the water businesses existing assets.

The issue of cost excluding existing assets was raised by Hern who noted that the failure of pricing methodologies to ensure recovery of embedded investment costs is likely to lead to difficulties, especially in a regulated industry where the implicit regulatory contract requires that investors receive adequate returns. Allowing companies to recover prudently incurred costs associated with previous regulatory obligations is necessary not only to honor the regulatory

contract but also to ensure future investment into the industry.[40] As stated in section 2 we believe that this is one area that may be subject to regulatory discretion by IPART.

Table 13: Assessment of distributed cost

Approach	Accurate	Applicable	Doable	Defendable	Cost effective
Distributed cost	≈	✓	✓	≈	✓

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Table 14: Distributed cost advantages and disadvantages

Approach	Costs considered	Against criteria	
		Pros	Cons
Distributed costs	• Direct opex and capex • Common cost • Time frame (regulatory period) • Includes return on and of sunk costs. • Fixed and variable	• Utilizes existing data therefore not overly costly • Relatively easy to understand • Ensures full cost recovery • Consistency in regulatory cost decisions • Numbers subject to prudency and efficiency test	• Requires some form of service based costing • Not a marginal based approach

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4.5.2. A long run marginal cost based approach

Marginal cost is the cost of producing an additional unit of a good or service. It will generally include direct costs that vary with output and some indirect costs. Marginal cost is an alternative approach to measuring the cost associated with the provision of a "reasonably efficient competitor'.

Marginal cost can be measured in the short run or the long run. Utilising LRMC based approaches will require IPART to adopt an approach to estimating LRMC. There are a number

[40] Hern, R. (2001), "Competition and Access Pricing in the UK Water Industry", *Utilities Policy*, 10, 117-127.

of different ways to measure marginal cost. Most reliable approaches rely on perturbation methods (utilising linear programming). An assessment of LRMC against the criteria is provided in tables 15 and 16.

Under a perturbation approach the businesses will need to forecast out the operating and capital costs over an extended period of time separately for each level of retail service.[41] Perturbation estimates LRMC by applying an increment to the demand forecasts over the period and measuring the resulting cost impact based on the rule that demand must never exceed supply. The perturbation approach requires the businesses to be readily able to optimise their long run cost function. The primary benefit of an LRMC based approach is that it is the most robust statistical approach for identifying marginal costs available and subsequently the most accurate. It also ensures that the wholesale price retailer customers face will be the most likely to produce efficient outcomes.

LRMC as a method for calculating avoidable cost has been promoted by Ofwat.

> *In many circumstances, LRMC is an appropriate measure of avoidable costs since it should approximate to the savings made by a company in the event of not supplying an additional unit of water"…."Where a competitor is providing bulk treated water for common carriage by the incumbent, the LRMC of resources and treatment could measure avoidable costs to the incumbent.*[42]

Another benefit of this approach is that it does not require subjective cost allocations. The act of perturbation itself will identify the total cost impact of the increment in demand.

A drawback of this approach is that it is relatively complicated, it is data intensive and requires robust long run forecasts it also requires the businesses to have the capacity to optimise their costs over the long run based on linear programming model. The data intensity and the requirement for businesses to adopt complicated mathematical models for the optimization of capital programs and ongoing maintenance and operating cost may make this approach impractical and difficult to implement.

Another drawback of this approach is that, in being purely forward looking in nature it does not account for the return on and off existing assets associated with retail services. The retail price is set under a building blocks based approach which will include a return on and off all existing assets. By being only forward looking the avoided costs component will not include a return on and off existing assets and the resulting wholesale price will be partially funding the wholesale service provider's retail activities in other areas.

Another issue with LRMC is that it requires a number of subjective assumptions that may make it difficult to defend in a regulatory context. These include:

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41 ESC (2005) Estimating Long Run Marginal Cost, implications for future water prices.

42 OFWAT, May 2001. MD170: The Role of LRMC in the Provision and Regulation of Water Services.

- The size of the increment used to perturb demand.
- The nature of demand over the long run.
- The availability of water and weather patterns over the long run.
- What time frame constitutes the long run.

Horizon for cost considerations

While theoretically a long run position would appear to be reasonable there are a number of practical considerations that make long run cost estimates problematic. One of the biggest issues is that water supply demand planning is heavily reliant on assumptions regarding weather which is highly uncertain. Long run planning is by its nature subject to high levels of uncertainty, and while long term plans are appropriate as guides for businesses, businesses review them periodically and routinely update their investment decisions, and they may not be appropriate to use for pricing purposes.

The appropriate time horizon over which to consider costs is an issue both for LRMC and for LRIC (see section 5.53). While these two approaches are different in many aspects, they are both forward looking and consider costs over the long run. This issue is just as pertinent for LRIC as it is for LRMC.

Regulators vary in the time periods which they adopt to measure forward looking costs. IPART in its recent price review of Sydney Water noted Sydney Water's LRMC model extended over a 50-year period, which contrasted with ESCOSA's recent estimates of the LRMC for SA Water which were calculated over a 35-year period. IPART adopted a 40-year estimate, because in the base case the major supply augmentations are completed by year 40 of the model.[43] This avoids an overestimation of LRMC under the perturbation approach as augmentations appear in both the shocked and base case demand. In contrast, both Ofwat and the ESC adopt 20 to 25 year for the calculation of LRMC and average incremental cost based approaches.

We note that most of the available literature on LRMC and other forward looking cost estimates relate primarily to the large lumpy centralised assets water businesses invest in for water treatment and storage or for wastewater treatment. They do not typically extend to retail services or reticulation services. What constitutes an appropriate time frame for LRMC (LRIC) would need to be determined in consultation with Sydney Water and Hunter Water and would depend on the average lives of the assets used to provide these services.

An assessment of LRMC is outlined in Tables 15 and 16.

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43 IPART. (2016). Review of prices fro Sydney Water Corporation, From 1 July 2016 to 30 June 2020. IPART. Sydney: IPART.

Table 15: Assessment of LRMC

Approach	Accurate	Applicable	Doable	Defendable	Cost effective
LRMC	✓	✓	✘	≈	✘

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Table 16: LRMC advantages and disadvantages

Approach	Costs considered	Against criteria	
		Pros	Cons
LRMC	• Direct and common opex • Direct and common new capex • Fixed and variable	• Forward looking • Consistent with economic concepts of efficiency • Requires no cost allocation	• Complex computation (linear programming) • Difficult to apply at the service level • Increment/decrement subjective • Require long term forecasts.

Note: This table summarizes the pros and cons associated with individual assessment criteria. The assessment may be qualitative in nature where this is the case we have endeavored to provide text supporting the assessment.

4.5.3. A long run incremental cost based approach

An alternative approach to measuring the costs associated with service provision by a 'reasonably efficient competitor' is to adopt an incremental cost. While there are a number of definitions of incremental cost, in practice, in practice they are typically defined by the size of the increments of output, and the time frame under consideration (BTCE 1995). Long run incremental cost (LRIC) approaches and long run avoidable cost (LRAC) based approaches are essential the same approach the main difference being that for LRIC cost is measured based on incremental demand whereas LRAC costs are measured based on decrements in demand. An assessment of this approach against the criteria is outlined in tables 18 and 19. For the purposes of this paper we are referring to both collectively as incremental approaches.

LRIC (long-run incremental cost), in contrast, can be defined to include the costs of adding or removing a defined quantity of traffic, or the addition or removal of a smaller set of services.

LRIC is an alternative approach to measuring marginal cost that is often viewed as more practicable than LRMC perturbation approaches. Although technically the approach is an average cost based approach it has historically produced estimates that approximate those of a perturbation LRMC model. Long run incremental cost (LRIC) includes operating and

maintenance costs, incremental capital costs (that is, a return on the additional assets required) and incremental indirect costs. Per unit incremental cost is the cost of the relevant increment (or block) of output divided by the number of additional units.

The primary benefit of LRIC based approach is that it provides a reliable approximation of the marginal cost of supply. As with LRMC, prices based on marginal costs are expected to produce more economically efficient outcomes. The drawbacks associated with this approach are similar to LRMC. It is relatively data intensive and will require more sophisticated computations than some of the other approaches. The avoided cost and LRIC based approaches also require a large degree or discretion in the ability to allocate costs appropriately across the separate levels of service into the future.

We note that Anglian Water, in its 2015 paper identifying potential approaches to access pricing stated:

> *For most water companies, moving to a comprehensive and fit for purpose LRIC model across their operations would require a significant lead-time, and very considerable investment. This may also be more than is needed to deliver a successful expansion of upstream competition in those areas most likely to be contestable, such as sludge. The experience of BT, which took many years to develop its LRIC models through several versions, at significant cost, is instructive here.*[44]

Anglian Water also stated:

> *As soon as we attempt to estimate incremental costs, we are presented with a range of empirical and modelling assumptions which can entirely shift the meaning of what we describe as incremental costs as well as the consequences for economic efficiency. These challenges can make constructing incremental cost models very challenging and assumption intensive. The large degrees of additional definition necessary in measuring incremental costs are acknowledged by the academic literature, leading some to think: "estimating LRIC based costs is as much an art as it is a science. This being the case, the implication is that it is better to be approximately right, rather than exactly wrong."* [45]

LRIC is extensively adopted in the telecommunications sector. In Table 17 the International Telecommunications Union sets out the multitude of different telecommunications products that have adopted LRIC to determine access prices.

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[44] Anglian Water. (2015). *Potential apporaches to access pricing in the UK water sector.* Anglian Water.

[45] Anglian Water. (2015). *Potential apporaches to access pricing in the UK water sector.* Anglian Water.

Table 17: Access products and costing approaches, telecommunications

Service	Cost approach
Retail access to PSTN	• Retail-minus and Benchmarking
PSTN originating and terminating access	• LRIC, BAK and Benchmarking
Wholesale network infrastructure access	• LRIC and Benchmarking
Wholesale broadband access	• LRIC,GB and Benchmarking
Wholesale leased lines	• LRIC and Benchmarking
Voice call termination on mobile networks	• LRIC, BAK and Benchmarking

Source: (ITU, 2016)[46]

Notes: BAK (bill and keep) where the calling party's network retains whatever revenue it raises through retail usage charges. This is the system used for mobile networks in the USA. One advantage of a bill and keep policy is that it can be adopted quickly without the need to employ a cost analysis.GB Volume based charging. This is a possible alternative access pricing to address changes in the industry that BAK cannot address.

Along with the historical use of LRIC in telecommunications sector it has also been adopted in other jurisdictions. Examples of competition cases where the LRIC cost concept has been used include Deutsche Post AG (Case COMP/35.141),[47] and Telefónica (Case COMP/38.784).[48] In the light of Condition 11(3) of Royal Mail's Licence, Postcomm endorsed the use of LRIC and used a proxy for LRIC based on a mark-up of long run marginal cost (LRMC) in its investigation into the pricing of Mailsort Light (2010).

As with LRMC, LRIC is technically purely forward looking in nature it does not necessarily account for the return on and off existing assets associated with retail services (although a number of regulators have adopted LRIC based approaches that include existing assets). The retail price is set under a building blocks based approach which will include a return on and off all existing assets. By being only forward looking the avoided costs component will not include a return on and depreciation of existing assets and the resulting wholesale price will be partially funding the wholesale service provider's retail activities in other areas.

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46 TU. (2016). *Regulating access prices*. Retrieved July 07, 2016, from ICT Regulation Toolkit: http://www.ictregulationtoolkit.org/2.4

47 Commission of the European Communities. (2002). *Case no COMP/M.2908 Deutsche Post/DHL (II).* Luxembourg: Office for Official Publications of the European Communities.

48 Commssion of the Eurpean Communtiies . (2007). *Commission Decision relating to a proceedings under Article 82 of the EC Treaty (Case COMP/38.784).* Commission of the Eurpean Communities .

We also note that the Competition Appeal Tribunal in the UK rejected the application of LRIC by Dwr Cymru in their offering of an access price to Albion Water:

> *The Tribunal considered the Referred Work in its Unfair Pricing Judgment. The Tribunal agreed with Ofwat that, as the Tribunal put it: 'there is no single "correct" or completely straightforward way in which to calculate costs in the water industry. There will always be a degree of judgment involved in choosing which cost methodologies to apply when assessing the lawfulness of an access price.' (paragraph 103).* [49]

The Tribunal rejected LRIC as an appropriate methodology and made a number of adjustments to Ofwat's calculations based on an 'average accounting cost plus' and 'local accounting cost basis'.[50] As with LRMC the time period over which to conduct an LRIC assessment needs to be considered. As with LRMC what constitutes an appropriate time frame would need to be determined in consultation with Sydney Water and Hunter Water and would depend on the average lives of the assets used to provide these services.

Table 18: Assessment of LRIC

Approach	Accurate	Applicable	Doable	Defendable	Cost effective
LRIC	✓	✓	✘	≈	✘

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[49] CAT. (2008). *The Unfair Pricing Judgement CAT 31.* London: Competition Appeal Tribunal.

[50] CAT. (2008). *The Unfair Pricing Judgement CAT 31.* London: Competition Appeal Tribunal.

Table 19: LRIC advantages and disadvantages

Approach	Costs considered	Against criteria	
		Pros	Cons
LRIC	• Direct opex and capex • Potentially some common costs if avoided	• Incremental costs are a proxy for marginal costs, so this approach has a strong link to efficient costs	• Requires robust forecasts of costs and demand • Requires relatively more data • Requires subjective decisions and regulatory discretion in term of identifying avoidable costs

4.5.4. A short run incremental cost based approach

Short run incremental cost based approaches are principally the same as long run based approaches, the difference being the period of time over which the costs are calculated. The short run is technically that period of time in which at least one factor of production is fixed in nature. Typically defined as the period of time in which an augmentation could not occur (2 to 3 years). Short run based calculation exclude capital expenditure.

These approaches determine the minus based on the average cost of an increment of supply (SRIC) over the short run or a decrement of supply (avoidable cost) over the short run.

An assessment of this approach against the criteria is outlined in tables 20 and 21.

One of the benefits of this approach is that it avoids having to allocate capital based expenditures to the various retail services. It is also consistent with economic efficiency in terms of prices reflecting the marginal cost of supply in the short run.

The drawbacks include that the short run period may actually be shorter than the regulatory period under consideration and that subsequently SRIC would not be sufficient for determining prices over the full regulatory period.

Given their nature, short run costings will inevitably focus on variable costs and may exclude some fixed costs, especially those relating to capital augmentation. In this regard SRIC may not provide the wholesale customer with sufficient revenue to recover its capital based investments.

The appropriate timeframe to adopt when assessing incremental costs can depend on the context, and there are pros and cons in applying a short-run or long-run timeframe. Assessing incremental costs using a short-run timeframe can promote short-run allocative efficiency, but it might provide access seekers with insufficient margin to cover their fixed and common costs. While assessing incremental costs on a long-run basis can mitigate this, to the extent that it results in

prices that are "too low", it might encourage inefficient entry by competitors who free ride on the incumbent's investments, thereby discouraging any future investment.

There is relatively limited practical guidance in the economics literature in respect of the appropriate timeframe for the analysis of incremental costs. One paper is that of Hern (2001), who considers the timeframe over which avoidable costs are calculated in the application of the efficient component pricing rule (ECPR) in the UK water industry. Hern argues that at least three different possibilities exist for avoidable costs in ECPR:

- A timeframe consistent with the time period during which retail prices remain unchanged.
- A timeframe consistent with the regulatory period.
- A timeframe consistent with the access contract period.

Hern notes that an argument can be made for any of these alternatives, with a short-run timeframe promoting short-run allocative efficiency, while a long-run timeframe may lead to increased price stability (thereby lowering transaction and informational costs). Hern concludes that the right approach would likely vary across sectors and individual access arrangements. While Hern's point applies in respect of the calculation of avoidable costs for ECPR, the same analysis is relevant in respect of calculating the costs for assessing the minus in retail-minus calculations more generally.

