Detailed paper H – Licences and volumes

Submission to IPART for prices from 1 July 2021 for water management services provided by the Department of Planning Industry and Environment-Water and the Natural Resources Access Regulator on behalf of the Water Administration Ministerial Corporation

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Detailed paper H – Licences and volumes

This Detailed Paper provides the detail of our proposed licence and volume forecasts that we have used in our water management activity tariff modelling for the 2021 regulatory period.

The water management activity tariff structure is made up of three components:

- Entitlement charge – an annual charge that applies to the share component specified on each water access licence.
- Water take charge (formerly usage charge) – a charge that applies to the quantity of water recorded as taken for a water licence in the billing period.
- Minimum annual charge – an annual charge that applies to a licence if the sum of the entitlement charge and water take charge for a water licence is less than the value of the minimum annual charge.

There are currently two tariff categories for licences:

- Entitlement charge licences – licences subject to a (fixed) annual entitlement charge, based on the share component for the licence.
- Water take charge only licences – licences subject only to the water take charge, based on the volume of measured water taken against the licence.

Entitlement licences are subject to a two-part tariff (entitlement charge and water take charge) if the water take is measured. Otherwise, for unregulated river and groundwater sources, a one-part tariff (entitlement charge) applies.

Until December 2023, halfway through the 2021 regulatory period, we will be rolling out the Government's metering policy, which will result in a large number of unregulated river and groundwater licensees moving from a one-part to a two-part tariff. To assist with accurate volume forecasting we engaged a consultant (the CIE) to estimate the rate of transfer and metered water take volumes. Our consultant's report is included in this Detailed Paper[1].

This Determination period also sees the introduction of floodplain harvesting licences, as anticipated in the 2016 Determination. For the 2021 regulatory period the introduction of these licences is more imminent and we have incorporated forecasts of floodplain harvesting water take throughout the period. This is discussed further below.

Floodplain Harvesting

Floodplain harvesting is the capture and use of water flowing across a floodplain. Floodplain harvesting works are generally works built:

- specifically to facilitate floodplain harvesting, including pumps, structures or other works that divert water into or from storages, supply channels, depressions or otherwise impound flows
- for multiple purposes that have the effect of facilitating floodplain harvesting, such as:
    - levees, conveying works and off-river storages constructed in billabongs or depressions
    - below ground-level channels from which the water is delivered into storages
    - works that collect rainfall runoff and which deliver that water into storage.

[1] the CIE, Forecasting water take, Prepared for Department of Industry – Water, 12 June 2020

The NSW Floodplain Harvesting Policy (the Policy), first published in 2013 and amended in 2018, is now being implemented across the designated floodplains in the Barwon Darling, Border Rivers, Gwydir, Macquarie and Namoi valleys. The policy sets out who is eligible for a floodplain harvesting licence and the process for getting one.

The Floodplain Harvesting Action Plan[2] was published in September 2019 and sets out a timeline for implementing a robust floodplain harvesting framework.

By 2021, we expect the licensing framework for floodplain harvesting to be operational in all water sharing plans. This includes having water sharing rules in place for floodplain harvesting.

NSW water sharing plans set out water sharing rules within the state. This includes limits on the volume of water that can be harvested from floodplains. These limits are set to keep floodplain harvesting levels at or below the long-term volume that was capable of being taken in the 1993–94 water year[3].

While the limits exist, to date the floodplain harvesting water take has not been regulated or measured. As we implement the NSW Floodplain Harvesting Policy, licences will define the volume of water users can continue to legally harvest from floodplains.

Bringing floodplain harvesting into the water licensing system will ensure the volume of water harvested stays within NSW water sharing plan limits.

We are using multiple sources of information to determine the amount of water that has been taken historically by floodplain harvesting and how much is being taken now.

Information sources include farm surveys, on-ground mapping of all floodplain harvesting works, satellite imagery and remote sensing. We are also using flood models that have been built to help with rural floodplain management planning.

We are using the best available information to determine appropriate licensing volumes for floodplain harvesting.

Work is continuing to issue floodplain harvesting licences and amend water sharing and water resource plans. Throughout the rest of 2020 and early 2021 we will release draft entitlements to individuals for comment and in 2021 finalise licences and amend water sharing and water resource plans for re-accreditation.

For the purposes of this pricing submission we have used the best available estimates of licence numbers and water take forecasts and can provide IPART with actual figures throughout the review period.

Floodplain harvesting water take forecasts

We are currently working towards creating floodplain harvesting licences in the following valleys:

- Barwon Darling
- Border
- Gwydir
- Macquarie, and

[2] Floodplain Harvesting Action Plan, https://www.industry.nsw.gov.au/__data/assets/pdf_file/0015/272301/floodplain-harvesting-action-plan.pdf

[3] Floodplain Harvesting Action Plan, https://www.industry.nsw.gov.au/__data/assets/pdf_file/0015/272301/floodplain-harvesting-action-plan.pdf, p 5

- Namoi.

As identified in our submission to IPART's last price review, the cost of developing and implementing the floodplain harvesting framework has been funded by the Commonwealth Government. The activities relating to administering floodplain harvesting licences are incremental to the activities undertaken for other licence administration and are strongly correlated to the level of water take. Therefore, we propose the approach taken by IPART at the 2016 Determination that the floodplain harvesting licences are charged as water take only licences.

We have maintained our approach to the 2016 regulatory period and, for applicable valleys, floodplain harvesting management costs and water take and entitlement has been added to regulated rivers, except for the Far West, where water take and entitlement estimates are added as unregulated. This reflects the type of water source from which the floodplain waters are harvested. For the 2021 regulatory period, we anticipate most floodplain harvesting licences to occur in regulated water sources, except the Barwon Darling, which is an unregulated water source.

Water take forecasts

For the calculation of water take forecasts we estimate that entitlement volumes are issued at the level of the long term average diversion limits, as specified in the water sharing plans. It is likely that actual entitlement values will be greater than this and more accurate values will be provided through the review period.

Water take forecasts have been incorporated in our modelling at the level of the long term average diversion limits, as specified in the water sharing plans.

Consultant report

the CIE, Forecasting water take, Prepared for Department of Industry – Water

INDEPENDENT
QUANTITATIVE
EVIDENCE-BASED

NOTE

Forecasting water take

Prepared for
Department of Industry - Water

12 June 2020

1 Introduction

The CIE is assisting DoI Water in preparing forecasts of water take[1] from rural water sources for the purpose of a Price Submission to the Independent Pricing and Regulatory Tribunal (IPART). The purpose of the forecasts is to provide a robust set of inputs to support tariff modelling for the Price Submission. This means that the split of entitlement between two-part and one-part tariffs, and the split across charge areas is generally required. Usage by one-part tariff customers has not been estimated, since no data is available to indicate their usage and one-part tariff usage is not required for tariff modelling.

Methodologies to forecast water take are limited by data availability. Water take data is most complete for regulated water sources, then somewhat less complete for groundwater sources and even less complete for unregulated water sources.

The objective of this note is to describe the data sources available and the methodologies followed to produce water take forecasts. This is intended to enable replication and updating of this approach for the purpose of tariff modelling in the future.

This note can be interpreted in conjunction with the forecasting spreadsheets, namely:

- CIE Reg forecasts 12062020.xlsx
- CIE Unreg forecasts 09062020.xlsx
- CIE GW forecasts 10062020.xlsx

1 Water take is also referred to as water usage. The two terms are used interchangeably in this document.

2 Regulated water source usage

We project take/usage of regulated water sources by assuming that take in future years will be equal to the long-run average of water take over all years of available data. This approach is consistent with the forecasting approach used for the previous Determination. Forecasts were based on a dataset supplied by WaterNSW of historical usage by year and water source. This includes usage within NSW where the water is sourced from interstate trade, which is separately identified in the dataset. The time series of usage data covers 1996-97 to 2018-19.