Table 20: Assessment of SRIC

Approach	Accurate	Applicable	Doable	Defendable	Cost effective
SRIC	✓	✓	✘	≈	✘

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Table 21: SRIC advantages and disadvantages

Approach	Costs considered	Against criteria	
		Pros	Cons
SRIC	• Direct opex • Potentially some common costs if avoided	• Incremental costs are a proxy for marginal costs, so this approach has a strong link to efficient costs	• May not be particularly cost effective – complex/a lot of discretion involved in assessing what costs are avoidable • Unlikely to provide the entrant with sufficient margin to recover its fixed capital costs and common costs that are not considered avoidable

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4.5.5. Summary: approach to measuring cost

- Avoidable cost should be calculated based on a distributed cost based approach. The approach should utilise the price review data for both Sydney Water and Hunter Water used to set the current retail prices.

- The distributed cost based approach should be amended to exclude avoided common costs on the grounds that such costs would be avoidable in nature.

- The distributed cost approach should include a return on and of existing assets on the basis that such cost are included in the retail price and their exclusion from the avoidable component would result in wholesale customers partly funding the wholesalers provision of retail and contestable services to other areas.

4.6. Translating a reasonably efficient competitors costs into a price

The final step in the generation of wholesale prices is to translate the reasonably efficient competitor costs into a minus that can be applied to the retail price. In developing an approach to translating costs into price impacts we have had to be mindful of the level of data available to us. We note that both Sydney Water and Hunter Water had issues providing detailed cost allocations at an aggregate level within the time available let alone breaking it down to allow for detailed cost analysis based on meter size.

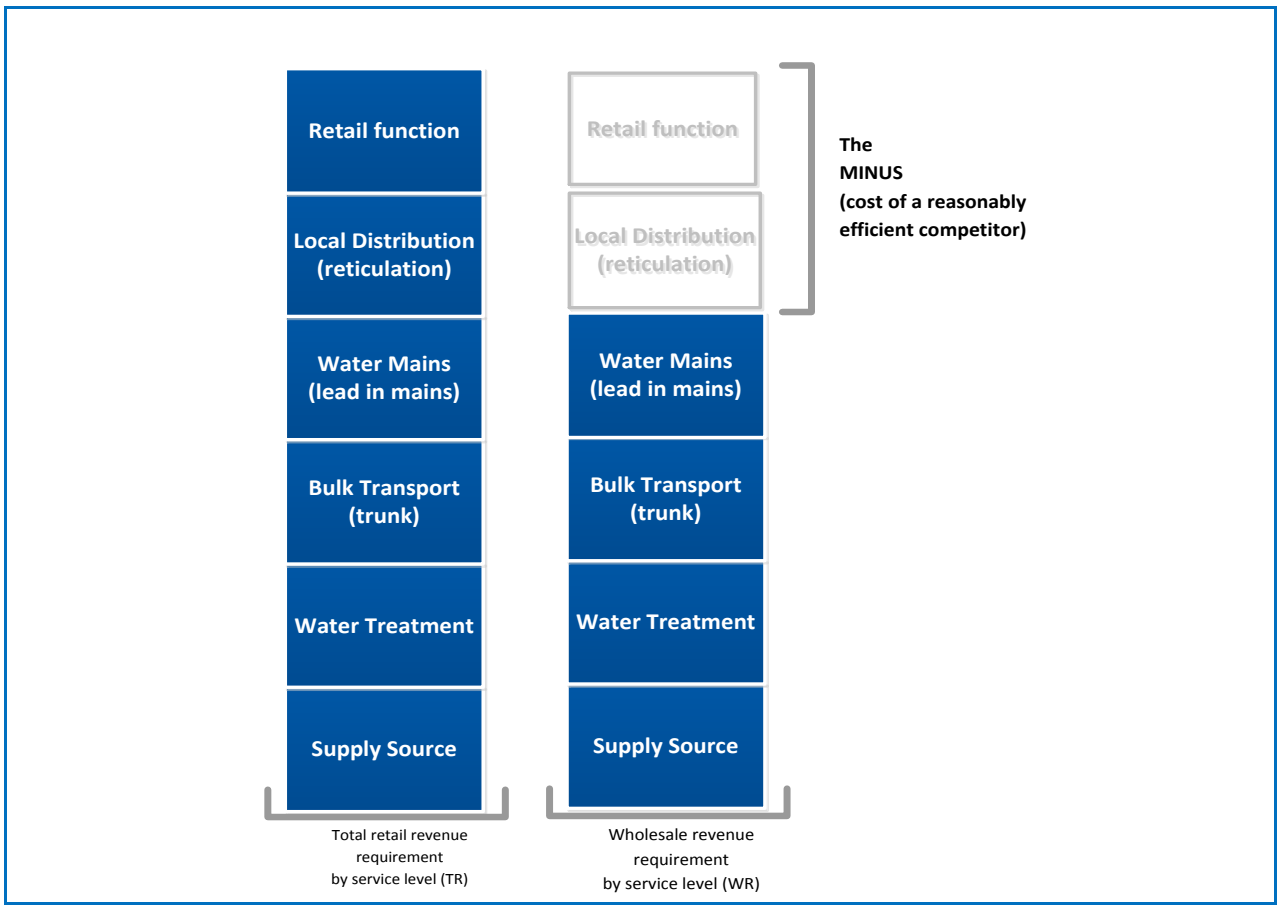
In addition nether Sydney Water or Hunter Water were able to provide geospatial data (illustrating cost differences over areas) or any meaningful breakdown of the costs on a unit basis within the given timelines. The only unit based numbers we were able to obtain were in terms of total connections and total length of reticulation.

The approach we have adopted to translating the costs into a price impact is based on the following:

- Transparent: the approach should be relatively simple and not overly complicated
- Applicable: the approach should be applicable to an average based wholesale price and ensure that the revenue outcomes are consistent with the retail minus based approach outlined in the paper.
- Precautionary: given the current lack of data regarding cost drivers at a retail and reticulation level the approach should be precautionary in that it minimizes the changes to the manner in which the current tariff structure for retail prices recovers costs.
- Defendable: the approach needs to be logically valid and mathematically correct.

Given that we are developing average prices based on whole of business service levels, we are proposing that the minus be calculated as the percentage difference between the building block revenue requirement used to generate the retail price and the same building block revenue requirement adjusted to reflect the avoidable cost (see figure 5).

Figure 5: Calculating the minus as a proportion of revenue requirement



For example if the wholesale revenue requirement for water is 2% less than total revenue requirement for retail water, then the minus to apply to the retail price will be 2% and the final wholesale price will be retail price less 2% plus the net facilitation charge. This approach to translating avoidable costs into prices will ensure that the wholesale price is consistent with the retail price from which it is derived. The approach also relies on the adoption of the demand assumptions that underlie the setting of the retail price. This means that the volumetric revenue earned by wholesale prices will be 2% less than the volumetric revenue earned by retail prices thus ensuring that on average the margin as defined by the "reasonably efficient competitor" approach is maintained.

The wholesale revenue requirement is determined as:

WRR = TRR – cost associated with a reasonably efficient competitor.

These costs are converted into a price impact by comparing the wholesale revenue requirement to the total revenue requirement associated with the provision of retail services by Sydney or Hunter Water. The revenue requirements are in effect cost based concepts. They translate to prices through the application of demand forecasts to determine a per unit cost (or price). In a regulatory context, the fundamental relationship between cost and price is that the revenue

requirement as determined by the costs incurred in the provision of services equates to the revenue earned by the prices set by the regulator.

The difference between the revenue requirements is measured as:

Minus (%) = (WRR/TRR)-1

The minus under this approach is measured as a percentage which can then be applied to retail tariffs. The advantages of this approach include:

- It can be readily applied to all tariff parameters regardless of the unit used to apply the parameters — it can be readily applied to volumetric (per kL) tariff parameters as well as fixed or per connection based parameters.
- It allocates retail costs to tariff parameters in a manner consistent with that implied by the existing tariff structure for retail prices.
- it ensure that the revenue earned by the wholesaler (based on the price review demand forecasts) will not exceed that needed to deliver wholesale services (given the adjustment for reasonably efficient competitor's cost).

It should be noted that by definition this approach will not allocate a constant cost to each connection, rather it will allocate the minus cost to customers based on the current retail tariff structure.

We believe the approach outlined above meets our criteria as expressed above:

- Transparent: the application of a percentage to retail prices is relatively simple approach. The approach also allows for prices that are consistent with the current retail tariff schedule.
- Applicable: the approach allows for the determination of average based prices at a whole of service level. The pattern of cost recovery from such average wholesale prices will be consistent with that currently imposed by retail prices (less the avoidable cost).
- Precautionary: Our approach is also precautionary in nature. We are conscious that the current tariff structure applied by IPART to retail prices has evolved over time and over a number of successive price reviews. Given the lack of data necessary to determine the cost reflectivity of tariff structures, we have taken the approach that costs should be translated to price in a manner that does not distort the pre-existing retail tariff structures.
- Defendable: the approach is logically valid and will ensure that the revenue earned by wholesale prices equates with each businesses approved revenue requirement less the costs associated with the 'minus'.

One of the issues that arose during the course of the project was a concern that this approach would not provide for consistent outcomes were it applied to individual systems that do not mirror the composition of the businesses aggregate demand profile.

Table 22 sets out the profile of a not to scale scheme as identified by IPART. It shows the revenue that is earned by current retail prices. Table 21 depicts a scheme with the same profile to which wholesale prices have been applied on the basis of a 2% minus (for the purposes of illustration we have assumed no facilitation charges).

This example illustrates a case where a 2% difference in the revenue requirement between retail and wholesale service provision translates into a uniform 2% decrease in prices which then translates into a 2% decrease in forward revenue.

Table 22: Revenue from retail prices based a 'not to scale' scheme

Tariff	Meter size	Connections	Vol per connection	Total vol	Retail Price (per connection) (per volume)	Revenue
Fixed	20	750	100	75,000	100.00	$75,000
Fixed	50	0	7,000	0	625.00	$0
Fixed	100	4	40,000	160,000	**2**,500.00	$10,000
Fixed	200	1	200,000	200,000	10,000.00	$10,000
Variable				435,000	2.00	$870,000
Total revenue						$965,000

Table 23: Revenue from wholesale prices based a 'not to scale' scheme (2% minus)

Tariff	Meter size	Connections	Vol per connection	Total vol	Wholesale Price (per connection) (per volume)	Revenue
Fixed	20	750	100	75,000	98.00	$73,500
Fixed	50	0	7,000	0	612.50	$0
Fixed	100	4	40,000	160,000	2,450.00	$9,800
Fixed	200	1	200,000	200,000	9,800.00	$9,800
Variable				435,000	1.96	$852,600
Total revenue						$945,700

The difference between the revenue recovered in table 22 and table 21 is 2%

In this case the minus is 2%, which means that the revenue requirement for wholesale services is 2% less than the revenue requirement for retail services (as set in the price review). Given that prices are set to recover the revenue requirement any proportional decrease in price will result in a corresponding decrease in the forward revenue that equates with the proportional decrease in the revenue requirement. Thus preserving the basic regulatory function of ensuring that prices do not provide for revenue streams that are greater than or less than the revenue required by the business.

This relationship is true not matter how the individual scheme is constituted — regardless of whether that composition mirrors the aggregate demand profile of the business or not. It is based on the fundamental mathematical argument that if

$R = P*Q$ it then follows that $X*R = X*P*Q$

The only way this relationship will not hold is if the underlying assumptions about demand are changed over the course of the application of the minus. Our approach is based on the utilisation of the demand forecasts that were approved by the Tribunal in the recent price reviews for Sydney Water and Hunter Water, it assumes these demands are applied over the course of period to derive wholesale prices.

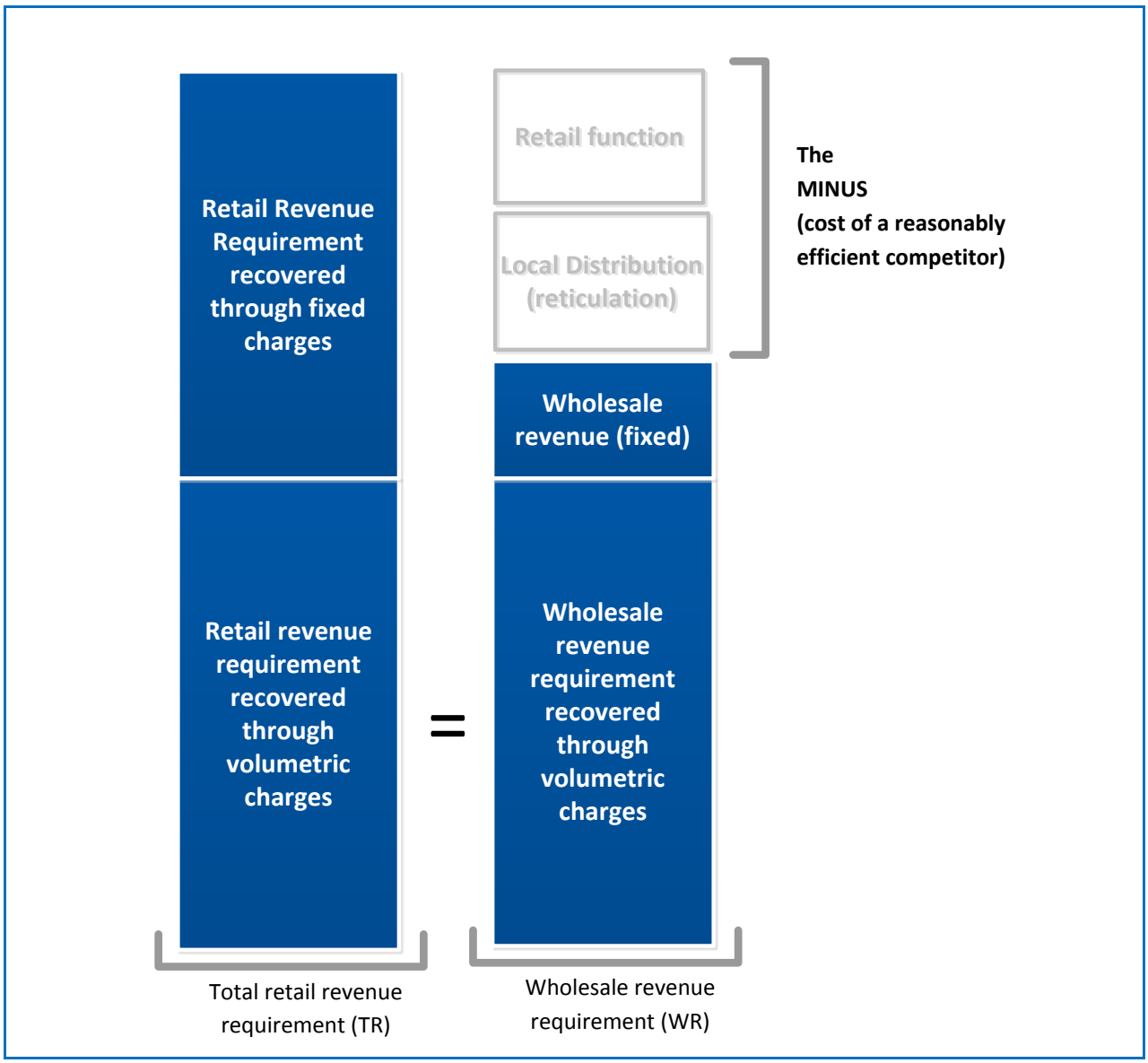
4.6.1. Preserving current volumetric charges

One issue that was raised by us during the course of the project was the relationship between wholesale prices and IPARTs retail price structure. Our understanding is that IPART currently set prices such that the volumetric component of the tariff references the long run marginal cost associated with the provision of water. The rational for setting volumetric tariffs on this basis is that it provides end users with signals regarding the cost of their water usage, allowing them to adjust their behaviour accordingly.

As we understand this LRMC calculation does not currently include retail or reticulation expenditure and is focused on headworks and tail works component of the supply chain. Applying a minus to the volumetric price will result in a volumetric price that is lower than that calculated by IPART. The implication being that the wholesale customers will not face the full impact of the price signal imbedded in the variable charge. If IPART wishes to reinforce the price signals imbedded in its retail volumetric charge by applying the same volumetric price at the wholesale level it could adopt an alternative approach to that which we have proposed.