Forecasts of usage

For regulated rivers, we forecast total usage to be equal to 4.165 million ML from 2020/21 onwards.[2] Water take data is available up to 2018/19. We forecast usage to be equal to the 20-year average level of water take for each valley. There are two exceptions to this approach:

- Lowbidgee usage, which is projected to be equal to zero on the basis that it has been 0 for a number of preceding years.
- Water take data is only available from 2004/05 onwards for the North Coast and South Coast valleys. We forecast usage of these valleys using a 15-year average (all years of available data).

For years prior to 2004/05 for the North Coast and South Coast, there was no usage data, and these years are excluded from the average for these valleys. We project that usage in each forecast year of the determination period will remain constant at this long-run average level, given that the level of entitlements is forecast to remain constant over this period.

2 An estimate for 2019/20 usage based on usage for the year-to-date and other information has been supplied by WaterNSW to DPIE. This estimate of 2019/20 usage is not included in the period over which the 20-year average is calculated.

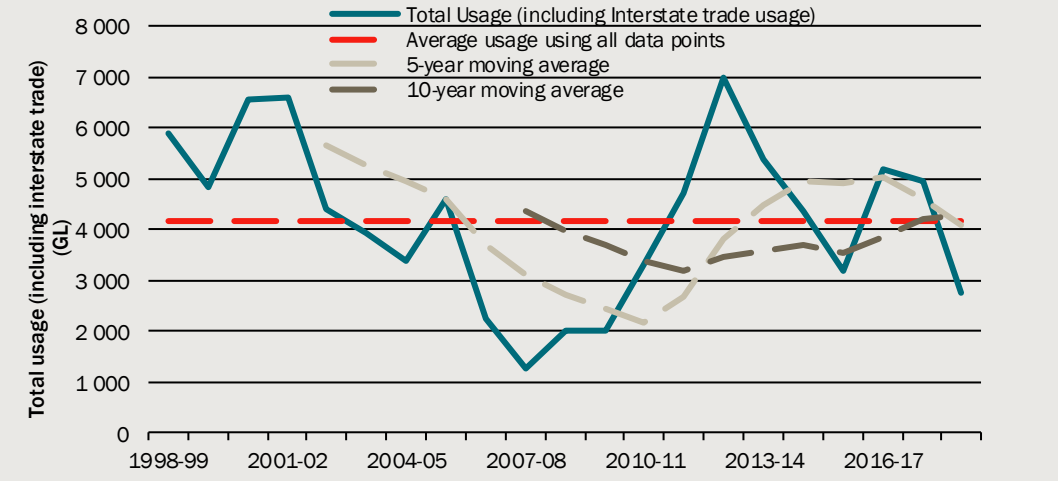
2.1 Forecast regulated usage by charge valley

Charge valley	Long-run average and forecast usage from 2019/20 onwards
	ML
Border	147 948
Gwydir	239 365
Namoi	149 925
Peel	12 686
Lachlan	191 214
Macquarie	249 042
Murray	1 419 325
Murrumbidgee	1 593 152
Lowbidgee	36 530
North Coast	574
Hunter	121 447
South Coast	3 946
Total	**4 165 155**

Source: CIE.

To illustrate, chart 2.2 shows historical usage from regulated water sources (the teal line) and the average level of usage over all available years of data (the red line). It compares this long-run average to 5-year and 10-year moving averages of take (the grey lines). All three averages are similar in 2018/19, suggesting little impact on the forecasts from choosing a shorter period.

2.2 Regulated usage over time and the long-run average



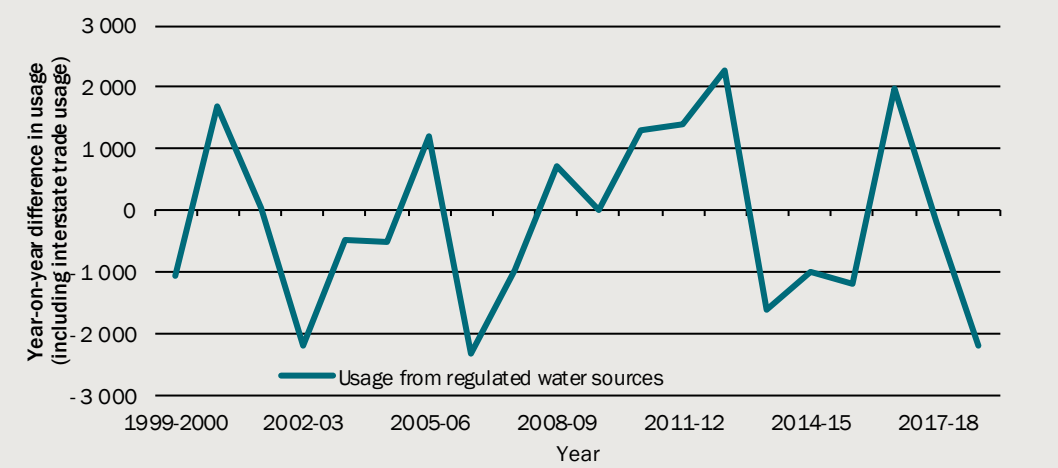
Note: The average usage shown in this chart is calculated based on total take across all valleys with water take data. For the period prior to 2004/05 this excludes North Coast and South Coast. Therefore, water take before 2004/05 is slightly understated because these valleys are not included in the total. For this reason, the average water take in this chart differs from our forecast of total water take, which is the sum of 20-year average for each valley and 14-year averages for South Coast and North Coast usage.

Data source: CIE.

A shorter-period moving average would be more appropriate if fluctuations were strongly correlated between years. If this were the case, we would expect that usage over the

forecast period is more likely to resemble recent years than earlier years. However, fluctuations do not appear to be strongly correlated to changes in previous years (chart 2.3). Usage is highly volatile, and there is little clear pattern in year-on-year changes. This supports using a long-run average to mitigate the effect of random variation in recent years on our forecasts.

2.3 Year-on-year change in usage from regulated water sources

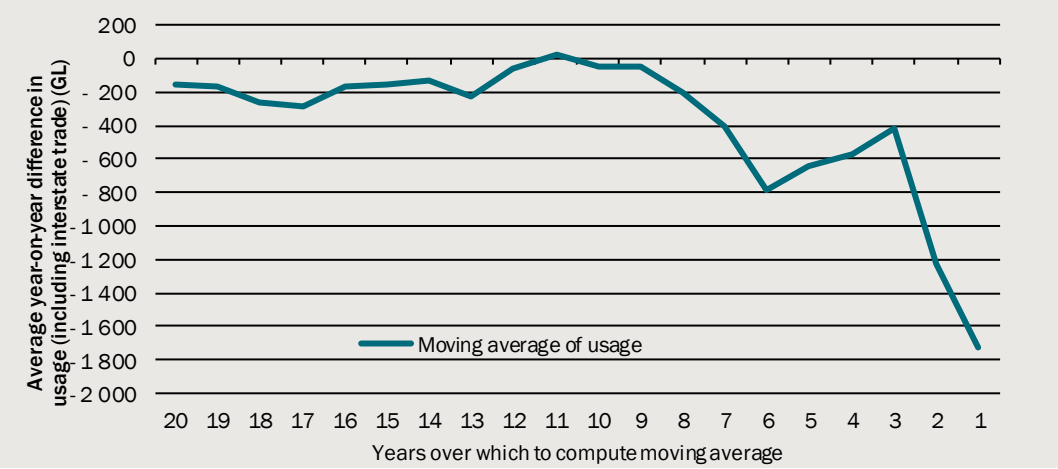


Data source: CIE.

The trend in water take over a period of time can be measured in terms of the average annual change in take. Between 1999/2000 and 2018/19, the water take from regulated water sources fell by an average of 156 608ML per year. We have not forecast a falling level of total water take, instead remaining consistent with the approach of a moving average from the previous Determination. This is because:

- water take in recent years has been below the long-run average, which drives a large portion of the declining trend. For example, the average decline between 1998/99 and 2017/18 was 82 789ML per year.
- The trend decline is volatile over time. As shown in chart 2.4, using a different averaging period results in significantly different estimates of the decline.

2.4 Average year-on-year change depending on averaging period



Note: The one-year average shown for the most recent year corresponds to the decline in 2017/18 of 1732GL.

Data source: CIE.

Sustainable Diversion Limits

Sustainable Diversion Limits (SDLs) are limits on how much surface water, on average, can be used in the Murray-Darling Basin for consumption. These limits aim at reserving an amount of surface water to be recovered and used to achieve environmental outcomes.[3] The Murray-Darling Basin Plan allows for SDLs to be adjusted through the SDL Adjustment Mechanism. This adjustment can be achieved through either supply or efficiency measures:

- Supply measures are projects that allow equivalent environmental outcomes to be achieved with less water. These measures reduce the amount of water that needs to be recovered from consumptive use to meet the SDL.
- Efficiency measures are projects that recover more water from the environment through improving the efficiency of irrigation or water delivery. Water savings associated with these efficiency improvements can be made available for environmental use.

In order to achieve the SDLs, the Commonwealth Environmental Water Holder (CEWH) has purchased entitlements (currently being used for irrigation purposes), so that the licence can instead be used for environmental purposes. The licences purchased by the CEWH remain billable licences. Accordingly, buyback of surface water licences is a reallocation of billable entitlement between different licence holders, rather than a change in billable entitlement.

A change in usage may be expected if the utilisation rate of customers with consumptive uses of water (e.g. irrigation) are different from the utilisation rate of the CEWH. Usage by the CEWH consists for delivering water to rivers, wetlands and floodplains of the Murray-Darling Basin.

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3 This explanation is largely derived from: https://www.mdba.gov.au/basin-plan-roll-out/sustainable-diversion-limits

No adjustment has been made to the forecasts to account for reallocation of licences between consumptive and environmental uses. The usage patterns of environmental uses will be reflected in historical usage data for these licences.

Adjustment to the forecasts could be made for anticipated supply or efficiency measures over the forecast period. Estimates of the impact of these measures on water take are not currently available.

3 Unregulated water source usage

Forecasting usage of unregulated water sources is associated with more uncertainty than forecasting usage for regulated or groundwater sources. This is because data on usage of unregulated sources is more sparse than other sources. For the previous Determination, a more involved approach was required to:

- combine various datasets with usage/entitlement data, and
- extrapolate utilisation rates for charge valleys where no data was available.

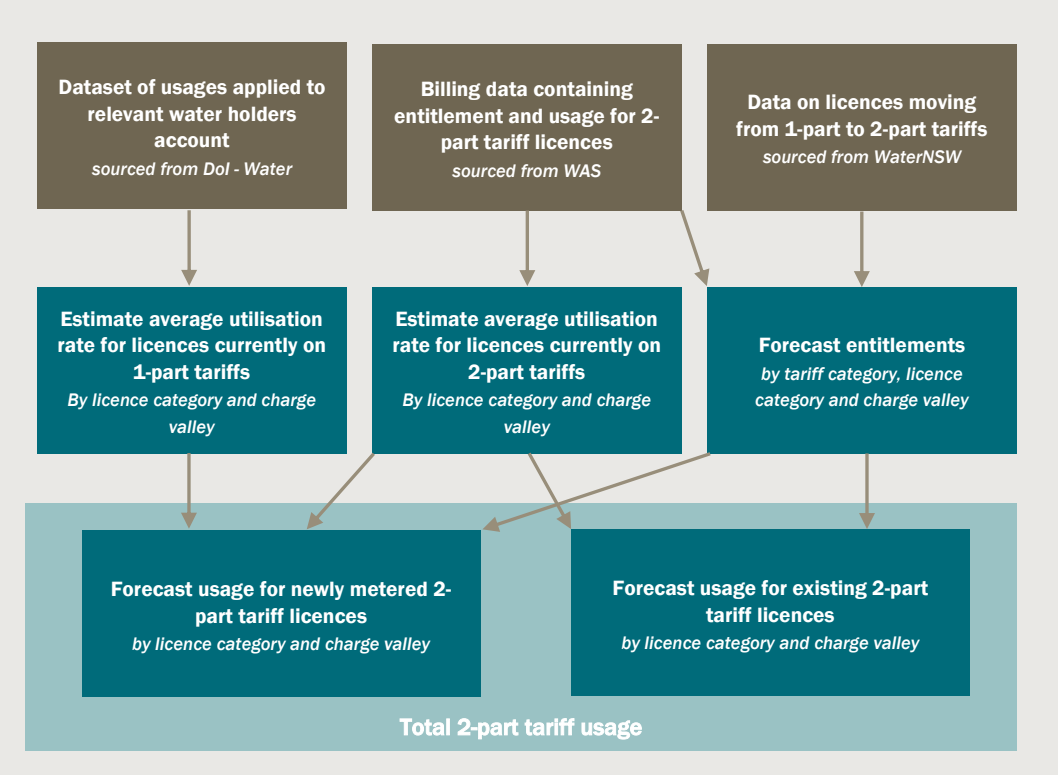
However, significantly more complete unregulated usage data is now available, and it is now stored in the Water Accounting System (WAS). This simplifies the process of obtaining data inputs and reduces the need for extrapolation of limited data to a wide range of water sources.

Our methodology for estimating two-part tariff usage is summarised in chart 3.1. Usage and entitlement by major utilities are not included in this approach, because we simply adopt forecasts of usage supplied by each utility.[4] Each step of estimating average utilisation rates, projecting entitlement and forecasting usage is separately performed for each licence category and charge valley.

Note that the 'dataset of usages applied to relevant water holders account' is a separate dataset from the billing dataset output by the Water Accounting System (WAS). It includes usage observations for metered customers, whether they are on a one-part or a two-part tariff. Therefore, it provides an indication of how one-part tariff and two-part tariff licences compare in terms of their utilisation rates.

4 Forecasts of WaterNSW usage supplied by Stevan Munic (WaterNSW) on 28 February 2019, in spreadsheet titled 'Unregulated water take forecast.xlsx'. Forecasts of Hunter Water usage supplied by Brett Janissen (Hunter Water Corporation) on 26 March 2019, in spreadsheet titled 'Hunter water extraction forecasts_CIE.xlsx'.

3.1 Approach to forecasting unregulated 2-part tariff usage excluding major utilities



Note: Brown boxes indicate inputs and data sources, while blue boxes are processes/steps of the methodology.

Data source: CIE.

As noted in the table, the two data sources required for this methodology are

- entitlement and usage data (by tariff category, licence category and charge valley) and
- data to inform projections of 1-part and 2-part licence entitlement under the metering program.

This approach is broadly similar to the approach taken to forecasting for the previous Determination. Unregulated rivers accounted for around 33 per cent of target revenue over 2016/17 – 2019/20 in IPART's 2015/16 Determination.[5]

Estimating average utilisation rates

Utilisation rates are estimated based on usage and entitlement data for existing two-part tariff customers. For newly metered two-part tariff licences, usage data is not available since these customers are unmetered. Thus, we use an assumption to estimate their utilisation rate based on the utilisation rate for existing two-part tariff licences.