This could be achieved by separating that proportion of the total retail revenue requirement recovered through volumetric charges and that proportion of the wholesale revenue requirement recovered through volumetric charges. The resulting minus would then only be applied to the fixed component of the tariff (see figure 6).

Figure 6: Minus applied to fixed charges



This approach is applicable as long as the minus does not exceed the level of revenue requirement recovered through fixed charges.

This approach will also generate a minus based on a percentage difference that will preserve the existing tariff structure in relation to fixed charges. For example, both Sydney Water and Hunter Water currently differentiate fixed charges between retail users based on meter size, the application of a percentage difference across theses fixed charges will ensure that the relativities between the charges are preserved as they are converted into a wholesale price. As previously discussed the wholesale fixed charge should be an aggregation of the retail connections being serviced by the wholesale customer, the only way to ensure that the price relativities between the

different meter sizes is maintained as they are aggregated is to apply a percentage minus uniformly across the various meter sized based fixed charges.

We note that this approach (applying the minus exclusively to the revenue generated by fixed charges) may not be possible given the magnitude of the minus relative to the revenue requirement currently recovered through volumetric charges. Based on the data provided by Hunter Water the maximum revenue recoverable through fixed charges for water would not be enough to capture the full extent of the minus cost and therefore there would be a need to recover costs through the volumetric component.

It is worth noting that if in the future IPART chooses to move to a marginal based costing approach such as LRMC or LRIC in order to determine the minus it would be possible to extend the retail volumetric charge (that is, include retail and reticulation costs in the LRMC calculation for retail prices) so that it is more comprehensive and therefor more reflective of the true cost of service provision. Were this to occur and the cost underlying the minus also being based on a marginal approach, IPART may wish to consider applying the minus to the volumetric component.

4.6.2. An alternative approach

Sydney Water has proposed that the average wholesale price be applied differently for retail and reticulation related services:

- For retail services Sydney Water have proposed that the cost be translated to wholesale price on the basis of cost per connection.
- For local reticulation, Sydney Water has proposed that the costs be translated to price based on cost per km of reticulation basis.

Sydney Water's proposal as it relates to retail charges is reasonable to the extent that retail costs are not expected to vary across different classes of customer. However, we note that the replacement and renewal of meters and the operating and maintenance costs associated with meters is included in retail costs. The difference between the costs associated with servicing a 200mm meter (the highest in the pricing schedule) as opposed to 20mm may be material, in which case its not appropriate to have a single per customer application as a large non-residential customer with higher retail costs will be allocated the same cost as a small residential or non-residential connection that imposes materially lower costs.[51]

The degree to which this approach is more cost reflective than a percentage approach (which preserves the relativities imbedded in the current schedule) will depend on the degree to which the current retail price schedule is reflective of costs at the retail service level. As stated previously, we have adopted a precautionary approach

[51] A formula is adopted for meters larger than 200mm.

The application of a per km cost to prices for reticulation services has been suggested on the grounds that it is more cost reflective than a simple percentage based approach. However this alternative does raise a number of concerns. Based on alternatives raised during the course of the project this approach appears to be centred on the application of either a single average pre connection length of reticulation and/or the application of an average unit based costing of reticulation. Potential issues with such an approach include:

- Adopting an average length of reticulation per customer approach adds no value. Decomposing reticulation costs to a per km basis and then applying them based on a single average measure of length of reticulation per connection to all connections is equivalent to simply dividing the costs associated with local reticulation services by the number of connections and as such is an unnecessary complication.

- An average per km or unit based approach applied either on a per customer basis or a scheme specific basis does represent a valid alternative. However, it does not necessarily provide for increased cost reflectivity. We note that the unit based measure is an average and will therefore not reflect costs associated with:

  a) Geospatial costs — i.e. cost differences in trenching based on soil type (sandy soils, clay soil and rock).

  b) Infill vs greenfields — cost differences that reflect the reinstatement costs or restoration costs associated with undertaking works in established urban environments (eg restoring footpaths and roads).

  c) Large and small users — current tariff schedules differentiate between large non-residential users are small non-residential users. Laying reticulation infrastructure for a customer with a 200 mm meter is expected to be materially different from a customer with a 20 mm meter due to an expectation that they will require bigger pipes, deeper trenches and wider trenches.

4.7. The facilitation charge

IPART's preferred approach to wholesale pricing outlined in the Discussion Paper includes the provision of a factor in the wholesale price for net facilitation costs. These costs are defined in the Discussion Paper as costs (positive) or cost savings (negatives) to the wholesale service provider of servicing the wholesale customer.

Facilitation costs are costs or savings to the wholesaler from servicing the wholesale customer that are not reflected elsewhere in the retail-minus formula and additional to what the wholesale service provider would have otherwise incurred.

Facilitation costs can be categorised as either:

- Transaction costs — additional unaccounted for costs that are incurred in the administration of wholesale services.

- Infrastructure planning costs — additional unaccounted for costs or benefits that are incurred in the supply of wholesale services. These are costs that are associated with either augmenting or deferring additions to supply.

4.7.1. Transaction cost

Transaction costs would ordinarily encompass:

- Wholesale billing costs which are incurred as a result of a wholesale service,
- Administrative and/or operational costs associated with the provision of a wholesale service,
- Additional investment costs incurred through connection to the incumbents infrastructure.

These costs are legitimate costs associated with the provision of wholesale services and are unlikely to have been included in the recent price reviews and therefore not in danger of being double counted. These costs should be included in a facilitation charge on a system wide basis.

Consultation with Sydney Water and Hunter Water may be necessary to identify wholesale transaction costs and how to estimate a system wide average or typical estimates if they are to be included in a facilitation charge.

Neither Sydney Water nor Hunter Water provided much information in their respective responses to IPART's Discussion Paper on the magnitude of such transaction based costs. Sydney Water categorized these types of activities as simply wholesale customer contract negotiation and suggested a standard fee to reflect the cost to develop the standard contract plus hourly rates for if wholesale customer wishes to negotiate changes to the standard contract. Hunter Water stated

> *Under the IPART approach, the transaction costs associated with negotiating utility services agreements, monitoring those agreements, and metering at the offtake point would be added to the wholesale price. Hunter Water has not given detailed consideration as to how some of these transaction costs would be allocated to specific supply agreements or how the wholesale price would be adjusted through time.*[52]

The average facilitation transaction based cost will be calculated as the total cost forecast for any given year divided by the number of wholesale customer applications or new connections forecast for that year.

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[52] Hunter Water (2016) Hunter Water Response to IPART , prices for wholesale water and sewerage services, May 2016

4.7.2. Infrastructure planning facilitation charges

The Discussion Paper gives examples of facilitation costs that relate to the impact of new retail service providers on the incumbents capital works program. A positive facilitation cost is one which would see servicing of the wholesale customer involving some form of augmentation of the existing capacity. A negative facilitation cost is one that would see a wholesale customer duplicating the incumbent's capacity and deferring the incumbent's future augmentations.

The Discussion Paper suggests that the facilitation charge be based on a wholesale planning framework similar to that which was implemented to support developer charges. We note that there are a number of aspects of the facilitation charge that resemble elements of IPART's previous developer charges framework and are very similar to developer charges approaches that have been employed in other jurisdictions. For example, the ESC has previously managed a developer charges framework based on bring-forward costs that it developed in its 2004 Water Price Review. This approach was eventually abandoned by the ESC on the basis that it was difficult to communicate with developers and that it was very difficult to establish underlying works schedules that were robust enough for businesses to base bring-forward cost calculations.

Unlike developer charges which are aimed primarily at allowing Sydney Water and Hunter Water to maintain capital works programs that minimised costs for consumers, the facilitation charge is being associated with a wholesale charge that is aimed at allowing for competition in service provision. This difference in the apparent objectives of both frameworks means that there are a number of issues which should be addressed in the development of facilitation charges. These issues include:

- The potential for systemic double counting of costs.
- Issues in identifying an average facilitation charge.
- Adopting an appropriate approach to deferral values.
- Each of these issues is discussed separately below.

Another consideration is that a supply demand based facilitation charge is not particularly suitable to an average based pricing approach. Based on their alleged heterogeneity, supply demand facilitation charges would best be dealt with on a case by case basis and not on an averaged approach. This observation is supported by Sydney Water in its response to IPART's Discussion Paper where the business proposes the adoption of a hybrid retail-minus approach primarily on the basis that such facilitation charges will need to be individually assessed

4.7.3. Current approaches to funding growth

Sydney Water and Hunter Water have obligations in their respective Operating Licences to provide infrastructure to support current and future population growth. This infrastructure is usually provided just in time or when it is actually required.

The businesses forecast required growth related expenditure for each regulatory pricing period (every 4-5 years), however longer term strategic plans are developed to ensure that all likely

development areas are able to be serviced if required. The businesses use a combination of planning strategies, models and alternative data sources to predict future growth and hence future infrastructure requirements. For example, in determining market demand for services, Sydney Water is primarily guided by the Department of Planning and Environment's lot and dwelling projection forecasts. Sydney Water also consider:

- broad macro-economic trends
- NSW Government benchmarks for zoned and serviced land
- sub-regional analysis of greenfield areas
- available Metropolitan Development Program data
- comparison of annual new connection rates to the corresponding dwelling production forecasts
- development application activity across Sydney Water's area of operations
- new connection rates across Sydney Water's area of operations
- the capacity of existing infrastructure in infill areas
- the level of land fragmentation in greenfield areas
- intelligence from the Department of Planning and Environment and the development industry.

These forecasts of expenditure are included in the submissions made to IPART as part of each regulatory pricing period.

The actual timing of land development is highly variable, however the businesses mitigate this variability by setting an allowance or a pool of expenditure that is designed to cover the expected work required based on historical growth rates, release of development areas and predicted growth rates as determined by the State Government. The pool of expenditure reduces risks for the businesses in catering for changes to development timing, whether they are plan deferrals or developers bringing forward plans. Developments that materially deviate from the planed timing of works (that is are outside of the five years of a growth service plan) are funded by developers. Sydney Water reimburses these developers for their works on a lot by lot basis, once their land is released (see table 24).

For Sydney Water these pools of expenditure may be set on an individual growth precinct basis and may be based on plans. However the actual timing of service provision is reactive to developer demand. The implication is that while a planned schedule of works exists the timing of works will vary from that included in the plan.

Table 24: Sydney Water funding principles

Planning status of developer's proposed works	Sydney Water's timing of proposed works	Developer's timing of proposed works	Funding arrangements
On Sydney Water's five year Growth Servicing Plan(GSP), or in Brownfield areas.	Within five year GSP or in Brownfield areas	In line with GSP, or in Brownfield areas	No commercial agreement Sydney Water funds and constructs works through Capital Investment Program as planned in Growth Servicing Plan.
On Sydney Water's GSP	Within five year GSP	Earlier than GSP timing	Commercial agreement - developer funds and constructs works, transfers to Sydney Water. Sydney Water provides repayment regime, initially as development occurs (per lot basis). Once one third of the signing developer's lots developed (Section 73 certificates received), Sydney Water pays all remaining costs of works in a single payment
Not on Sydney Water's GSP, but on government MDP as medium-term (5 – 10 years).	Beyond 5 year GSP	Anytime	As for 2, however the threshold is development (Section 73 certificates) of two thirds of the signing developers' lots
Not on Sydney Water's GSP, but on MDP as a PAP or other land release that is to be 'no cost to government'	Beyond 5 year GSP	Anytime	Developer funds and constructs works, transfers to Sydney Water. Sydney Water provides payment regime, initially as development occurs (per dwelling connection basis). Once half of the dwellings are connected, Sydney Water pays all remaining costs of works in a single payment
Not on Sydney Water's GSP, not on government MDP	Beyond 5 year GSP	Anytime	Developer funds and constructs works, transfers to Sydney Water. Commercial agreement for transfer and operation of assets, but development has no status under planning instruments therefore no repayment regime.

Source: (Sydney Water, 2014)

The issue of augmentation expenditure is relatively less material for Hunter Water as it requires developers to gift lead in and trunk infrastructure if it is necessary to service a development.[53]

> *Hunter Water has a funding of growth infrastructure policy that requires developers to fund lead-in infrastructure works to connect the development and amplify existing assets where necessary to provide sufficient service capacity. In almost all cases, the developer builds and commissions the lead-in infrastructure. The developer may also elect to pay for lead-in infrastructure delivered by Hunter Water.*
>
> *Under these funding arrangements, the developer directly funds infrastructure works necessary to connect the new development to Hunter Water's water and wastewater networks. Consequently, there is no need to adjust wholesale prices to factor in any additional 'facilitation costs' associated with connecting and extending network assets for each development. Further, given the type and scale of WIC utility developments in the Lower Hunter, Hunter Water does not consider that there is likely to be any material benefits associated with deferred or avoided investment elsewhere in Hunter Water's water supply system.*

In addition, the regulatory process also allows the post-recovery of costs expended in excess of the allowed pool of expenditure, if it is deemed to be prudent and efficient. This essentially reduces the risk faced by the businesses in relation to growth expenditure to the potential loss of financing costs of any expenditure over and above the allowed pool.

Further details on each of Sydney Water and Hunter Water's approaches to allowing for growth expenditure are outlined in the following boxes (boxes 5 and 6) which are extracted from relevant sections of the expenditure review consultant's reports completed for the current regulatory price review for Sydney Water (December 2015) and Hunter Water (February 2016).

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[53] Hunter Water (2016) Hunter Water's response to IPART's Wholesale Pricing Discussion Paper, May 2016

Box 5: Sydney Water's growth funding

The key clause of the Operating Licence in relation to growth is that drinking water and wastewater services must be available on request for connection to any property in the area of operations, subject to any conditions to ensure safe, reliable and financially viable supply to properties.

Sydney Water spent $205.7m on water service growth in the current price path (2012-2016) and is projecting expenditure of $226.9m in the next price path (2016-2020).

Growth servicing strategies have been developed to ensure the timely delivery of infrastructure on the basis of confirmed plans. This was one of the reasons for lower expenditure than planned in the current price path. We found the process well controlled but there are inevitably uncertainties from the scope and timing of new developments.

At the previous review, projections were based on the Metropolitan Development Plan (MDP). The MDP has not been updated recently and is no longer considered up-to-date. Sydney Water now bases its projections primarily on figures provided by the Department of Planning and Environment (DPE), which appear to be informal projections, not formally documented.

SWC's approach to growth is informed by its Growth Servicing Plan (2014 to 2019) which sets out the framework for decision-making and an overview of growth expectations and by location-specific Water/Wastewater Growth Servicing Strategies which consider future growth levels, strategy analysis and the preferred servicing strategy.

SWC has developed an improved approach to planning for growth which carry out the detailed planning at an early stage but deferral of the decision to start construction until demand is demonstrated and there is a low risk of delay. This approach is summarised in their Growth Servicing Plan as follows**:**

> Sydney Water will invest in trunk services where there is demonstrated demand and risk of delay is low. This is when the land can be serviced with logical extension to Sydney Water's trunk network and:
>
> - Land in held in consolidated ownership and landowners wish to develop
> - Land is fragmented and there is evidence it is ready for development across a number of owners
> - Land is fragmented and there is developed land adjacent to it and landowners wish to develop
> - The development site is brownfield and there is no excess system capacity

Source: Sydney Water Corporation – Expenditure Review, December 2015, Atkins/Cardno

Box 6: Hunter Water's growth funding

Underlying population growth is the major input to growth capital requirements and accurate forecast of population growth by area is the key to accurate growth related capital expenditure forecast. HW uses an Integrated Supply-Demand Planning (iSDP) model. The Institute for Sustainable Futures6 recently reviewed HW use of the model and confirmed that the model is being successfully applied.

Along with the iSDP model, HW provides growth mapping to regionalise the forecasts with the latest version being completed in 2014. The growth mapping comprises:

- Liaison with each local council for updates of each development area
- Review of developer servicing strategies received of the last year to refine the size and timing of new connection including those from private water utilities
- Review of Section 50 development applications
- Update of spatial layer in ArcGIS to include new development areas
- Update of future development timing

If the growth mapping identifies regional capacity constraints in the existing network, the planning support team undertakes a risk assessment and constructs recommendations for an appropriate response. Recommendations may include adjustments to the timing of future upgrade works, development of a business case to proceed with upgrade works, or limits on development connections until upgrade works are completed.

Growth projects have been driven by average increases in residential connection since 1988 and average population growth over the past 25 to 30 years of 1-1.12% per annum. HW considers the average increase in residential connection since 1998 as an input into its growth mapping model to predict future growth for each HW catchment or sub-catchment. We consider this approach to be reasonable for long term planning purposes. Short term planning will often be driven by 'hot spots' of localised growth.

Demand growth drives one-third of the forecast 10-year capital budget to 2026 and 27% ($30.2m) of the 2017 budget.

The use of Integrated Supply-Demand Planning model represents good industry practices in forecasting growth in water services. The HW approach to growth mapping as described in the supplied documentation is both thorough and current for the review. HW suitably considers and tests the input assumptions for growth projection through the regular reviews of actual growth versus projected growth.

Source: Hunter Water Expenditure Review, February 2016, Jacobs

4.7.4. The potential for systemic double counting of costs

Given that the current retail prices approved for Sydney Water and Hunter Water would form the basis for the retail-minus wholesale charge, we need to be cognisant that these retail prices reflect a revenue requirement that includes costs that are aimed at meeting the supply obligations and the assumed growth assumptions adopted in the cost forecasts for their retail price reviews.

If a new wholesale customer requires augmentation which is reflected in the facilitation charge, it is important that this same augmentation cost is not already included in the incumbent's retail price.

This potential for double counting not only relates to large augmentations that are separately identified and accounted for in the price review, but also to general growth which is allowed for in the price review by inclusion of an allowance for growth.

The only exception to double counting would be where the new retail entrant related to growth that was not anticipated by the incumbent wholesale and was not covered by the growth allowance imbedded in their approved revenue requirement. Included in these unanticipated costs would be any material bring-forward costs associated with out of sequence developments.

4.7.5. Accounting for bring-forward costs and deferral benefits

An alternative approach to the setting of facilitation charges is to include in the charge an allowance for the costs associated with brining forward augmentation of network assets associated with a wholesale customer requesting wholesale services for a new development that is out of sequence. Out of sequence refers to the timing expectations underlying the wholesale service providers' capital program. Given that the costs of the infrastructure itself is included in the revenue requirement the bring-forward cost will relate solely to the financing costs associated with funding the works earlier than anticipated. The inclusion of these types of facilitation charges is canvased by Sydney Water in its response to IPART's Discussion Paper.

Financing costs relating to bring-forward connections should be calculated as the financing costs on the connection capital expenditure for the number of years that the expenditure is brought forward. That is, the product of the capital expenditure, a measure of the cost of capital (typically the WACC) and the number of years.

Another issue that will need to be addressed is the approach adopted for addressing deferral values. Based on our experience with the calculation of deferral values for infrastructure in the Metropolitan Melbourne water and wastewater system we are conscious that deferral values are largely dependent on forward looking assumptions regarding demand and growth, these include assumptions regarding climate and the availability of water. Such assumptions can be highly subjective.

The ability to accurately value deferral benefits will depend on the ability to identify the individual expenditures associated with growth within those that have been approved in the forward capital programs for Sydney Water and Hunter Water in their respective price reviews. This issue is further complicated by the allowance of growth related funding pools in the approved revenue requirement. These funding pools relate to growth in general and not to specific projects.

Sydney Water in its response to IPART's Discussion Paper supported the adoption of supply demand facilitation charges. It suggested that current growth plans may provide a base case. However, it also questioned the ability of its current planning framework to deliver the detail needed to support such facilitation charges.

> *IPART has requested comment on whether a wholesale service provider's growth plans are the most appropriate determinant of the level of cross-subsidy. Fundamentally a robust base case long-term plan is required to establish an*

incumbent's facilitation costs. Sydney Water considers that the wholesale service providers' growth plans would be the most appropriate base case.

However, we would like to note that Sydney Water has a number of different types of growth plans that are developed depending on when the growth is likely to occur. These plans are developed in line with the Government's planned release of land. This sequencing affects the detail that is contained within the plans. For example, our short-term growth plans used for the prevailing price determination period are much more detailed than our 20-year growth plans.

Also, the information that is contained within our long-term growth plans is not publically available as they contain information that we consider to be confidential, including our planned investment. It is unlikely that our Growth Servicing Plan, which is publically available, would be detailed enough, or cover the relevant time period for the purposes of determining any cross-subsidy for facilitation costs. Sydney Water could respond with more certainty to this matter, after seeing further detail from IPART on what should be included in the wholesale service provider's growth plans. [54]

4.7.6. An averaged based approach to facilitation infrastructure planning charges

While we have raised a number of issues regarding the development of an average based approach to facilitation infrastructure planning charges, one of the requirements of this project is the development of an averaged based approach to facilitation charges including those that relate to infrastructure planning. In order to develop a supply demand facilitation charge that is consistent with an average based approach, the charge would need to be set over service areas that have homogenous servicing cost profiles. This is most likely to occur at the precinct level.

The approach would essentially develop average bring-forward cost for each year of the regulatory period for each precinct (1, 2 and 3 year bring-forwards). The bring-forwards would relate to the lead in mains infrastructure and trunk infrastructure needed to service the precinct. The average bring-forwards would most likely need to be calculated on a per lot basis.

This approach is symmetric in that it can also be utilized to determine the deferral values associated with new wholesale customers. As with bring-forward costs these deferral values would be measured by the financial savings of deferring an investment for 1, 2 or 3 years.

This averaging approach is predicated on the availability of a number of inputs and assumptions. These include:

- The homogeneity of growth related expenditure within the context of individual precincts

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54 Sydney Water (2016) Sydney Water's reponse to IPART's Wholesale Pricing Discussion Paper, May 2016.

- The ready availability of publicly accessible planning documents that clearly identify the timing for the delivery by the wholesaler of trunk infrastructure and lead in main infrastructure.

- The plans also need to clearly articulate the number of lots being released by developers over the course of the regulatory period.

- These plans also need to be living documents that are updated annually to account for any changes that may transpire to timing due to the occurrence of out of sequence developers or deferrals.

- Both the bring-forward costs and deferral benefits are essentially net present value calculations and there needs to be agreement on the discount factor used. The ESC in its bring-forward based developer charges (New Customer Contributions) framework adopted the WACC as determined in the corresponding price review as the appropriate discount factor.

Based on our experience with bring-forward charges under the ESC's historical New Customer Contribution framework we stress the importance of having detailed pre-existing plans which clearly outline timing of works for lead in mains and trunk infrastructure. In the absence of such plans IPART will inevitably find itself arbitrating outcomes between developers who have based bring-forwards or deferrals on the assumptions and opinions of their engineers and water businesses who have also based their determination of bring-forward or deferral on their own engineering assumptions.

We also note that we are unaware of any regulatory precedent for an averaged charging framework that accounts for bring-forward costs or deferrals. These types of arrangements are typically established as part of a developer charges regime and are administered on an individual level. Victoria's current developer charges regime does account for bring-forward; however this is done on a case by case basis. The approach adopted for bring-forward costs currently employed by Yarra Valley Water is outlined in Box 7.

Box 7: Incremental financing costs (IFC)

Yarra Valley Water may calculate and levy an IFC equivalent to the financing cost associated with bringing forward the provision of shared infrastructure assets.

The charge is calculated on the basis of:

- the development -specific capital costs associated with connecting a customer or group of customers
- the financing costs that may be attributable to bringing forward the timing of the provision of shared assets required to connect to the existing network

The cost is calculated as:

$$IFC = \left(1 - \left(\frac{1}{(1+r)^n}\right)\right) \times cost\ of\ assets\ being\ provided\ sooner\ than\ planned$$

Where:

r = estimated pre-tax WACC (currently 4.8%)

n = the number of years the asset is required sooner than planned

Source: (Yarra Valley Water, 2016)

Given that the bring-forward cost or deferral benefit associated with any particular individual wholesale customer is not ongoing nature, the most appropriate way to levy the charge would be up front at the time of connection as a one off charge.

We recommend that IPART also recognise the different funding approaches for growth adopted by Sydney Water and Hunter Water. While Sydney Water appears to fund lead in mains and trunk expenditure, Hunter Water requires developers to gift these assets and therefore incurs no expense. Accordingly the supply demand facilitation charge should only apply to Sydney Water.

We also recommend that the facilitation charge excludes major bulk water transport, water treatment, or water source assets. Similarly for wastewater we recommend that the facilitation charge excludes bulk transport assets, treatment assets and disposal assets. These large headworks and tailworks assets are relatively long lived and it is inherently difficult to subscribe augmentations to such assets as resulting from changes in the timing of individual developments. The long lives of such assets means that deferrals or bring-forwards could be referring to long run costs that are not anticipated for significant periods of time, some of which may extend beyond the 20 to 25 year costing horizons envisaged in LRMC and LRIC estimations.

4.7.7. Calculating the precinct average

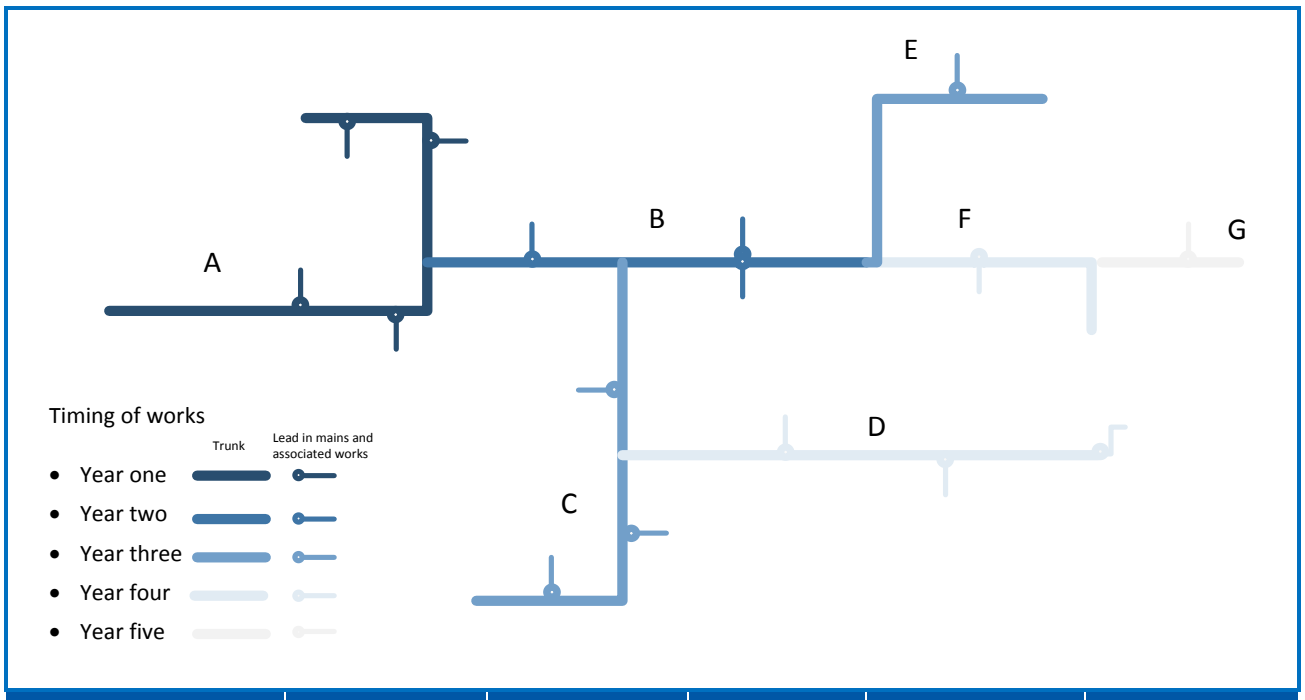
The process for determining precinct average bring-forward and deferral values would be based on an averaging process with five distinct stages:

1. Map out precinct plan in terms of value and timing of works.
2. Identify separate growth paths within the precinct.
3. Calculate bring-forward schedule for each growth path.
4. Calculate schedule of average bring-forwards across all the paths.
5. Update schedule annually.

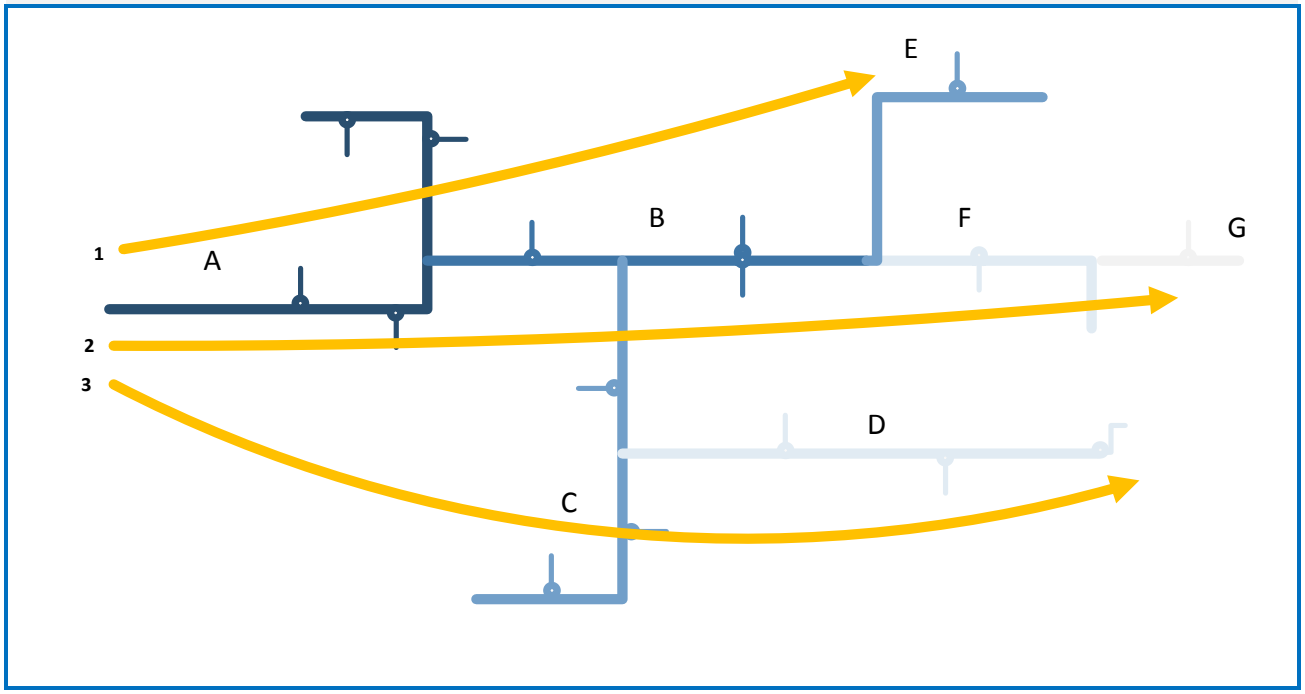
Figure 7 sets out a highly stylised representation of a hypothetical growth precinct. In the hypothetical the precinct is planned to be serviced incrementally over a five year period. The works included in the example are trunk mains, lead in mains and associated works (such as reservoirs or pumping stations).

There are three separately identifiable growth paths within the planning precinct. For each growth path we will identify the bring-forward costs (deferral values) for a point in time (i.e. from year one). We note that the schedule and bring-forward calculations are from a particular point in time. The schedule will need to updated at least annually to account for actual development within the period. Once a bring-forward or deferral has occurred the wholes schedule will need to be reviewed to account for the changed timing going forward after the bring-forward or deferral. For each growth path, bring-forward values for 1, 2, 3 and 4 years will be calculated. The average bring-forward cost across the growth paths will represent the average for the precinct. These averages are levied on a per developer basis, that is the development that triggers the bring-forward will face the associated bring-forward charge.