5 IPART, 2016, *Review of prices for the Water Administration Ministerial Corporation*, Table 10.16 at p.135.

Existing two-part tariff licences

We calculate utilisation rates for existing two-part tariff licences as follows:[6]

$$U_{vcy} = \frac{T_{vcy}}{E_{vcy}}$$

where

- U_{vcy} is the utilisation rate for a valley v, licence category c and year y
- T_{vcy} is water take in megalitres (ML), and
- E_{vcy} is the volume of entitlement in ML.

The two licence categories we define for the purpose of this methodology are:

- local water utilities including town water supplies
- other unregulated water source licences such as domestic and stock licences

These categories have significantly different utilisation rates, which justifies modelling their usage separately. Further disaggregation would reduce the simplicity of the modelling and increase risks of data quality.

After estimating utilisation rates for each year, as per above, we then take the average for each valley and licence category across all years of available data for that valley and licence category. This is estimated according to the following equation:

$$\overline{U_{vc}} = \frac{\sum_Y U_{vcy}}{Y}$$

This average is calculated across each year for which we have robust historical data for unregulated licence usage. This period (Y in the equation above) covers the years between 2014/15 and 2018/19.

Average utilisation rates for each valley and licence category are presented in table 3.2.

3.2 Average utilisation rates for existing two-part tariff licences

Charge valley	Local water utilities and town water supplies	Other unregulated including domestic and stock
	Per cent	Per cent
Border	32.1	35.2
Gwydir	25.0	7.5
Namoi	33.1	8.9
Peel	57.9	14.1
Lachlan	36.7	13.0

6 No separate adjustment needs to be made for inactive licences, since this calculation approach will account for licences with zero usage. For example, if all licences for a water source type in a particular valley had usage of zero (i.e. were all inactive), the estimated utilisation rate would be zero. A projection of usage based on these utilisation rates will implicitly assume that the same proportion of licences remain inactive for a particular licence category, charge valley and tariff type.

Charge valley	Local water utilities and town water supplies	Other unregulated including domestic and stock
	Per cent	Per cent
Macquarie	39.5	32.5
Far West	42.6	58.2
Murray	49.2	15.1
Murrumbidgee	52.3	21.5
North Coast	43.1	17.8
Hunter	26.5	16.8
South Coast	54.8	16.9
All valleys	**37.7**	**35.8**

Source: CIE.

Data limitations

Our methodology described above requires entitlement and usage data for licences on a two-part tariff.

However, data for two-part tariff licences is available in different formats depending on the financial year of interest:

- 2016/17, 2017/18 and 2018/19: data exports from WAS include usage and entitlement for each licence on a two-part tariff. We aggregate this licence-level data to totals by licence category (as defined above) and charge valley.[7]
- 2014/15 and 2015/16: data exports from the Water Billing System (WBS) include entitlement and usage for two-part tariff licences that did not pay the Minimum Annual Charge (MAC). For customers paying the MAC, entitlement and usage data is not available. WaterNSW have added entitlement data for the majority of licences paying the MAC by merging data from their 2016/17 billing reconciliation reports. Further, WaterNSW state that all other entitlement volumes have been applied based on the WAS report for that year and some of the Water Act licences from the 2016/17 billing reconciliation report. The CIE have aggregated this licence-level data to totals by licence category and charge valley.
- 2013/14 and previous years: no data has been obtained from these years, given that multiple datasets would have to be combined. This was an involved process for the previous determination, and significant data gaps remained, particularly for certain valleys. We believe that given a significantly lower share of licences were metered in 2013/14, it is best to use utilisation rates from 2014/15 onwards as the basis for forecasts, since less extrapolation across valleys is required. The share of licences that were on two-part tariffs in 2017/18 is shown in table 3.3, and these shares are understood to be significantly higher than those at 2013/14.[8]

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7 Note that licence category information isn't available for 2018/19. We draw the licence category for each licence from 2017/18 and merge this with the 2018/19 entitlement and usage data to calculate entitlement and usage by licence category.

8 Potential reasons for the significant increase in licences on two-part tariffs may be that more customers have been metered, that data was missing in the datasets used for the previous

3.3 Share of unregulated water source licences that were on two-part tariffs in 2018/19

Charge valley	Local water utilities and town water supply	Other unregulated (exc. major utilities)
	Per cent	Per cent
Border	4.5	39.1
Gwydir	0.0	35.6
Namoi	0.0	14.6
Peel	0.0	18.8
Lachlan	53.1	12.0
Macquarie	82.7	17.1
Far West	85.7	61.6
Murray	9.2	59.6
Murrumbidgee	49.2	28.9
North Coast	75.0	21.5
Hunter	99.9	12.7
South Coast	97.3	44.8

Source: CIE.

The billing datasets contain a significant number of cells with missing licence category, water source or tariff category observations. These are generally straightforward to fill in from observations from other years. For example, where the water source is missing from 2015/16, we have identified the water source based on the water source indicated in the 2017/18 dataset for that licence number.

However, given that tariff category can change over time, we have to infer tariff category based on whether the licence has non-zero usage. If non-zero usage is recorded for a particular billing year, then we assume it is a two-part tariff licence. If zero usage is recorded for a year, and the tariff category is missing, we assume it is a one-part tariff licence.

Further, where the entitlement of a licence is zero but there is non-zero usage recorded for that year, we have excluded the observation. For example, a particular licence in the Border region has 283.4 ML usage in 2014/15, but is recorded as having zero entitlement in all years from 2014/15 to 2018/19. Therefore, we have excluded this observation as it would otherwise imply an infinite utilisation rate for this licence.

Newly metered licences moving from a one-part to a two-part tariff

Usage of one-part tariff customers has not been forecast, because this forecast is not needed for tariff modelling. Tariff modelling only requires a forecast of usage that is billed, since unbilled usage (e.g. one-part tariff usage) does not affect revenue.

determination, or that the current datasets have erroneous data for these two-part tariff licences. We believe the WAS exports are a reasonable source of truth for the usage and entitlements of two-part tariff customers, and therefore that these observations are unlikely to be errors.

However, the usage of newly metered customers who move to a two-part tariff must be forecast.

In brief, our approach involves:

- Estimating the ratio of utilisation rates among newly metered licences compared to existing licences
- Applying this ratio to the utilisation rates for each valley and licence category shown in table 3.3

Further detail is explained below.

Relative usage of licences that are newly on a two-part tariff

Utilisation of entitlements by newly metered customers will likely not be the same as observed utilisation of existing two-part tariff customers. Customers that do not currently have meters may have different usage patterns, which should be accounted for in forecasting take once they move to a two-part tariff.

Therefore, our approach is to observe how usage of newly two-part tariff licences[9] compares to usage of existing two-part tariff licences. The key assumption underlying this approach is that the relative usage of newly two-part licences compared to existing two-part tariff licences is representative of the relative usage of newly metered licences compared to existing licences.

We estimate this ratio using a dataset of metered usage for one-part and two-part tariff customers. The usage of one part tariff customers is not recorded in billing datasets, and accordingly must be obtained from another dataset. Department of Industry – Water have provided a dataset (separate from the billing dataset) that records usage for customers with meters, whether they are on a one-part or a two-part tariff.[10]

To illustrate the approach with an example, we compare the 2016/17 utilisation rate between two cohorts of licences:

- Licences that were on a 2-part tariff in 2015/16 and remain on a 2-part tariff in 2016/17
- Licences that were on a 1-part tariff in 2015/16 and move to a 2-part tariff in 2016/17

These customers moving to a 2-part tariff would include licences that are newly metered and also licences already with a meter that now choose to be on a 2-part tariff for some other reason. We think that it will mainly reflect customers that are newly metered, on the basis that very few of these licences have usage recorded for 2015/16. In 2015/16, the total recorded usage of 1-part tariff customers that moved to a 2-part tariff in 2016/17

9 In this section, 'new two-part tariff licences' refers to those customers that moved from a one-part tariff to a two-part tariff. It does not refer to entirely new customers.