Figure 7: Stylized growth precinct by



Growth path	Year 1	Year 2	Year 3	Year 4	Year 5
1	A	B	E	-	-
2	A	B	-	F	G
3	A	B	C	D	-



The formulas for calculating bring-forwards (where r = discount rate) at the growth path level would be:

$$1\ year = \left(1 - \left(\frac{1}{(1+r)^1}\right)\right) \times cost\ of\ assets\ being\ provided\ sooner\ than\ planned$$

$$2\ year = \left(1 - \left(\frac{1}{(1+r)^2}\right)\right) \times cost\ of\ assets\ being\ provided\ sooner\ than\ planned$$

$$3\ year = \left(1 - \left(\frac{1}{(1+r)^3}\right)\right) \times cost\ of\ assets\ being\ provided\ sooner\ than\ planned$$

$$4\ year = \left(1 - \left(\frac{1}{(1+r)^4}\right)\right) \times cost\ of\ assets\ being\ provided\ sooner\ than\ planned$$

These bring forwards would also need to be cumulative in nature, such that at year zero the bringing forward of works from year four will also include the bring forward of relevant works from year 3 and year 2.

Table 25: Bring-forward values

Growth path	1 year	2 year	3 year	4 year
1	$= \left(1 - \left(\frac{1}{(1+r)^1}\right)\right) \times$ B	$= yr\ 1 + \left(1 - \left(\frac{1}{(1+r)^2}\right)\right) \times$ E	-	-
2	$= \left(1 - \left(\frac{1}{(1+r)^1}\right)\right) \times$ B	-	$= yr1 + \left(1 - \left(\frac{1}{(1+r)^3}\right)\right) \times$ F	$= yr1 + yr3 + \left(1 - \left(\frac{1}{(1+r)^4}\right)\right) \times$ G
3	$= \left(1 - \left(\frac{1}{(1+r)^1}\right)\right) \times$ B	$= yr1 + \left(1 - \left(\frac{1}{(1+r)^2}\right)\right) \times$ C	$= yr1 + yr2 + \left(1 - \left(\frac{1}{(1+r)^3}\right)\right) \times$ D	
Precinct average	= mean of growth paths (1, 2, 3)	= mean of growth paths (1, 2, 3)	= mean of growth paths (1, 2, 3)	= mean of growth paths (1, 2, 3)

4.7.8. The impact of supply demand facilitation charges on incentives for efficient entry

We are concerned that there is a potential for supply demand facilitation charges (whether they are averaged or not) to distort efficient entry of wholesale service providers.

The developer and wholesale customer on-selling water, wastewater or recycled water are undertaking distinctly different functions. This distinction does not appear to have been recognised. Although it is evident that developers may seek to become wholesale customers and on-sell water or wastewater service providers, it is also possible that they could transfer their

assets (either through sale or gifting) to third parties that specialise in the provision of water and wastewater services.

Where the developer chooses to retain ownership of their assets and on-sell wholesale services they are undertaking two separate functions, the first is as the land developer the second is as the wholesale service customer. This distinction is important as the incentives involved are different for each function. At its simplest level the developer is seeking to maximise their profits through the release of development land while the water, wastewater or recycled water on-seller is seeking to maximise their profits through the ongoing operation local reticulation networks and the on-selling of wholesale services.

Both Sydney Water and Hunter Water typically have an obligation to provide services to developers within their licenced areas. There are currently no developer charges levied within these areas. Where developments occur out of sequence they are required to construct the necessary assets and Sydney Water will reimburse them on a per lot basis as their development is released.

It is reasonable to assume that developers develop land primarily for the sale of land and not to become on-sellers of water and wastewater products. The issue is then that if the wholesale price is utilised to send developers signals about the location or timing of their development, the developer may choose to simply gift their assets to Sydney Water or Hunter Water and not to engage in wholesale services, even if it had been efficient for them to do so.

Developer charges are the most appropriate vehicle for signalling to developers locational or timing signals. Wholesale charges should ideally be used to signal to on-sellers of wholesale services the costs and benefits that they impose on the wholesaler.

4.7.9. Offsetting investments

One aspect of deferrals that needs separate consideration is where wholesale customers make unanticipated investments that fully offset a wholesalers planned investments. For example, if a wholesale customer invests in lead in infrastructure that the wholesaler had planned on building over the course of the regulatory period. The investment by the wholesale customer does not defer the wholesaler's planned works, rather it fully offsets them.

Sydney Water, in its response to IPART's Discussion Paper suggested that these offsets should be encapsulated in the net facilitation charge as a positive cost on the basis that it is included in the retail price. However we note that under the current regulatory framework, what is actually included in the retail price is a temporary allowance for a return on and off a planned expenditure. It is a temporary allowance because the end of the current regulatory period and prior to the commencement of the next, IPART will update the regulatory asset base to account for actual capital expenditure. This means that if Sydney Water did not incur the expenditure it will ordinarily not be rolled into the asset base.

Including in the facilitation charge a negative component to account for offsetting investments by the wholesale customer is in effect requiring the wholesaler to pay for the offsetting investment. It is not clear how this payment should be treated under the regulatory framework. If

it is treated as a capital payment it will need to be rolled into the RAB which would allow the wholesaler to earn a return on and of the asset over time (as if it would have, had it actually made the investment), however this would imply that the wholesaler's RAB includes assets which it does not actually own.

Given that the actual delivery of growth related investments is reactive in nature it may be more practicable to treat the offset as you would a developer who chose not to proceed with their development and reprioritise the expenditure over other growth opportunities within the regulatory period allowing for the rebalancing for the RAB at the end of the regulatory period to account for any excess in the growth related expenditure forecasts.

4.8. Summary: facilitation charge

- The facilitation charge should include an allowance for any transaction costs associated with wholesale customers.
- If the necessary data were available it would be possible to develop average bring-forward and deferral benefits (as required by IPART) at the precinct level. These charges should be levied on individual customers up front and not in an ongoing manner.
- We proposes infrastructure facilitation charges are not applied to Hunter Water

5. Calculating the wholesale price

5.1. Our retail-minus model

We have developed a relatively simple building block model to derive the indicative wholesale prices. The model is made up of the following components:

- Retail and reticulation service functions covering:
  a) Direct operating and capital expenditure for water and wastewater
  b) Common operating and capital costs / allocation for water and wastewater
  c) Existing regulatory assets value for water and wastewater.
- Facilitation cost data.
- Other regulatory accounting items including tax allowances, return of and on assets, etc.

The model has the ability to include or exclude specific items including existing assets and common costs and allows the user to choose the nominated wholesale point of connection. This has the effect of determining which service functions are therefore to be included into the wholesale pricing model.

5.2. Data Collection process

Data was collected or made available at a number of stages throughout this project. The chronological steps taken to complete this report are listed below with those highlighted in bold reflecting a data related interaction.

1. Inception Meeting
2. Methods workshop
3. Delivery of Methods Paper
4. Data discovery workshops
5. First receipt of data
6. Draft findings report
7. Data template
8. Second receipt of data
9. Analysis of data
10. Final findings report (this report)

The data collection process for this project broadly outlined above was applied equally to both Sydney Water and Hunter Water.

The data collection process for this project was not intended to replicate and is not generally directly comparable with the more formal process undertaken in a retail price review (refer

section A.1.1.3 for further details) as the purpose of the project was to assess the feasibility of calculating average retail-minus prices in order to reduce the need for potentially more costly scheme-specific reviews of wholesale prices. The process for this project was somewhat less structured reflecting the fact that the type, scope, and quality of available data was unknown at the time of developing our method and initially identifying the data we would need; and further that this is potentially the first time such data has been requested in such a format from the businesses. As a result of this, and the timeframes in which to seek and review data, the reliability and robustness of the data is lower than that which would be expected under a more established and formal price review data collection process.

5.3. Critical review of the Sydney Water data

5.3.1. Distributed cost data

Operating Expenditure – Retail

Sydney Water has submitted operating expenditure figures for the retail service function identifying total direct retail opex which includes common divisional overheads. Sydney Water's calculation of operating expenditure for retail services is based on 2013-14 Cost to Serve Study. This figure is then escalated from 2013-14 value to a 2016-17 value using a combination of actual CPI and customer growth escalation factors. Project total figures beyond 2016-17 are escalated using customer growth adjustments only. It would be preferable to have more current figures for total costs to ensure that they are cost reflective of current conditions. In 2014-15 Sydney Water participated in the WSAA 2014-15 Opex Benchmarking exercise and observed that the benchmarking retail cost (based on actual Sydney Water's retail costs) was consistent with the cost data provided for this project.

Sydney Water has also been requested to calculate direct retail opex using the total customer and support services costs identified in the 2015 AIR/SIR. By removing, direct and indirect business support costs attributable to water and wastewater activities, thus leaving a calculated value of retail costs representing approximately 22.1% of the total customer and support services costs. The total direct retail opex plus common divisional overheads figure is then distributed across water and wastewater according to a weighted allocation of 60% water and 40% wastewater. This allocation method is derived from the assumption of a 50:50 split of customer interactions to water and wastewater and a 65:35 split of accounts / billing costs with the higher split to water due to meter reading costs.

The calculation from total customer/support services to retail only costs is based on a top-down approach in order to identify the component costs from the high level service/activity information presented in the AIR/SIR. The supporting information for this top-down approach is available however it was not provided given the restrictions on available time.

The allocation of the adjusted total retail costs to water and wastewater appears to be appropriate. Our own original allocation method, based on customer numbers, identified a similar, but slightly lower, split than the 60:40 allocation used by Sydney Water. We would assume however that in the area of customer interactions, the wastewater network might receive a larger number of interactions (sewer blockages and surcharges) however this could only be resolved with some

reporting and analysis of actual customer centre call logs. Sydney Water implied that customer interactions were not necessarily reportable by whether they related to water or wastewater issues however we would be surprised if this information was not available.

Whilst Sydney Water has incorporated divisional overhead costs in its retail costs based on causality, common corporate costs were only allocated at product level. Sydney Water as however provided the common corporate costs separately with an estimated allocation percentage to be applied to retail costs.

Operating Expenditure – Reticulation

Sydney Water has calculated its operating expenditure for the reticulation system in a similar manner to that for retail services. The calculation of reticulation operating expenditure is based on historical (2014-15 actuals) and projected total reticulation (transportation) expenditure (2015-16 to 2019-20) which has been adjusted downwards by around 52% and 34% for water and wastewater respectively to remove costs not directly related to local reticulation. These adjustments are necessarily to track the component costs from the high level service/activity information reported in the AIR/SIR using a top-down analysis approach.

The adjusted estimate of local reticulation costs which, as per the retail costs analysis above, also includes common divisional overheads and they are consistent with the Sydney Water's actual performance reported in the 14-15 WSAA Opex Benchmarking.

The adjusted estimate of local reticulation costs (including overheads) has been converted to unit rates using lengths of reticulation water mains and branch sewerage mains and channels. Sydney Water provided two estimates of lengths of mains – the first based on definitions of reticulation used in some 2014-15 industry benchmarking exercises and the second set based on mains length figures provided during the 2016 retail price review. To adjust for the difference between the mains length figures, Sydney Water has calculated an adjustment factor based on the ratio of the two sets of figures. This mains length adjustment factor has been applied to the estimate of reticulation costs to determine a final direct reticulation opex with common divisional overheads. The final figures are already split between water and wastewater so no allocation method is required.

Supporting information provided by Sydney Water indicates that this top down method of cost allocation is problematic with comments made including "*The data could not be reliably used for estimating Sydney Water's avoided or avoidable costs.*" However this top down approach is necessarily to dissect the component costs such as reticulation and retail costs from the aggregated service level cost information reported in the AIR/SIR.

Sydney Water has previously provided more specific reticulation cost data based on the actual costs experienced by smaller scale reticulation schemes. Costs for these schemes were derived from Sydney Water's costs allocation model (Value Driver Model) with actual lengths of reticulation main extracted from Sydney Water's asset maintenance system. Unit rates derived for these schemes are less than half the unit rates calculated using the top down approach.

Whilst this more specific information may potentially reflect the likely costs experienced by an individual wholesale service customer (at least in the short to medium term), this specific approach is not consistent with the average based distributed cost approach being used and will become increasingly less cost reflective in the longer term. The use of the longer time frame over which the average is calculated also provides some consistency to the cost assumptions in the retail price review process, which reflect a mature business with an extensive asset base and aging profile.

The 2014-15 industry (WSAA opex) benchmarking study provides some interesting benchmarking comparison for Sydney Water's estimated unit rate (based on the two sample schemes) The average water and wastewater reticulation costs of these two schemes are significantly lower than the benchmarking median cost performance. We would have expected this result given the relatively low age of the assets in the two schemes.

The data provided by Sydney Water is based on the forward projections of operating expenditure related to reticulation assets for the period from 2015/16 to 2019/20. This expenditure reflects the operating characteristics of a mature business with an extensive asset base and aging profile. The implications of using this expenditure as the basis for a "new" entrant are that in the short term, the costs are not necessarily reflective of the actual expenditure required. Over the long term, however (by this we mean likely greater than 50 years), the average expenditure will come to reflect actual costs more closely. This is quite normal when using an average based approach and the differential (between average and actual) is only an issue when the timeframe for analysis does not correspond with the timeframe for the average.

Capital Expenditure – Retail

Sydney Water has provided two sets of capital expenditure figures related to the retail service function; the first being meter investment (replacement of water meters) and the second being capital replacement / upgrades to billing systems (IT systems). Capital expenditure for meter investment has been taken from Sydney Water's meter investment program proposed as part of the 2016 Retail Price Review and is naturally fully allocated to water. Capital expenditure related to the replacement of billing systems was also proposed as part of the recent retail price review. The expenditure is part of a wider IT systems upgrade however only a proportion of this replacement program (for billing systems) has been included.

The allocation of capital expenditure for the billing systems replacement to water and wastewater has been made consistent with the allocation of operating expenditure for the retail service function, that is, a 60:40 split between water and wastewater.

Sydney Water has suggested that no allocation of common capital expenditure is required for the retail service function as the expenditure remains fixed irrespective of whether there is a wholesale service or not.

Sydney Water's capital expenditure on retail for meter replacements is based on program of works that was recently review as part of the 2016 Retail Price Review. This expenditure has undergone prudency and efficiency tests and we note that Sydney Water has provided expenditure figures which are consistent with the recommended expenditure.

The other component of capital expenditure for billing systems represents a proportion of the total expected expenditure on IT related assets proposed for the next few years. Sydney Water has identified the expenditure on billing systems and has provided additional capital expenditure that could be considered directly related to the retail service function such as website, integrated contact centre & self-serve functions.

We note that Sydney Water has stated that this retail expenditure remains fixed and would not be avoided with changes to the numbers of new customers served and should therefore not be included in the analysis of a minus factor. However, our average based distributed cost model considers the total expenditure related to each service function and as such, we intend to include the all relevant costs where data is available.

Capital Expenditure – Reticulation

Sydney Water has proposed capital expenditure for reticulation asset replacements based on expenditure allocated in the recent 2016 Retail Price Review process. The expenditure identified represents the recommended expenditure determined by IPART rather than Sydney Water's originally proposed levels of expenditure. The expenditure program was developed for water and wastewater services separately so no allocation process is required.

Sydney Water's capital expenditure costs for reticulation are based on programs that have recently been assessed for prudency and efficiency during the retail price review process. The data should therefore be considered quite robust and reliable. However, some confirmation to ensure that any separate programs or projects related to reticulation assets are included in the total reticulation expenditure would be useful.

Sydney Water stated that common costs related to reticulation assets could not be identified however we would expect that this information could be derived in some manner with an analysis of activities related to the reticulation system.

The data provided by Sydney Water is based on the forward projections of capital expenditure related to reticulation assets for the period from 2015/16 to 2019/20. This expenditure reflects the operating characteristics of a mature business with an extensive asset base and age profile with assets that are increasingly requiring replacement. The implications of using this expenditure as the basis for a "new" entrant are that in the short term, the costs are not necessarily reflective of the actual expenditure required. Over the long term, however (by this we mean likely greater than 30 years), the average expenditure will come to reflect actual costs more closely. This is quite normal when using an average based approach and the differential (between average and actual) is only an issue when the timeframe for analysis does not correspond with the timeframe for the average.