10 This dataset was obtained from DoI – Water in a personal communication from Mark Burrell. Note that this analysis was completed prior to 2018/19 data being available, and hence uses the most recent year of data available at the time (2017/18).

was only 59 ML. Most of these licences have zero usage recorded, which likely means they did not have a meter in this year.[11]

The ratio of utilisation between new and existing two-part tariff licences is estimated for the three years between 2015/16 and 2017/18 (table 3.4). The average utilisation rate for newly two-part tariff licences is between 7 to 25 per cent depending on the year. The average utilisation of customers already on a two-part tariff is between 42 to 56 per cent. The average ratio of these utilisation rates, weighted by the number of customers that move to a two-part tariff in each year, is 20 per cent.

Note that the vast majority of movements from a one-part to a two-part tariff occurred between 2016/17 and 2017/18. We have not been able to identify the factors that caused this increase in the number of customers newly on two-part tariffs. Understanding the cause for this increase would allow for the assumption that they are newly metered customers to be further tested. If these customers moved tariffs due to an administrative change, for example, then it would suggest that their utilisation rate would not be representative of newly metered customers. If this were the case, 2017/18 might be worth excluding from the calculation. In the absence of further information about this issue, we have included 2017/18.

3.4 Relative utilisation rate of licences that move from one-part to two-part tariffs

Year	Customers moving from 1-part to 2-part tariff		Customers already on 2-part tariff	Ratio of utilisation rates
	Utilisation rate	Number of customers	Utilisation rate	Newly 2-part compared to existing 2-part licences
	Per cent	Number	Per cent	Per cent
2015/16	25	68	42	59
2016/17	23	264	56	40
2017/18	7	2 514	43	17
Weighted average				**20**

Source: CIE.

We have not conducted the above analysis at the valley or licence category level, given that the sample size of customers that move tariff types is small.

Projecting utilisation rates of newly metered customers

We estimate the utilisation rate of one-part tariff licences that become newly metered and move to a 2-part tariff. We estimate this variable by combining two other variables:

11 Note that we cannot distinguish between zero usage as a result of not having a meter and a meter recording of zero usage. This is a limitation of the dataset. If these customers actually had meters but zero usage in 2015/16, it suggests they are not newly metered in 2016/17, and thus their usage may not be typical of newly metered customers in the future. Despite this possibility, we believe this is still the best approach to identifying usage patterns of newly metered customers.

- the utilisation rate for a given valley and licence category of current two-part tariff customers, and
- the ratio of utilisation rates among newly metered licences compared to licences already on a two-part tariff (20 per cent in table 3.4)

We can formally represent the calculation of the utilisation rate for newly metered customers as follows:

$$\widehat{U_{vc,newly\ metered}} = \overline{U_{vc,2-part}} \times \overline{U_{newly\ metered}} \Big/ \overline{U_{existing\ 2-part}}$$

where:

- $\widehat{U_{vc,newly\ metered}}$ is an estimate of the utilisation rate of newly metered licences for a particular valley and category
- $\overline{U_{vc,2-part}}$ is a calculated average utilisation rate of current two-part tariff customers, shown in table 3.2
- $\overline{U_{newly\ metered}} \Big/ \overline{U_{existing\ 2-part}}$ is the ratio of newly metered to existing licences, as discussed above.

Alternative approaches

One option that has been examined is to compare the size of works (in millimetres) between existing two-part tariff customers and newly metered customers under the metering policy. However, there are too many missing data points for works size of unregulated licences that make this comparison unreliable.

Another option is to observe the utilisation rate for unregulated water sources where almost all customers are metered, and to infer that utilisation rates for newly metered customers are equal to this average. This approach has merit because if the water source is widely metered, the average utilisation rate across these customers will be representative of the usage patterns of the whole spectrum of customers in an area.

There are four unregulated water sources that are widely metered:

- Barwon-Darling Unregulated River Water Source
- Hawkesbury and Lower Nepean Rivers Water Source
- Upper Bega/Bemboka River Water Source
- Upper Murray River Water Source

We can estimate the utilisation rates for these water sources using the same dataset supplied by DoI – Water described above. The three-year average utilisation rate for local water utilities across all customers in these water sources[12] is 40 per cent for local water utilities and 8 per cent for other licences (excluding major utilities).

12 This includes all customers whether they are on a one-part or two-part tariff, and whether they are metered or not. The dataset upon which this estimate is based does not distinguish between a recording of zero usage where the customer is metered (i.e. actually zero usage) or where the

We have not pursued this approach because there is such significant variation observed between the billed usage utilisation ratio across valleys (see table 3.2). That observation aligns to expectations that usage patterns would vary significantly across valleys, given that the types of users (e.g. cotton farms, livestock farms, etc.) varies significantly. Therefore, we think it is preferable to use the ratio of one-part to two-part tariff usage as a means to estimate the utilisation rate of newly metered customers.

Impact of Sustainable Diversion Limits

As discussed in the previous chapter, we have not made any adjustments to account for SDLs. Given that data for unregulated licences is less comprehensive than regulated licences, it is unclear that the added complexity of making adjustments for anticipated supply and efficiency measures would be warranted. Data is not yet available to make such adjustments.

Forecast entitlements

The total volume of entitlements tends to change slightly over time. This can happen because, for example, a licence is cancelled. However, we do not have sufficient information to project changes in entitlement associated with cancellations or similar factors. Thus, we assume that total entitlements for unregulated water sources remain constant over the forecast period at their 2018/19 level.

However, a new metering framework for non-urban water take commenced on 1 December 2018.[13] This framework requires that unregulated licence holders with works meeting one or more of the following requirements must have a meter:

- Already required to have a meter or measure water take
- Infrastructure size
- Multiple works

Since the primary purpose of forecasting water take is as an input to tariff modelling, the split of entitlement between one-part and two-part tariff licences is important to forecast. To forecast entitlement in each tariff category (to which we will apply utilisation rates to forecast two-part tariff usage), we need to project the impact of the metering policy on the split between tariff categories.

Approach to forecasting the impact of the metering policy

We project changes in the shares of entitlement that are on one-part and two-part tariffs. This reflects the roll-out of the metering policy, which will result in licences moving from one-part to two-part tariffs.

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customer is unmetered (which may be non-zero usage). Both records would display a reading of zero usage.

13 https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/205451/Works-requiring-a-meter-industry-guide.pdf

WaterNSW have supplied a dataset that identifies each water supply work (an access point to a water source) and categorises these into whether they fall under the metering policy categories (table 3.5).[14] This categorisation accounts for the metering policy thresholds, which are:

- Whether the work has a pump size of 100mm or greater
- Whether there are multiple works for the same licence that have a combined size of 100mm or greater
- Where a single licence or landholding has no more than two pumps, each of which is less than 75 mm.
- Where a single licence or landholding has no more than three pumps, each of which is less than 50mm
- Where a single licence or landholding has not more than four pumps, each of which is less than 40mm

This dataset of water supply works is then merged with the 2018/19 usage dataset, which indicates whether each licence is currently on a 2-part tariff. Based on the categorisation of each work in table 3.5, we determine whether each licence currently on a 1-part tariff is newly metered. If so, we assume that the entitlement associated with that licence would move to the two-part tariff category. The timing of this movement in tariff is discussed below.

To illustrate, if all unregulated licences currently on a one-part tariff in the Lachlan charge valley were found to meet the thresholds of the new metering policy, we would assume that all unregulated licences in the Lachlan charge valley would move to a two-part tariff. Therefore, our forecast of entitlements on a one-part tariff for this valley would fall to zero.

3.5 Alignment of work approvals to metering policy thresholds – unregulated

Metering category	No active meter	Active meter	Total	If not already on a 2-part tariff, do licences with this work become newly metered and move to 2-part tariff?
	Number of approvals	Number of approvals	Number of approvals	
(KPI) Largest Pump - 500m or above	180	444	624	Yes
(KPI) 5 or more Pumps - All Less than 100mm	20		20	Yes
(KPI) Largest Pumps between 100mm - 199mm	3 582	1 856	5 438	Yes

14 Work commissioned from Aither by DoI – Water estimated the number of metering works that were expected to result from the Metering Policy. We have considered if these estimates could be used to forecast the movement of entitlement from one-part to two-part tariffs. We concluded it could not be used because the volume of entitlement that moves tariffs will not precisely align to the number of metering works, or even the number of licences with metering works. Further, those estimates were not at the charge valley level, rather falling into categories of Northern Inland, Southern Inland and Coastal. Our understanding is that the data supplied by WaterNSW is likely the data used by Aither to produce their estimates.

Metering category	No active meter	Active meter	Total	If not already on a 2-part tariff, do licences with this work become newly metered and move to 2-part tariff?
	Number of approvals	Number of approvals	Number of approvals	
(KPI) Largest Pumps between 200mm - 499mm	1 109	1 664	2 773	Yes
(KPI) Multiple - Largest Pump 40mm & above	20	3	23	Yes
(KPI) Multiple - Largest Pump 50mm & above	52	6	58	Yes
(KPI) Multiple - Largest Pump 75mm & above	321	60	381	Yes
Multiple - Largest Pump below 50mm	4		4	No
Multiple - Largest Pump below 75mm	348	25	373	No
Single - Less than 100mm	8 317	1 067	9 384	No
Grand Total	**13 953**	**5 125**	**19 078**	
Newly metered total [a]	**5 284**	**4 033**	**9 317**	**Yes**

[a] This row corresponds to the total number of approvals where the right-most column is equal to "Yes". That is, it is the total number of approvals that fall under the metering policy requirements.

Source: CIE.

We are not able to assess the number of customers that are newly metered because they are already required to have a meter or measure water take.

Timing of shifts in entitlement from one-part to two-part tariffs

Roll-out of the metering program will occur in the following stages:

- Stage 1: Surface water users with pumps of 500 mm or larger must comply by 1 December 2020.
- Stage 2: Remaining users in northern inland regions must comply by 1 December 2021 (2021/22 financial year).
- Stage 3: Remaining users in southern inland regions must comply by 1 December 2022 (2022/23 financial year).
- Stage 4: Remaining users in the coastal regions must comply by 1 December 2023 (2023/24 financial year).

For the purpose of determining the timing of the metering rollout for each charge valley, we have allocated valleys to regions as follows:

- Border, Gwydir, Namoi, Peel, Macquarie and Far West as 'Northern Inland'
- Lachlan, Murray, Murrumbidgee as 'Southern Inland', and
- North Coast, Hunter, and South Coast as 'Coastal'.

For local water utilities, we assume that meters in each region are rolled out at a constant rate between 2018/19 and the end-date for each region specified by stages 2-4. There are no local water utility licences with newly metered pumps of 500mm or more.

For other unregulated water source types (excluding major utilities) there are both licences with pumps of 500mm or more, and licences with smaller pumps. We assume

that between 2018/19 and 2019/20, only licences with pumps of 500mm or greater are newly metered. From 2019/20 until the end-date for each region specified by stages 2-4, remaining licences are newly metered at a constant annual rate.

We do not have data to indicate the timing of roll-out of metering except the stage dates above. That is, we do not know if metering of Northern Inland pumps between 100-500mm will occur gradually between now and 1 December 2021, or mainly in the months immediately preceding December 2021, or in some other pattern. Accordingly, we have only made very generic assumptions about timing of the roll-out.

Estimates of the share of entitlement on one-part and two-part tariffs

Tables 3.6 and 3.7 present the share of entitlement that is on 2-part tariffs for each valley, for local water utilities/town water supplies and other unregulated (excluding major utilities) respectively. The end-date for the roll-out of each region is shown by the teal cells.

3.6 Shares of entitlement that are on 2-part tariffs by valley – Local water utilities and town water supplies

IPART region	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio
Border	0.66	0.42	0.05	0.30	**0.55**	0.55	0.55	0.55	0.55
Gwydir	1.00	0.00	0.00	0.09	**0.18**	0.18	0.18	0.18	0.18
Namoi	0.96	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00
Peel	1.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00
Lachlan	0.85	0.53	0.53	0.53	0.53	**0.53**	0.53	0.53	0.53
Macquarie	0.96	0.56	0.83	0.87	**0.91**	0.91	0.91	0.91	0.91
Far West	0.68	0.79	0.86	0.86	**0.86**	0.86	0.86	0.86	0.86
Murray	1.00	0.09	0.09	0.09	0.09	**0.09**	0.09	0.09	0.09
Murrumbidgee	0.99	0.51	0.49	0.49	0.49	**0.49**	0.49	0.49	0.49
North Coast	0.99	0.66	0.75	0.76	0.77	0.79	**0.80**	0.80	0.80
Hunter	1.00	1.00	1.00	1.00	1.00	1.00	**1.00**	1.00	1.00
South Coast	1.00	0.91	0.97	0.97	0.97	0.97	**0.97**	0.97	0.97

Source: CIE.

3.7 Shares of entitlement that are on 2-part tariffs as a share of total entitlement by valley – other unregulated water source types (excluding major utilities)

IPART region	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2023/24
	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio
Border	0.16	0.29	0.39	0.56	**0.66**	0.66	0.66	0.66	0.66
Gwydir	0.05	0.35	0.36	0.51	**0.62**	0.62	0.62	0.62	0.62
Namoi	0.18	0.24	0.15	0.36	**0.44**	0.44	0.44	0.44	0.44
Peel	0.02	0.37	0.19	0.19	**0.19**	0.19	0.19	0.19	0.19
Lachlan	0.10	0.48	0.12	0.14	0.23	**0.31**	0.31	0.31	0.31

IPART region	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2023/24
	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio
Macquarie	0.17	0.39	0.17	0.55	**0.78**	0.78	0.78	0.78	0.78
Far West	0.63	0.69	0.62	0.65	**0.69**	0.69	0.69	0.69	0.69
Murray	0.51	0.68	0.60	0.62	0.73	**0.84**	0.84	0.84	0.84
Murrumbidgee	0.27	0.37	0.29	0.40	0.45	**0.49**	0.49	0.49	0.49
North Coast	0.02	0.29	0.21	0.22	0.23	0.24	**0.25**	0.25	0.25
Hunter	0.01	0.30	0.13	0.13	0.15	0.17	**0.20**	0.20	0.20
South Coast	0.31	0.57	0.45	0.45	0.47	0.49	**0.51**	0.51	0.51

Source: CIE.

Forecasts of usage combining utilisation rates and entitlement projections

The final stage of the forecasting methodology involves for each valley, licence category, and tariff category multiplying the average utilisation rate by entitlement in each forecast year. This produces an estimate of usage by local water utilities and town water supplies plus other unregulated water source types (excluding major utilities). We add together these two licence categories and add forecasts of usage provided by major utilities to estimate total take for each charge valley (table **Error! Reference source not found.**).