Existing Assets – Retail

Sydney Water has identified forward projections of existing assets over the coming four years based on the anticipated capital expenditure program and using a roll forward mechanism to determine the regulatory asset base. The opening asset base has been calculated using a proportional approach taking the historical book value of, for example, meters compared to the

historical book value of the total water assets. The resulting percentage can then be applied to the determined book value of water assets in the first year.

The value of existing assets for metering is fully allocated to water, while the value of assets for billing systems has been distributed to water and wastewater using the same allocations ratio as previously identified, that is a 60% split to water and 40% split to wastewater. Given that the calculation of existing assets is forward looking and based on projected capital expenditure, using the same allocation process to proportion existing assets is considered appropriate. The projected existing asset values are based on the metering investment program and billing systems program, both of which have been reviewed as part of the 2016 Retail Price Review. The data can therefore be relied upon as robust. If any further capital expenditure related to retail services is identified, the projected values would need to be revised.

The information on existing assets provided by Sydney Water was limited to existing RAB values however these asset values can be expressed as a DORC or a MEERA value. Discussion of the consideration of existing / sunk assets has been provided in section 3.2 above however the use of the RAB values does not significantly reduce the robustness of the outcomes of this process, particularly given the limited information available and the lack of existing DORC asset base information.

Existing Assets – Reticulation

Sydney Water has not provided any specific figures for existing assets in relation to the reticulation service function. Our approach is to develop an average based distributed cost model and as such we require the longer term, system wide context to be used in the calculation of the average. That is, we require the value of existing assets to be determined across all reticulation assets and across a longer timeframe to ensure consistency with the cost basis used for the retail price review.

Sydney Water have not provided any details of this wider existing asset base and as such the calculation of an robust existing RAB becomes quite difficult. Given an appropriate amount of time, however, Sydney Water should be able to undertake the task of developing DORC valuations which are the preferred approach for considering existing /sunk assets (refer section 3.2). It is noted that the use of DORC valuations would likely result in much higher minus factors for existing assets than the current RAB valuations with the use of a MEERA valuation resulting in even higher still costs and therefore a much lower wholesale price

Summary of data not provided

Sydney Water has not provided the following data which was requested in the information template:

- Common costs for retail and reticulation operating expenditure for water and wastewater – Sydney Water has included common divisional overheads in the direct retail and reticulation operating expenditure figures, but provided separately (in the notes) the indicative common corporate overhead costs (≈10% of $160m) to the retail and retic activities. The model requires this information to be considered separately.

- Common costs for retail and reticulation capital expenditure for water and wastewater - Sydney Water provided the direct CAPEX as per requested, and also the information on other related CAPEX that could potentially be common to the retail & retic functions.
- Existing assets – common for reticulation for water and wastewater. Sydney Water has stated that they do not have such assets.
- Existing assets – direct for reticulation for water and wastewater. Sydney Water Is unable to segregate the component value (ie for both RAB and MEERA) for the renewed reticulation assets.

5.3.2. Facilitation charge data

Sydney Water has identified potential facilitation charges / savings in three key areas:

- administration costs
- pumping savings
- chemical savings.

The latter two areas relate specifically to the likely savings in costs for Sydney Water related to the scenario where a wholesale customer provides recycled water services. As the focus of this project was on the provision of retail and reticulation services, these potential savings are excluded from our analysis.

The administration costs related to wholesale agreements, as identified by Sydney Water, include legal fees, internal labour, on-going ICT costs, ongoing contract administration requirements and potential trade waste mass balance analysis. The latter point is, as was identified above, related to the discharge of waste from a recycled water plant. Given recycled water scenarios are not included in this project, this latter issue is excluded from our analysis.

Facilitation charges related to legal costs have been estimated by Sydney Water based on three current Utility Servicing Agreements. Sydney Water has provided a range of estimates ranging from low ($15,000) to high costs ($20,000). We have taken the medium scenario to use in our models as it essentially represents an average cost, but would expect that these fees may decrease over time and with a number of agreements settled. We would expect that the broad structure of the agreements would become more consistent and standardised and key issues around standards of service be pre-filled in agreements based on initial review of the wholesale customer's intended approach and scope.

Facilitation charges related to ongoing contract administration have been identified as being between $6,500 and $10,500 depending on the complexity of the agreement and reporting requirements. We have taken the medium scenario for use in our model for the same reasons as identified above. It is noted that internal labour costs are assumed included in the ongoing contract administration costs.

Average facilitation charges covering the potential benefits or costs related to the deferral of new or augmented infrastructure or the bring forward of works required to connect new developments have been discussed earlier in this report and it has been resolved that the complexity involved in

the determination of such costs or benefits would most likely outweigh any benefits of implementing the charging arrangement.

5.4. Critical review of the Hunter Water data

5.4.1. Distributed cost data

Operating Expenditure – Retail

Hunter Water has provided the total direct retail operating expenditure forecasts for each year of the period to 2019-20. These forecasts are derived from Hunter Water's activity based costing system and specifically the following components:

- billing and collection costs
- retail customer contact related costs.

Totals for each of these categories are provided along with Hunter Water's estimation of the likely avoidable costs and details of miscellaneous income which may offset some of the costs. The total direct retail operating expenditure is then allocated between water and wastewater on the basis of the proportion of revenue required for water operating expenditure compared to the total revenue required for operating expenditure (excluding corporate) and the proportion of revenue required for wastewater operating expenditure compared to the total revenue required for operating expenditure (excluding corporate).

The total common retail operating expenditure is determined as follows:

- (Corporate Costs - Retail Costs) * (Retail Costs / (Direct Costs + Retail Costs)).

The overhead was calculated on the apportionment of 2016 Retail Price Review operating expenditure proportions.

Operating Expenditure – Reticulation

Hunter Water's direct reticulation operating expenditure is derived from their activity based costing systems and includes the following components:

- direct costs
- salaries & wages
- bulk contract
- administration costs.

The total of these costs is then allocated to water and wastewater using allocation percentages of 68% for water and 32% for wastewater.

Common reticulation operating expenditure for water and wastewater are calculated separately and are derived from the HWC activity-based costing model relating to operating costs for 2016-

17. The allocation to water is based on a 42% share of all water transport overhead allocation (the portion of direct costs for retic as % of total water transport direct costs). The allocation to wastewater is based on a 21% share of all wastewater transport overhead allocation (the portion of direct costs for local sewer retic as a % of total wastewater transport direct costs). No further supporting evidence was provided to explain the detail of the allocation however it is expected that this information should be available.

Capital Expenditure – Retail

Hunter Water's total direct retail capital expenditure includes allowances for Meter and Standpipe Replacements, Customer Services Platform refresh, Customer Contract and Billing system upgrades, Meter Management System and Geographic Information Systems (GIS) Upgrade. The allocation of the total capital expenditure between water and wastewater is done on the basis of the proportion of water or wastewater capital expenditure compared to the total capital expenditure (excluding corporate costs).

Common retail capital expenditure is derived from costs including other IT and Land and Property expenses. The allocation of common retail capital expenditure to water and wastewater follows the same method as that used to apportion corporate costs in the recent retail price review.

The data supplied is derived from forward estimates assessed in the recent retail price review and could therefore be considered relatively robust.

Capital Expenditure – Reticulation

Hunter Water provided details of the direct reticulation capital expenditure. This was based on capital expenditure data (over 2016-17 to 2019-20) representing a best estimate of all renewal capital expenditure for water and wastewater reticulation networks. Hunter Water indicated that these estimates would set the very upper end of any estimate of capital costs as:

- The estimates apply to Hunter Water's entire water and sewer reticulation network assets – of all ages, different pipe sizes and different materials.
- New water and wastewater reticulation network assets have a design life of 100 years for water pipelines and 90 years for wastewater pipelines. It would therefore be expected to have a very low renewal capex on new assets in at least the first decade.
- The cost of any initial faults with new reticulation assets would be recovered through defect liability claims and warranty periods.

As previously discussed, our average based distributed cost approach seeks to look at the total expenditure picture over the long term and modelling this therefore requires the total reticulation costs.

The capital costs consistent with the average based distributed cost approach and are preferred for use in our modelling. These capital costs were derived from forward estimates assessed in the recent retail price review and could therefore be considered relatively robust. Issues around

the variation between the average cost and the actual cost are normal for average based approaches and, as discussed previously, the primary area where this becomes a concern is where the analysis timeframe varies significantly from the timeframe over which the average is calculated. In these situations, the average cost becomes less reflective of actual costs.

Existing Assets – Retail

Hunter Water has calculated the value of existing assets by assuming that a RAB has been rolled forward from 2009 assuming average asset lives of 70 years until 2015-16 as per IPART's allowance for existing assets. The remaining life of existing assets after 2015-16 are as per below. Actual indexation was applied until 2015-16 (no indexation applied after this) and there were no estimated disposals in the RAB roll forward. The 2009 closing retail RAB was calculated by identifying the Gross Replacement Cost (GRC) of retail assets as a proportion of the GRC of Total Assets (in 2008-09) and applying this % to the 2009 actual RAB value. Retail assets included are water meters, standpipes, the Customer Services Platform and call centre equipment. Water and Wastewater allocation has been determined by the relative proportions of the Water/Wastewater RAB values in the 2016 IPART retail price determination.

Remaining life of existing assets is as per the 2016 IPART retail price determination.

Hunter Water stated that the allocation of return on assets, regulatory depreciation, working capital and tax depreciation for retail assets for water and wastewater respectively are calculated using the following proportional approach against the total water and wastewater returns, depreciation, working capital and tax depreciation.

- Return on Assets (Retail assets water) = RAB for retail water assets / (RAB for overall water assets incl. corporate allocation) x Total Return on Assets (Water).
- Return on Assets (Retail assets wastewater) = RAB for retail wastewater assets / (RAB for overall wastewater assets incl. corporate allocation) x Total Return on Assets (Wastewater).

Existing Assets – Reticulation

The derivation of existing reticulation assets value involved developing forward capital expenditure forecasts for reticulation which were then extrapolated backwards to maintain an equal reticulation capital expenditure to total capital expenditure ratio back to 2000. The same percentage was then applied across all years including 2009-10 and 2010-11 which included substantial expenditure on the upgrade of wastewater treatment plants to meet Environmental Protection Licence requirements. No opening RAB base at 2000 was estimated. This method produced RAB values which represented an extreme upper limit directly resulting in significant minus factors in the determination of an indicative wholesale price. In discussions with Hunter Water it was noted that the calculation of the value of existing assets using the MEERA or DORC approach results in even higher valuations and therefore likely significantly higher minus factors.

The outcomes were modelled with the range of model outputs used to assess each approach. The approach used makes broad assumptions and further work is required to determine the most appropriate approaches particularly around the inclusion or exclusion of particular assets and the timeframe over which the figures are derived. The inclusion of existing assets in the model is a matter for regulatory discretion.

5.4.2. Facilitation charge data

Hunter Water has identified potential facilitation charges related to the following:

- legal costs
- internal labour required
- ongoing ICT costs
- on-going contract administration costs.

Hunter Water has based its estimated costs on the actual costs incurred in the preparation of two initial Universal Service Agreements. Legal costs have been identified as likely being in excess of $20,000 per agreement. Hunter Water's two current agreements have both incurred around $50,000 in legal fees so there is an assumption around some economies of scale in regards to setting up the agreements. Hunter Water's suggested cost is at the upper end of the costs suggested by Sydney Water so some further assessment of Hunter's proposal would be warranted.

Hunter Water has further identified costs likely greater than $20,000 in the first year for internal labour to manage the setup and negotiation of the agreements. This cost seems somewhat high and further details on the likely tasks that would be required as part of this cost should be sought from Hunter Water. It is noted that Sydney Water did not identify any specific additional labour cost in the first year but included this cost type in the ongoing contract administration cost. Hunter Water are also proposing to levy a separate contract administration charge each year of $5,000. Combined with the first year charge, Hunter Water's costs for establishing and maintaining an agreement may be considered high. Some thought could be put into shifting the upfront fee to a slightly higher ongoing fee to reduce the disincentive to apply for a wholesale service.

Hunter Water has indicated that facilitation charges covering the potential benefits or costs related to the deferral of new or augmented infrastructure or the bring forward of works required to connect new developments are not necessarily applicable to Hunter Water's development process. At present, developers are required to fund the construction of all reticulation, lead-in and other infrastructure to connect their development to Hunter Water's network. Given that the timing of infrastructure provision rests predominantly with the developer, there is little scope for achieving deferral benefits or incurring bring forward costs.

5.5. Summary assessment of data reliability

5.5.1. Sydney Water

The key issues in relation to Sydney Water's data were:

- Common costs for retail and reticulation operating expenditure for water and wastewater – Sydney Water has included common divisional overheads in the direct retail and reticulation operating expenditure figures. Information on indicative common corporate overhead costs to retail and reticulation activities was also provided. The model requires this information to be considered separately.
- Common costs for retail and reticulation capital expenditure for water and wastewater - Sydney Water provided both direct capital expenditure, as requested, and information on other related capital expenditure that could potentially be common to retail and reticulation functions. The model requires this information to be considered separately.
- Existing assets – common for retail and reticulation for water and wastewater. Sydney Water has stated that they do not have such assets.
- Existing assets – direct for reticulation for water and wastewater. Sydney Water was unable to segregate the component value (for either RAB or MEERA) for renewed reticulation assets.
- The use of operating expenditure data from 2013-14 and 2014-15 as the basis for current and projected costs and the inability to derive current component based cost data. Sydney Water does not maintain cost-component structured financial systems that align with retail and local reticulation functions.

The absence of this data restricts some functionality in our models resulting in model results which would not be truly cost reflective. Given further time, supporting information could be collated by the businesses to provide more robust data that has a greater degree of confidence around it.

5.5.2. Hunter Water

The key issues in relation to Hunter Water's data were:

- There is material difference in the values for existing assets (RAB) based on the method of valuation adopted, particularly in the reticulation system. This issue requires more assessment to resolve. We recommend a methodology consistent with the retail price review be agreed and applied for both Sydney Water and Hunter Water.
- The seemingly high proportion of common / corporate costs which appeared to represent up to 38% of the individual service (water, wastewater) specific expenditure. This issue requires some more detailed analysis of the common costs and corporate overheads to ensure the categories and assessment process are correct.
- Costs related to facilitation charge – administration costs and in particular the legal fees. Given the relative differences between Hunter Water and Sydney Water we see value in

further review of these costs to identify the drivers behind the differences between the two water utilities.

6. The results

6.1. Calculating the retail-minus

The following tables set out the minus in both percentage terms and absolute cost for a reasonably efficient competitor cost standard including existing assets and common costs. For illustrative purposes, tables 30 through to 33 set out indicative wholesale prices for Sydney Water and Hunter Water based on the retail prices determined in the relevant 2016 price reviews and the minus developed in this report for the primary water and wastewater charges.