The 2015/16 DPI Water price submission project that water take from unregulated water sources would be approximately 900 GL from 2016/17 onwards. Our forecasts are slightly higher (between 980 and 1000 GL). This reflects that utilisation rates are estimated for each valley and licence category individually, and also the rollout of the metering program which increases the share of licences on a two-part tariff.

Usage of major utilities is included in table **Error! Reference source not found.** and also separately identified in table 3.9 below.

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3.8 Forecast unregulated water source take by two-part tariff licences

Charge valley	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
	ML	ML	ML	ML	ML	ML	ML	ML	ML
Border	4 760	1 419	976	5 357	5 724	5 724	5 724	5 724	5 724
Gwydir	0	3	0	1 421	1 506	1 506	1 506	1 506	1 506
Namoi	879	2 923	510	3 731	3 942	3 942	3 942	3 942	3 942
Peel	3 683	45	8	575	575	575	575	575	575
Lachlan	1 605	2 685	2 295	3 825	3 937	4 050	4 050	4 050	4 050
Macquarie	30 274	41 284	20 114	51 019	54 931	54 931	54 931	54 931	54 931
Far West	297 648	19 300	2 442	91 933	92 802	92 802	92 802	92 802	92 802
Murray	6 306	2 693	3 084	4 891	5 046	5 201	5 201	5 201	5 201
Murrumbidgee	3 849	4 581	3 380	8 712	8 892	9 073	9 073	9 073	9 073
North Coast	45 733	32 680	32 085	40 791	40 964	41 138	41 311	41 311	41 311
Hunter	108 089	102 158	108 821	122 987	123 137	123 287	123 438	123 438	123 438
South Coast	595 644	650 228	605 055	650 766	650 896	651 027	651 157	651 157	651 157
Total	**1 098 468**	**859 998**	**778 770**	**986 007**	**992 353**	**993 255**	**993 709**	**993 709**	**993 709**

Note: This table includes usage by major utilities, local water utilities, domestic and stock and all other unregulated water licences.

Source: CIE.

3.9 Forecast take by major utilities from unregulated water sources

Ipart region	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
	ML	ML	ML	ML	ML	ML	ML	ML
Macquarie	6 246	12 309	5 244	5 244	5 244	5 244	5 244	5 244
Hunter	75 646	74 336	83 599	82 085	82 085	82 085	82 085	82 085
South Coast	565 000	608 865	610 470	610 470	610 470	610 470	610 470	610 470

Source: WaterNSW, Hunter Water Corporation, CIE.

We do not produce forecasts of usage by one-part tariff customers, since no usage data is available to inform this. Our forecasts of take will be equal to total take in each charge area if one-part tariff customers have zero or negligible take. Estimates of take by unmetered customers could be based on utilisation rates of metered customers, but it is not clear how the utilisation rate of unmetered customers compares to metered customers.[15]

15 If data is available to support this, then forecasts of usage by one-part tariff/unmetered customers could be produced.

4 Groundwater usage

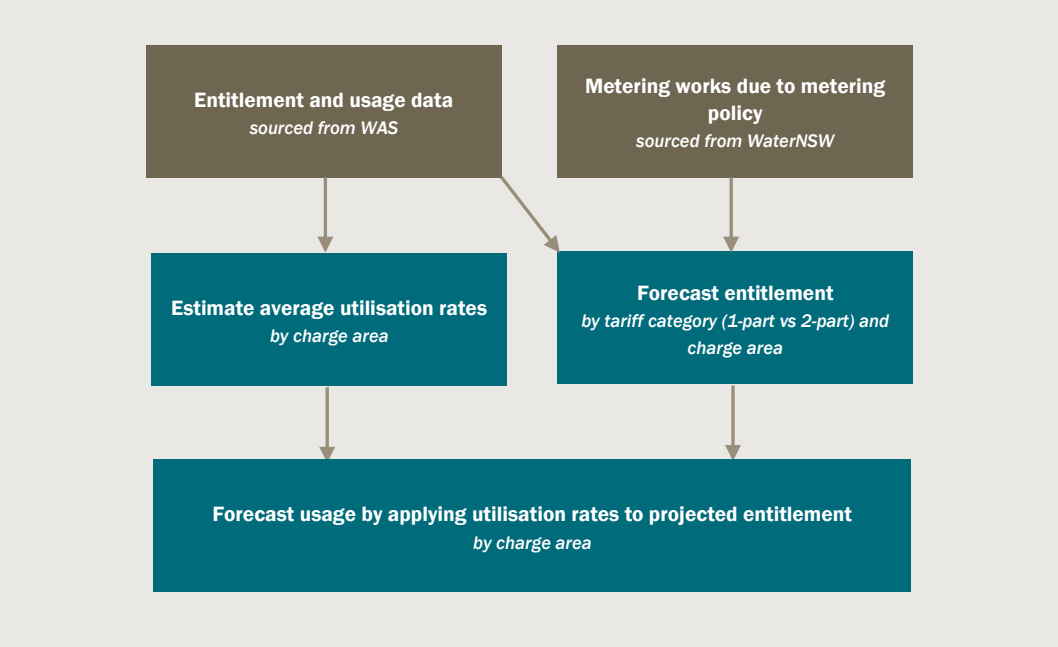
Data for groundwater entitlement and usage is more complete and robust than unregulated water sources, mainly because a higher share of customers are metered and datasets are available for a longer time series. Further, a larger share of licences are on 2-part tariffs and have usage data available compared to unregulated water sources.

Our approach to forecasting groundwater take by two-part tariff customers is shown in chart 4.1. We have largely followed the same approach taken to forecasting groundwater usage for the previous determination. The main differences are as follows:

- we estimate different utilisation rates for each charge area, rather than estimating a single utilisation rate across all areas

Note that usage by major utilities is forecast using the projections supplied by those utilities (Water NSW and Hunter Water), and not included in the method shown in chart 4.1.

4.1 Approach to forecasting groundwater two-part tariff usage excluding major utilities



Note: Brown boxes indicate inputs and data sources, while blue boxes are processes/steps of the methodology.

Data source: CIE.

Estimating average utilisation rates

Utilisation rates are estimated based on usage and entitlement data for two-part tariff customers. For newly metered two-part tariff licences, because usage data is not available since these customers are unmetered, we use an assumption to estimate their utilisation rate based on the utilisation rate for existing two-part tariff licences.

Existing two-part tariff licences

We calculate utilisation rates for two-part tariff licences as follows:[16][17]

$$U_{sa} = \frac{\overline{T_{sa}}}{E_{sa,2018/19}}$$

- U_{say} is the average utilisation rate for a water source *s*, aquifer type *a* (i.e. major or minor aquifer).
- $\overline{T_{sa}}$ is average water take in ML for all years of usage data available, excluding entitlement and usage associated with major utilities and 'Supplementary water' licences. Usage data is available for most major aquifers back to 2006/07, but only for shorter time frames for minor aquifers.[18]
- $E_{sa,2018/19}$ is entitlement in ML on two-part tariffs (excluding entitlement and usage associated with major utilities and 'Supplementary water' licences) in 2018/19.

This approach to estimating utilisation rates will account for inactive licences. For example, if all licences for a water source type in a particular valley had usage of zero,

We then calculate the average of utilisation rates in each charge area, weighted by the entitlement of each water source in 2018/19.[19]

Table 4.2 presents estimates of the weighted average utilisation rate for each charge area. Note that the utilisation rate for Murrumbidgee exceeds 100 per cent, which means that major aquifer licences in this charge area are, on average, using more than their entitlement. For example, usage of the Lower Murrumbidgee Deep Groundwater Source was 322 120 ML in 2017/18 compared to entitlement of 260 037 ML. In 2018/19, usage of this water source was 374 426 ML compared to entitlement of 260 484.