Table 26: Sydney Water – Reasonably efficient minus (%)

		Minus (%, reasonably efficient)			
Product	Level of service	2017	2018	2019	2020
Water	Retail	2.9%	3.1%	3.3%	3.5%
	Retail and retic	6.7%	7.1%	7.5%	7.9%
Wastewater	Retail	1.7%	1.8%	1.9%	2.0%
	Retail and retic	4.7%	4.9%	5.1%	5.2%

Table 27: Sydney Water – Minus cost ($000)

		Minus cost (2015-16$, reasonably efficient)			
Product	Level of service	2017	2018	2019	2020
Water	Retail	$32,211	$35,357	$38,123	$40,687
	Retail and retic	$75,150	$81,099	$86,407	$91,579
Wastewater	Retail	$20,354	$22,010	$23,389	$24,649
	Retail and retic	$57,405	$60,506	$63,247	$65,907

Table 28: Hunter Water – Reasonably efficient minus (%)

		Minus (%, reasonably efficient)			
Product	Level of service	2017	2018	2019	2020
Water	Retail	4.9%	5.1%	5.2%	5.4%
	Retail and retic	15.5%	15.7%	15.7%	15.9%
Wastewater	Retail	5.6%	5.9%	6.0%	6.2%
	Retail and retic	10.2%	10.4%	10.5%	10.6%

Table 29: Hunter Water – Minus cost ($000)

		Minus cost (2015-16$, reasonably efficient)			
Product	Level of service	2017	2018	2019	2020
Water	Retail	$6,616	$7,026	$7,407	$7,774
	Retail and retic	$20,982	$21,609	$22,209	$22,798
Wastewater	Retail	$8,247	$8,850	$9,146	$9,505
	Retail and retic	$14,855	$15,558	$15,955	$16,416

Table 30: Sydney Water – retail

Determination Tariffs - ($2016/2017)				
Financial year ending 30 June	**2016-17**	**2017-18**	**2018-19**	**2019-20**
Water				
Availability charges				
Residential	87.38	87.17	86.96	86.78
Non residential				
20mm connection	87.38	87.17	86.96	86.78
25mm connection	136.54	136.20	135.88	135.60
32mm connection	223.70	223.15	222.63	222.16
40mm connection	349.54	348.67	347.86	347.13
50mm connection	546.15	544.79	543.53	542.39
80mm connection	1,398.16	1,394.66	1,391.42	1,388.53
100mm connection	2,184.62	2,179.16	2,174.10	2,169.57
150mm connection	4,915.39	4,903.11	4,891.73	4,881.54
200mm connection	8,738.48	8,716.63	8,696.40	8,678.28
300mm connection	19,661.57	19,612.43	19,566.91	19,526.14
Usage charges				
Water Usage - Filtered water	1.94	1.93	1.93	1.93
Water usage - Recycled water top-up	1.94	1.93	1.93	1.93
Filtered Water - SDP uplift to water usage charge	0.12	0.12	0.12	0.12

Table 31: Sydney Water – retail and reticulation

Determination Tariffs - ($2016/2017)				
Financial year ending 30 June	**2016-17**	**2017-18**	**2018-19**	**2019-20**
Water				
Availability charges				
Residential	83.96	83.56	83.18	82.82
Non residential				
20mm connection	83.96	83.56	83.18	82.82
25mm connection	131.19	130.56	129.96	129.40
32mm connection	214.94	213.91	212.93	212.01
40mm connection	335.84	334.24	332.71	331.26
50mm connection	524.75	522.25	519.85	517.60
80mm connection	1,343.35	1,336.95	1,330.82	1,325.05
100mm connection	2,098.98	2,088.98	2,079.41	2,070.39
150mm connection	4,722.71	4,700.21	4,678.68	4,658.39
200mm connection	8,395.93	8,355.93	8,317.66	8,281.58
300mm connection	18,890.85	18,800.84	18,714.73	18,633.55
Usage charges				
Water Usage - Filtered water	1.86	1.85	1.85	1.84
Water usage - Recycled water top-up	1.86	1.85	1.85	1.84
Filtered Water - SDP uplift to water usage charge	0.11	0.11	0.11	0.11

Table 32: Hunter Water – retail

Determination Tariffs - ($2016/2017)				
Financial year ending 30 June	**2016-17**	**2017-18**	**2018-19**	**2019-20**
Water				
Availability charges				
Residential	24.43	47.52	68.28	90.01
Residential - common meter	24.43	47.52	68.28	90.01
Non residential				
20mm individual meter	24.43	47.52	68.28	90.01
20mm connection	28.69	52.16	71.47	90.01
25mm connection	44.83	81.50	111.67	140.65
32mm connection	73.45	133.54	182.97	230.44
40mm connection	114.76	208.65	285.88	360.06
50mm connection	179.32	326.01	446.70	562.59
80mm connection	459.06	834.59	1,143.54	1,440.24
100mm connection	717.28	1,304.04	1,786.78	2,250.37
150mm connection	1,613.88	2,934.09	4,020.26	5,063.33
200mm connection	2,869.12	5,216.16	7,147.12	9,001.47
300mm connection	6,455.51	11,736.36	16,081.02	20,253.31
Usage charges				
Usage - tier 1	2.14	2.13	2.13	2.13
Usage - recycled water top-up	2.14	2.13	2.13	2.13
Usage - unfiltered water	1.83	1.87	1.91	1.94

Table 33: Hunter Water – retail and reticulation

Determination Tariffs - ($2016/2017)				
Financial year ending 30 June	**2016-17**	**2017-18**	**2018-19**	**2019-20**
Water				
Availability charges				
Residential	21.70	42.22	60.73	80.05
Residential - common meter	21.70	42.22	60.73	80.05
Non residential				
20mm individual meter	21.70	42.22	60.73	80.05
20mm connection	25.49	46.34	63.56	80.05
25mm connection	39.82	72.41	99.32	125.08
32mm connection	65.25	118.64	162.73	204.92
40mm connection	101.94	185.37	254.26	320.19
50mm connection	159.29	289.64	397.28	500.30
80mm connection	407.77	741.48	1,017.03	1,280.77
100mm connection	637.15	1,158.56	1,589.11	2,001.21
150mm connection	1,433.58	2,606.76	3,575.51	4,502.72
200mm connection	2,548.59	4,634.23	6,356.46	8,004.83
300mm connection	5,734.32	10,427.01	14,302.03	18,010.86
Usage charges				
Usage - tier 1	1.90	1.90	1.90	1.89
Usage - recycled water top-up	1.90	1.90	1.90	1.89
Usage - unfiltered water	1.63	1.67	1.70	1.73

6.2. Alternative cost treatments

6.2.1. Exclusion of existing assets (reasonably efficient competitor)

The following tables set out the minus in both percentage terms and absolute cost for a reasonably efficient competitor cost standard, excluding costs relating to existing assets.

Table 34: Sydney Water – Reasonably efficient minus (%) excluding existing assets

Product	Level of service	Minus (%, reasonably efficient) 2017	2018	2019	2020
Water	Retail	2.3%	2.5%	2.8%	3.0%
	Retail and retic	6.1%	6.5%	7.0%	7.4%
Wastewater	Retail	1.4%	1.5%	1.6%	1.7%
	Retail and retic	4.5%	4.6%	4.8%	5.0%

Table 35: Sydney Water – Minus cost excluding existing assets ($000)

Product	Level of service	Minus cost (2015-16$, reasonably efficient) 2017	2018	2019	2020
Water	Retail	$25,696	$28,873	$31,720	$34,383
	Retail and retic	$68,634	$74,616	$80,004	$85,275
Wastewater	Retail	$16,994	$18,770	$20,260	$21,586
	Retail and retic	$54,045	$57,266	$60,117	$62,845

Table 36: Hunter Water – Reasonably efficient minus (%) excluding existing assets

Product	Level of service	Minus (%, reasonably efficient) 2017	2018	2019	2020
Water	Retail	3.7%	3.9%	4.1%	4.3%
	Retail and retic	14.3%	14.5%	14.6%	14.8%
Wastewater	Retail	3.5%	3.9%	4.1%	4.3%
	Retail and retic	8.1%	8.4%	8.5%	8.8%

Table 37: Hunter Water – Minus cost excluding existing assets ($000)

Product	Level of service	Minus cost (2015-16$, reasonably efficient) 2017	2018	2019	2020
Water	Retail	$4,985	$5,408	$5,806	$6,187
	Retail and retic	$19,344	$19,984	$20,601	$21,204
Wastewater	Retail	$5,167	$5,830	$6,189	$6,616
	Retail and retic	$11,769	$12,531	$12,991	$13,521

6.2.2. Exclusion of common costs (reasonably efficient competitor)

The following tables set out the minus in both percentage terms and absolute cost for a reasonably efficient competitor cost standard, excluding common costs.

Table 38: Sydney Water – Reasonably efficient minus (%) excluding common costs

Product	Level of service	Minus (%, reasonably efficient) 2017	2018	2019	2020
Water	Retail	2.9%	3.1%	3.3%	3.5%
	Retail and retic	6.7%	7.1%	7.5%	7.9%
Wastewater	Retail	1.7%	1.8%	1.9%	2.0%
	Retail and retic	4.7%	4.9%	5.1%	5.3%

Table 39: Sydney Water – Minus cost excluding common costs ($000)

Product	Level of service	Minus cost (2015-16$, reasonably efficient) 2017	2018	2019	2020
Water	Retail	$32,211	$35,357	$38,123	$40,687
	Retail and retic	$75,150	$81,099	$86,407	$91,579
Wastewater	Retail	$20,354	$22,013	$23,506	$24,747
	Retail and retic	$57,405	$60,509	$63,363	$66,006

Table 40: Hunter Water – Reasonably efficient minus (%) excluding common costs

Product	Level of service	Minus (%, reasonably efficient) 2017	2018	2019	2020
Water	Retail	3.9%	4.1%	4.2%	4.4%
	Retail and retic	11.3%	11.5%	11.6%	11.7%
Wastewater	Retail	4.6%	4.9%	5.0%	5.1%
	Retail and retic	7.8%	8.0%	8.2%	8.3%

Table 41: Hunter Water – Minus cost excluding common costs ($000)

Product	Level of service	Minus cost (2015-16$, reasonably efficient) 2017	2018	2019	2020
Water	Retail	$5,225	$5,609	$5,940	$6,286
	Retail and retic	$15,324	$15,861	$16,345	$16,848
Wastewater	Retail	$6,786	$7,332	$7,603	$7,936
	Retail and retic	$11,455	$12,072	$12,414	$12,820

6.2.3. As efficient competitor cost standard (including existing assets and common costs)

The following tables set out the minus in both percentage terms and absolute cost for an as efficient competitor cost standard, including existing assets and common costs.

Table 42: Sydney Water – As efficient minus (%)

Product	Level of service	Minus (%, as efficient) 2017	2018	2019	2020
Water	Retail	2.8%	3.0%	3.2%	3.3%
	Retail and retic	6.6%	6.9%	7.2%	7.5%
Wastewater	Retail	1.7%	1.7%	1.8%	1.8%
	Retail and retic	4.7%	4.8%	4.9%	4.9%

Table 43: Sydney Water – As efficient minus cost ($000)

Product	Level of service	Minus cost (2015-16$, as efficient) 2017	2018	2019	2020
Water	Retail	$31,736	$34,324	$36,465	$38,343
	Retail and retic	$74,040	$78,726	$82,644	$86,299
Wastewater	Retail	$20,053	$21,364	$22,368	$23,225
	Retail and retic	$56,556	$58,731	$60,485	$62,100

Table 44: Hunter Water – As efficient minus (%)

Product	Level of service	Minus (%, as efficient) 2017	2018	2019	2020
Water	Retail	4.8%	5.0%	5.0%	5.1%
	Retail and retic	15.3%	15.2%	15.0%	15.0%
Wastewater	Retail	5.6%	5.7%	5.8%	5.8%
	Retail and retic	10.0%	10.1%	10.0%	10.0%

Table 45: Hunter Water – As efficient minus cost ($000)

Product	Level of service	Minus cost (2015-16$, as efficient) 2017	2018	2019	2020
Water	Retail	$6,518	$6,821	$7,085	$7,326
	Retail and retic	$20,673	$20,975	$21,240	$21,482
Wastewater	Retail	$8,125	$8,590	$8,747	$8,955
	Retail and retic	$14,636	$15,101	$15,258	$15,467

6.3. Calculating the facilitation charge

6.3.1. Administrative component

The following tables set out the facilitation charges based on administrative costs for both Sydney Water and Hunter Water. We note that the ongoing charges for both Sydney Water and Hunter Water are broadly similar; however there does appear to be some differences in the once off costs. The data provided are actuals that are extrapolated over the period.

Table 46: Facilitation charges (2015-16 $)

Business	Type of cost	2017	2018	2019	2020
Sydney Water	Once off	$17,492	$17,492	$17,492	$17,492
	Ongoing	$8,423	$8,423	$8,423	$8,423
Hunter Water	Once off	$20,000	$20,000	$20,000	$20,000
	Ongoing	$5,000	$5,000	$5,000	$5,000

7. The application of an average wholesale price

7.1. The feasibility of wholesale prices

One of the requirements of this project was to assess the feasibility and accuracy of average wholesale prices. Our interpretation of feasibility relates to the degree to which wholesale prices can be determined. This is essentially a question of cost data in terms of both its availability and its adequacy (whether it's fit for purpose) and its quality (reliability). Given the time frames associated with this project, feasibility also has a timing aspect, that is, is the necessary cost data available in a format and quality in timely manner.

The quality and availability of data was discussed previously in detail in chapter 5.

7.1.1. Our proposed approach of utilising price review data

The method that we proposed for the development of average wholesale prices reflects our acknowledgement that given the available time and resources, there was a need to adopt a pragmatic approach. Accordingly our method recognised that both Sydney Water and Hunter Water have been subject to price reviews by IPART [55] [56] These price review regulatory processes occur over the period of 18 months and involve extensive consultation both with the water businesses and with other stakeholders (such as the EPA and other regulators) along with the water businesses' customers. The cost and demand forecasts proposed by the businesses are subject to extremely detailed independent review by highly qualified consultants and the results of these reviews are consulted on by IPART with all stakeholders through the draft decision process.

The cost forecast and demand forecast that results from this price review process represent the best available data. They have been subject to prudency and efficiency reviews and any resulting amendments have been iterated with the water businesses. Our approach has been designed on the premise that this data which was collected and compiled by the water businesses would be readily available (given that the price review occurred in 2016) and form a robust basis for the calculation of wholesale prices.

Our approach (based on distributed costs) essentially involved requesting both Sydney Water and Hunter Water to identify those costs underlying their revenue requirement (as per the 2016 price reviews) that can be associated with differing levels of service — retail, local reticulation and lead in mains. We believe that this is the most feasible approach as it utilises existing data and is essentially a cost allocation exercise.

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[55] IPART (2016) Review of prices for Sydney Water Corporation from 1 July 2016.

[56] IPART (2016) Review of prices for Hunter Water Corporation from 1 July 2016.

7.1.2. The feasibility of alternative sources of cost and demand data

The alternative would be to undertake a process of identifying potential wholesale customers, engagement, survey, review and iteration on new cost and demand forecasts. Given the adoption of a 'reasonably efficient competitor' cost standard, this process would ideally occur with wholesale customers and not with the water businesses. These customers are significantly different in nature from the water businesses. They are privately owned and typically not subject to economic regulation (and therefore potentially not internally resourced to effectively engage with economic regulators). The nature of data collection from a privately owned company (in a competitive market) and a public company which typically operates as a legislative monopoly is very different. We anticipate that there would be significant difficulties in obtaining cost and demand data from privately owned companies due to their natural concerns regarding commercial in confidence issues. It would also be relatively more difficult to review these data in terms of prudency and efficiency. We do not believe that the timelines associated with this project allowed for the engagement of wholesale customers in a manner which would be robust enough to satisfy the requirements of a typical economic regulatory price review process.

Another alternative, that is consistent with our proposed approach of using the water businesses data, was to source new cost and demand forecast data from Sydney Water and Hunter Water. This would have been necessary had we adopted a forward looking marginal or incremental cost based approach (such as LRMC or LRIC) for the calculation of costs in the retail-minus pricing framework. At a minimum such costs would necessitate an allocation across service levels (similar to that undertaken for our approach), and had they related to LRMC or LRIC, would have involved forecasts of up to potentially 40 years.

This new cost data would then need to be subject to a prudency and efficiency review by an independent consultant and amendments made to the data would need to be iterated with the water businesses. It is highly unlikely in undertaking this process that we would have an opportunity to also consult with other stakeholders and regulators regarding the validity of the data. Collecting, collating and accessing new data from the water businesses is relatively more complicated, resource intensive and time dependent than that of utilising the existing price review data.

Given the issues and timing risk that we experienced with our proposed relativity simple approach, it is highly unlikely that the alternative approaches would be feasible within our given timeframe.

7.2. Cost reflectivity (retail-minus)

The core undertaking of this project is the development of a schedule of average wholesale prices for Sydney Water and Hunter Water to apply across their respective areas of operation. One of the key concerns with the development of an average price (or uniform price) is the degree to which it is reflective of the costs associated with the provision of services based on a 'reasonably efficient competitor standard' and the costs associated with the provision of service at a customer level. To the extent that they differ at a customer level implies the existence of cross subsidies and can lead potentially to inefficient outcomes in customer behavior.

7.2.1. Reflective of a reasonably efficient competitor

In terms of cost reflectivity one of the principal questions is whether the average wholesale prices generated by our proposed approach are reflective of the costs associated with a reasonably efficient competitor.