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16 No separate adjustment needs to be made for inactive licences, since this calculation approach will account for licences with zero usage.

17 Note, this excludes supplementary water entitlement, consistent with the approach taken for the previous Determination's forecasts.

18 Data is available prior to 2006/07 for some water sources. Data prior to this year still exists in the old accounting system for rural water, but is more difficult to extract and collate to the water sharing plan areas, and may have been taken under rules that are no longer valid. Therefore, we do not use any data which is extracted on this basis, which is generally prior to 2006/07, but also in later years for some water sources. It is not believed to be representative of recent usage patterns.

19 This is equivalent to calculating a weighted average of the utilisation rate between major and minor aquifers.

4.2 Average utilisation rate for two-part tariff groundwater licences by charge area, excluding major utilities

Charge areas	Utilisation rate – Major aquifers	Utilisation rate – Minor aquifers
		Per cent
Murrumbidgee	96	50
Other inland	95	35
Coastal		21

Source: CIE.

Newly metered licences moving from a one-part to a two-part tariff

We assume that newly metered licences have the same utilisation rate as existing two-part tariff licences. We expect that their utilisation may be lower than existing two-part tariff licences, but have no data to substantiate such a conclusion. While data was available indicating the usage of unregulated water sources by one-part tariff customers, this same dataset has not been able to be obtained for groundwater source usage.

Note that the proportion of customers that are metered is very different for groundwater compared to unregulated water sources. Therefore, it is not appropriate to use the relative utilisation rates between new and existing two-part tariff licences for unregulated water sources will be representative for newly metered groundwater customers.

Forecast entitlements

The total volume of entitlements tends to change slightly over time. This can happen because, for example, a licence is cancelled. However, we do not have sufficient information to project changes in entitlement associated with cancellations or similar factors. Thus, we assume that total entitlements for groundwater water sources remain constant over the forecast period at their 2018/19 level.

We also estimate the share of entitlement which is covered by a one-part and by a two-part tariff in each year, accounting for the impact of the metering program that moves licences from a one-part to a two-part tariff.

Approach to forecasting the impact of the metering policy

We use the same WaterNSW dataset as described earlier in this note in relation to unregulated water usage. This dataset identifies which groundwater works fit into the following categories of licences that will have new meters:

- At-risk groundwater sources. The list of at-risk groundwater sources is contained in the *NSW Non-urban Water Metering Policy* at Appendix B.[20]
- Licences with works that have a largest bore size of 200mm or above.
- All spear points.

20 NSW Government, 2018, *NSW Non-urban Water Metering Policy*, Appendix B.

It also identifies licences that are yet to be confirmed whether they will meet the requirements ("KPI Yet to Confirm") and those that are outside the scope of the metering policy ("Work Status Not Installed"). The analysis to categorise works in this manner is yet to be completed awaiting further data about descriptions of works.

4.3 Alignment of work approvals to metering policy thresholds – groundwater

Metering KPI category	Work approvals	If not already on a 2-part tariff, do licences with this work become newly metered and move to 2-part tariff?
	Number	
(KPI) At-Risk GW Water Source	5 601	Yes
(KPI) Largest Bore 200mm & Above	984	Yes
(KPI) Well/SPOINTS	1 273	Yes
KPI Yet to Confirm	3 358	No
Work Status Not Installed	1 690	No
Total	**12 906**	
Newly metered total	**7 858**	**Yes**

[a] This row corresponds to the total number of approvals where the right-most column is equal to "Yes". That is, it is the total number of approvals that fall under the metering policy requirements.

Source: CIE.

This dataset is matched to licences. The amount of entitlement newly metered is based on the share of entitlement that is currently on a 1-part tariff and meets the metering policy requirements per table 4.3.

Timing of shifts in entitlement from one-part to two-part tariffs

Roll-out of the metering program for groundwater will occur in three stages. Stage 1 (discussed earlier in this note with reference to unregulated usage) is only relevant for surface water and not groundwater. These stages are:

- Stage 2: Users in northern inland regions must comply by 1 December 2021 (2021/22 financial year).
- Stage 3: Users in southern inland regions must comply by 1 December 2022 (2022/23 financial year).
- Stage 4: Users in the coastal regions must comply by 1 December 2023 (2023/24 financial year).

For the purpose of determining the timing of the metering rollout for each charge valley, we align 'southern inland' to the Murrumbidgee charge area, 'northern inland' to the rest of the Inland charge area ('other inland'), and the 'coastal' area to the coastal charge area.

We assume that meters in each region are rolled out at a constant rate between 2018/19 and the end-date for each region specified by stages 2-4.

Estimates of the share of entitlement on one-part and two-part tariffs

Table 4.4 present the share of entitlement that is on 2-part tariffs for each valley and separately for major and minor aquifers. As discussed above, the share of entitlement on 2-part tariffs is assumed to increase linearly from 2018/19 until the end-date of the roll-out for each region. The end-date for the roll-out of each region is shown by the teal cells.

4.4 Shares of groundwater entitlement that are on 2-part tariffs as a share of total entitlement by charge area

IPART groundwater region	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio
Major aquifers									
Inland	0.75	0.92	0.92	0.94	**0.95**	0.97	0.97	0.97	0.97
Murrumbidgee	0.80	0.94	0.95	0.95	0.95	**0.95**	0.95	0.95	0.95
Coastal	1.00	1.00	1.00	1.00	1.00	1.00	**1.00**	1.00	1.00
Minor aquifers									
Inland	0.62	0.59	0.60	0.68	**0.75**	0.83	0.83	0.83	0.83
Murrumbidgee	0.85	0.92	0.90	0.93	0.95	**0.97**	0.99	0.99	0.99
Coastal	0.12	0.28	0.26	0.32	0.37	0.43	**0.48**	0.54	0.54

Source: CIE.

Forecasts of usage combining utilisation rates and entitlement projections

The final stage of the forecasting methodology involves for each charge area and tariff category multiplying the average utilisation rate by entitlement in each forecast year. This produces an estimate of usage all groundwater sources excluding major utilities. We add forecasts of usage provided by major utilities to estimate total take for each charge area and tariff category (table 4.5). The only major utility with groundwater take is Hunter Water Corporation (HWC).

In the DPI Water 2015/16 submission, groundwater take was projected to be approximately 762 GL, while the forecasts below are around 1 000GL. This difference mainly reflects heightened take in recent years (e.g. over 1 000GL in 2017/18 and over 1 200GL in 2018/19) and the effect of the metering program, which significantly increases the number of customers on a two-part tariff.

We do not produce forecasts of usage by one-part tariff customers, since no usage data is available to inform this. The forecasts for the previous determination assumed that one-part tariff customers had zero or negligible usage.

4.5 Forecast groundwater take by two-part tariff licences

Charge valley	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
	ML	ML	ML	ML	ML	ML	ML	ML	ML
Inland	381 849	664 253	774 383	655 742	690 868	725 994	725 994	725 994	725 994
Murrum.	184 591	368 940	445 076	281 831	283 166	284 501	285 836	285 836	285 836
Coastal	21 378	24 612	22 119	23 524	27 684	31 845	36 005	40 166	40 166
HWC	3 978	3 863	3 991	8 353	8 353	8 353	8 353	8 353	8 353
Total	**591 796**	**1 061 667**	**1 245 568**	**969 449**	**1 010 071**	**1 050 692**	**1 056 188**	**1 060 348**	**1 060 348**

Note: HWC refers to Hunter Water Corporation.

Source: CIE.

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