This question relates to the issue of whether the costs we have used are representative of the costs associated with undertaking the activities that the reasonably efficient competitor intends to and secondly, given we are utilising Sydney Water and Hunter Water's data, whether the approach properly reflects the economies of scale adjustments necessary to reflect a reasonably efficient competitor.

In terms of the underlying base costs associated with the provision of services, it is reasonable to expect that Sydney Water's and Hunter Water's forecasts of cost are accurate representations. Both Sydney Water and Hunter Water have a long history of operating and providing the services that the wholesale customer would. Their expenditure has been subject to multiple price reviews and therefore been under independent oversight over a long period of time. It is reasonable to assume that the costs that they would incur are representative of the costs of providing a service in these areas.

Note that the one area in which there may be an issue of cost reflectivity relates to the economies of scale that Sydney Water and Hunter Water can achieve based on their size that a much smaller wholesale customer would not have the ability to exploit.

Most if not all of the available literature on scale economies in relation to retail services and operating and maintenance of local reticulation relates to large regulated utilities which are predominately publicly owned. Our working understanding of a wholesale customer throughout the course this project relates to service providers with between 700 to 10,000 connections. We were not able to identify measures of scale within the literature which could be readily related to a wholesale customer of this relatively small scale.

Ideally, the economies or diseconomies of scale associated with the 'reasonably efficient competitor' cost standard would be determined through an iterative consultation with wholesale service customers. Our ability to undertake such a process was constrained by the timelines associated with this project. We recommend that if IPART adopts an average based approach to wholesale pricing it should consider undertaking such a study. Ideally the study would occur once a number of wholesale customers are operating in the market, allowing IPART to identify economies of scale and scope using actual observable cost data rather than forecasts.

We have proposed a proxy based approach and adopted a proxy based on the efficiency assumptions typically applied by regulators to water utilities (see chapter 4 for a more detailed discussion). We acknowledge that this proxy is not a technically precise measure of scale economies but have adopted the proxy on the basis that it was readily available, related to productivity, and (because it is considered in the price reviews) have been subject to a high degree of scrutiny.

Sydney Water has suggested that we consider the retail costs per customer as outlined in a recent Water Services Association of Australia (WSAA) study. The WSAA study suggests scale impacts of approximately 24%. However, we are concerned that the WSAA study is based on the difference between utilities that are much larger (with customers <100,000 and utilities with customers >500,000) than what would be considered a typical wholesale customer (between 700 to 10,000 connections). Economic theory suggests that economies of scale are typically non-linear in nature and increase at a decreasing rate. We are therefore concerned that adoption of the WSAA numbers means a new entrant ranging between 700 to 10,000 connections would potentially be subject to scale adjustments much greater than 30%.

This could place unnecessary pressure on the ability of Sydney Water and Hunter Water to recover the costs associated with the provision of wholesale service and may conflict with the overarching objectives of not systemically providing for inefficient competitors. We recommend that the proxies we have suggested be adopted on the basis that, in the absence of better information, they would constitute a more precautionary approach.

7.2.2. Accounting for level of service

One of the distinguishing aspects of wholesale service provision for Sydney Water and Hunter Water is that it relates to wholesale customers who may be doing more than simply retailing services by on-selling potable water or sewerage services. These customers may potentially operate and maintain their own local reticulation services (water, recycled water, and/or wastewater) and in some cases operate and maintain water or sewerage mains (lead in services).

It is important that the wholesale price reflects the level of service associated with the wholesale services being provided. The approach that we have developed does this by default as it is based on the allocation of costs to clearly defined levels of service.

Given the data that was available we were able to generate costs for retail services and local reticulation services. Sydney Water and Hunter Water were unable to separately identify lead-in mains expenditure from trunk-mains expenditure.

7.2.3. Accounting for geospatial based cost differences

Geographical location affects cost estimations in a number of ways. One of the major costs associated with network infrastructure for water and wastewater is the digging of trenches for the laying of local reticulation and trunk and lead in mains. These costs can potentially vary greatly depending on the soil types, the general geography of different areas, or on the state and capacity of existing assets.

Sydney Water and Hunter Water were unable to provide cost data that illustrated geospatial cost differences. In the absence of such information it is difficult to ascertain the degree to which an average price will be reflective of location specific costs. This is true whether the price is based on a minus percentage (as proposed) or a single unit measure such as average km of reticulation per retail connection or alternatively a simple per retail connection basis.

While we do not have access to geospatial cost data, we can make observations regarding the costs associated with service provision and the likelihood that they will vary based on their geography.

Retail costs are not expected to vary based on geography. These costs relate to customer facing activities and including billing and customer management which should not be responsive to changes in geography. It is reasonable to expect that other retail costs such as those related to the operating and maintenance of meters would also not be responsive to geography (excluding the issue of density which is discussed in the following section).

Reticulation costs associated with the renewal or replacement of infrastructure would be expected to vary based on location. Primarily due to the reasonable expectation, that the costs associated with laying reticulation will differ based on soil type (sandy soils, clay soils and rock). Under an average based approach this issue would be best dealt with by identifying the regions where geography has a material impact on cost and developing a schedule of average prices that takes into account the regional differences in cost. We note that we were not able to obtain data identifying geographical cost drivers.

7.2.4. Accounting for the scale of a wholesale customer's scheme

Under our proposed approach the scale of a wholesale customer's scheme is accounted for in two ways. The first is by the application of the minus to the fixed charges. Under our approach the fixed charge that the wholesale customer faces is an aggregation of the relevant fixed charge (be it residential or non-residential by meter size) adjusted for the minus by the number of connections of that nature that the wholesale customer will be providing a service to. For example, if a wholesale customer is providing retail and reticulation services to 10,000 residential water users, the fixed wholesale charge will be the residential fixed retail charge less the minus by the number of connections being served (in this case 10,000). The greater the scale of the scheme being serviced by the wholesale customer, the greater the fixed charge they will face.

The second way in which scale is addressed is through the volumetric charge. The greater the number of connections being serviced by the wholesale customer the greater the volumetric charge the wholesale customer will face. The way in which the approach accounts for scale is illustrated in the tables below. The first two tables show the difference between retail revenue and wholesale revenue for a small scale scheme. The subsequent tables show the difference between retail revenue and wholesale revenue for a relatively large scale scheme. The retail price and wholesale prices are constant over both schemes as are the per connection demand profiles.

Table 47: Retail revenue from a small scale scheme

Tariff	Meter size	Connections	Vol per connection	Total vol	Retail Price (per connection) (per volume)	Revenue
Fixed	20	100	100	10,000	100	$10,000
Fixed	50	2	7,000	14,000	625	$1,250
Fixed	100	2	40,000	80,000	2,500.00	$5,000
Fixed	200	2	200,000	400,000	10,000.00	$20,000
Variable				504,000	2	$1,008,000
Total revenue						$1,044,250

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Table 48: Wholesale revenue from a small scale scheme (2% minus)

Tariff	Meter size	Connections	Vol per connection	Total vol	Wholesale Price (per connection) (per volume)	Revenue
Fixed	20	100	100	10,000	98	$9,800
Fixed	50	2	7,000	14,000	612.5	$1,225
Fixed	100	2	40,000	80,000	2,450.00	$4,900
Fixed	200	2	200,000	400,000	9,800.00	$19,600
Variable				504,000	1.96	$987,840
Total revenue						$1,023,365

Table 49: Retail revenue from a large scale scheme

Tariff	Meter size	Connections	Vol per connection	Total vol	Retail Price (per connection) (per volume)	Revenue
Fixed	20	100	100	1,000,000	100	1,000,000
Fixed	50	2	7,000	140,000	625	12,500
Fixed	100	2	40,000	400,000	2,500.00	25,000
Fixed	200	2	200,000	400,000	10,000.00	20,000
Variable				1,940,000	2	3,880,000
Total revenue						4,937,500

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Table 50: Wholesale revenue from a large scale scheme (2% minus)

Tariff	Meter size	Connections	Vol per connection	Total vol	Wholesale Price (per connection) (per volume)	Revenue
Fixed	20	100	100	1,000,000	98	980,000
Fixed	50	2	7,000	140,000	612.5	12,250
Fixed	100	2	40,000	400,000	2,450.00	24,500
Fixed	200	2	200,000	400,000	9,800.00	19,600
Variable				1,940,000	1.96	3,802,400
Total revenue						4,838,750

While individual consumers in both the small are large scale schemes are treated in a constant manner (for example a 20 mm fixed charge customer consuming 100 kl of water will generate the same level of retail revenue and wholesale revenue regardless of scale), the revenue generated by the scheme in aggregate will adjust proportionally to any change in its scale. The difference in the retail and wholesale revenue earned by each scheme is consistent with the 2% minus applied to the wholesale price.

If IPART determines to focus the minus on the fixed charge component, it would still be possible for the schemes to deliver a constant 2% decline in revenue but the minus applied to fixed retail prices would need to be adjusted to account for the constant volumetric price.

7.2.5. Accounting for the density of a wholesale customer's scheme

One issue that has been raised over the course of the project is how an average based wholesale price can account for variation in the density of a wholesale customer's scheme. The issue of density relates primarily to the costs associated with operation and maintenance of reticulation networks. While pure retail services such as billing and customer management will vary based on the scale of a scheme they are not expected to vary based on the density of a scheme. The density of a scheme can be measured by the average length of reticulation network per customer relative to the average length of reticulation network per customer in other schemes. The greater the relative length of reticulation network per customer the less dense the scheme.

The length of reticulation network per customer is directly related to the lot sizes. Changes in lot size occur both over time (see table 52) and potentially between schemes. We note that there has been a concerted effort by the NSW government and councils to require new developments to increase the potential mix of housing solutions by allowing for a greater degree of variation in lot size within schemes. From a pricing perspective, this trend will decrease the cost reflectivity of an average based wholesale price, especially where there are compositional differences between developments in terms of high, medium and low density lot sizes.

Table 51: Median lot sizes Sydney

Year	Lots released	Median lot size M^2
2010	3,526	524
2011	3,890	498
2012	4,640	508
2013	6,690	509
2014	8,565	456
2015	8,174	454

Source: Urban Development Institute of Australia, National Land Supply Study 2016.

The more diverse the composition of individual schemes the less cost reflective average prices will be. The degree to which average prices vary from costs based on density would require data to be collected on a scheme basis across a representative sample of scheme for both Sydney Water and Hunter Water, this exercise would include additional consultation with Sydney Water

and Hunter Water as well as consultation with the relevant council planning departments and the NSW Department of Planning and Environment and was not possible within the scope of this project.

An average based approach to pricing may not be the most appropriate pricing response to issues of density. The most appropriate way to deal with variations in scheme density and variations in composition of lot sizes within schemes may be to adopt a scheme specific approach to wholesale prices.

7.2.6. Accounting for the user composition of a wholesale customer's scheme

Another aspect of cost recovery is accounting for differences in the composition of users within a wholesale customer's scheme. The issue of end user composition may not be material where wholesale customers are servicing predominately residential customers or a mix of residential and small non-residential customers as these customers typically face the same fixed and volumetric charges.

User composition may become an issue when wholesale customers provide services to a mix of non-residential customers. The tariff schedules for retail prices for non-residential customers are differentiated based on meter size for both Sydney Water and Hunter Water. We assume that the rationale for IPART approving meter based fixed charges for non-residential customers is in recognition of variation in the costs associated with servicing non-residential customers of different sizes.

While we do not have sufficient data to measure such cost differences we do think it is reasonable to assume that non-residential water users with large meters are typically large water users and would require or impose different costs on the local reticulation network in order for the network to have the capacity to ensure supply for high volume users. For example, it is reasonable to expect that a non-residential user with a 200mm meter would require larger local reticulation works than a residential customer or small non-residential customer with a 20mm meter. The need to dig deeper and wider trenches to lay larger pipe will have an impact on the costs associated with local reticulation. These cost differences would be applicable to renewal and replacement expenditure.

The application of a minus based on percentage preserves the current relativities imbedded in the retail price in terms of non-residential fixed charges and would be more cost reflective than applying a flat rate per connection.[57]

[57] We note that Sydney Water proposed a minus based on a unit cost approach.

7.2.7. Accounting for potential differences between greenfield and infill schemes

Wholesale customers may potentially establish themselves in existing networks (depending on the ability of Sydney Water and Hunter Water to transfer assets), new infill developments or new greenfield development. Accounting for potential differences in the costs associated with providing services to greenfield and infill is an issue that has been raised over the course of this project. The primary difference between infill and greenfield developments is the comparative density. Infill schemes are typically characterised as being of a much higher density than greenfield developments.

An example situation would be how cost reflective are average prices when an infill development such as an apartment block or high-rise residential building may have a very small reticulation network (in some case comprising one or two meters of 100 mm pipe) with costs which are not comparable to a greenfield development that may be servicing 1000 lots of an average size of 450 m^2. In such instances we would suggest that the small pipe represents a connection and not a reticulation network. We would recommend that in such instances the wholesale customer servicing the infill development face a wholesale price that only reflects the costs associated with retail services, whereas the wholesale customer servicing the greenfield development should face a wholesale price that references both retail and local reticulation costs.

One way in which IPART may address this issue is to define a minimum size for a reticulation network. This minimum size would be identified through consultation with Sydney Water and Hunter Water. Works that are defined as less than what the businesses consider to be the minimum likely size of a greenfield development could be categorised as connection infrastructure.

As with any categorisation of service there are individual examples that may not be readily or easily categorised. In such cases regulatory discretion may be required to determine the appropriate price. The guiding principle should be what function Sydney Water or Hunter Water would have undertaken had the wholesale service customer not provided services. For example, the internal central plumbing of high-rise buildings is typically maintained and operated by the buildings' body corporates. These internal network systems should not be consider analogous to a localised reticulation system even though in principle they are undertaking the same function. They do not represent costs that Sydney Water or Hunter Water would have ordinarily incurred in the absence of a wholesale customer.

7.1. Feasibility and cost reflectivity (facilitation charges)

7.1.1. Feasibility of facilitation charges

Both Sydney Water and Hunter Water were able to provide aggregate cost data in relation to the administration and management of wholesale customers and wholesale contracts.

Sydney Water was not able to provide the data necessary to calculate average bring forward or deferral charges as outlined in chapter 4. The Growth Servicing Plan does not contain details relating to specific development areas.

We are conscious that the approach developed in chapter 4 to calculate average infrastructure planning facilitation charges requires the development of an ongoing live planning framework. Given Sydney Water's response to our information request and the reasonable expectation that implementing an average based approach for infrastructure planning would require ongoing resource intensive data commitments we do not consider it feasible to include infrastructure charge based facilitation charges as part of the average wholesale charge framework.

7.1.2. Administrative component of the facilitation charge

Sydney Water and Hunter Water provided cost data relating to the administration of wholesale contracts. Sydney Water provided costs for both legal and ongoing administration. Hunter Water provided legal, labour and ongoing administration. These costs are broadly similar across both businesses.

The data presented by Sydney Water and Hunter Water is based on current actual costs. While we would expect these costs to decrease overtime as both Sydney Water and Hunter Water establish default contracts or alternatively adopt a wholesale pricing schedule, we have no evidence on which to adjust these costs for the purposes of the facilitation charges outlined in this report. We expect that overtime as more wholesale customers enter the market both Sydney Water and Hunter Water will be able to generate more sophisticated forecasts of these costs.

Report qualifications/assumptions and limiting conditions

This report is for the NERA Economic Consulting and SIPA client named herein.

Information furnished by others, upon which all or portions of this report are based, is believed to be reliable but has not been independently verified, unless otherwise expressly indicated. Public information and industry and statistical data are from sources we deem to be reliable; however, we make no representation as to the accuracy or completeness of such information. The findings contained in this report may contain predictions based on current data and historical trends. Any such predictions are subject to inherent risks and uncertainties. NERA Economic Consulting and SIPA accept no responsibility for actual results or future events.

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

All decisions in connection with the implementation or use of advice or recommendations contained in this report are the sole responsibility of the client. This report does not represent investment advice nor does it provide an opinion regarding the fairness of any transaction to any and all parties.

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