Managing Estimated Consumption using Yearly Volume Estimates

February 2021

V1.0

Document Change control

Version	Date Issued	Amendments
V1.0	15/02/2021	Initial Version

CONTENTS

1 INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

This document provides guidance on the settlement of actual and estimated consumption, including the use of Yearly Volume Estimates (YVEs) for meters. It also outlines the impacts of meter reads and YVEs on settlement. It also provides information on managing consumption estimated by the Central Systems (CMOS) during periods where sites' historic usage cannot be used to forecast future usage. This document does not include information on YVEs for trade effluent calculated discharges.

1.2 REVIEWING THIS DOCUMENT

The document is owned, maintained and published by MOSL, with reviews by MOSL as needed.

1.3 OVERVIEW

Settlement generally uses historic volumetric usage to estimate future usage at sites. In circumstances such as the one mentioned above, historic consumption may not be an appropriate basis for estimates. Consequentially, the accuracy of volumes estimated by CMOS decreases.

MOSL identified a workaround in 2020 where Capped Yearly Volume Estimates (YVEs) could be used to override historic meter reads in estimating usage. This workaround is outlined in the following sections. In order to understand the impacts of this capping mechanism, it is important to understand how settlement operates in relation to volume calculation. The settlement process is covered in section 2 and the estimation capping mechanism is covered in section 3.

Covid-19 and YVEs

The outbreak of Covid-19 and its spread within the UK has had a profound impact on the daily lives of millions of people. Throughout 2020 and 2021, the UK government has issued guidance and imposed legislative measures to reduce spread of the disease. It requires that, non-essential businesses and premises should be closed and large gatherings, non-essential travel and other activities should be avoided. Many workers are in self-isolation and have implemented social distancing rules. This has subsequently caused extreme reductions in the levels of water and sewerage usage at some business sites across the country and hindered the collection of meter readings placing greater reliance on estimates.

> *"Retailers should continue to attempt to obtain meter reads in the first instance. Where access to a meter is not possible, Retailers should see if they can obtain a customer submitted read (where customers are willing to submit a read and can safely access their premises). Where a customer is unable to submit a read, Retailers should be able to demonstrate that they have taken reasonable steps to engage with their customer to understand what activities (if any) are ongoing at a site. This information should help a retailer calculate a more accurate estimate of consumption."* – Ofwat in 'Managing estimated consumption during periods of reduced consumption associated with Covid-19'

For more information, refer to section 4 of this document and Managing estimated consumption during periods of reduced consumption associated with Covid-19

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2   VOLUMES IN SETTLEMENT

This section provides an overview of volume calculation and estimation in the settlement process.

2.1   WHAT IS SETTLEMENT?

In broad terms, settlement refers to the process of calculating primary charges payable between Wholesalers and Retailers, i.e. wholesale charges.

Key Concept: Settlement

The settlement mechanism allows Wholesalers to invoice Retailers for the water and sewerage services they use. At a single premises with regular, monthly meter reads, this process is simple. Usage is known by taking a meter read after the end of the month and comparing that to the last known read. The Wholesaler then invoices the Retailer volumetric charges based on monthly usage. However, where a premises has not had a read taken, consumption must be estimated. The settlement routines ensure that, over time as further reads are taken, estimated usage is replaced by actual consumption and any differences are charged accordingly.

For information on how differences in charges are reconciled, refer to page 8.

The Central Market Operating System (CMOS) carries out the settlement process in accordance with the market codes and its provisions. The process combines two main datasets:

1) **Public tariff data**, where Wholesalers set prices for the provision of water and sewerage services; and
2) **Site usage information**, where details of consumption is recorded by Trading Parties as premises and Supply Point (SPID) data.

Primary charges for each calendar month ('invoice period') are calculated several times. This then forms the basis for charge reconciliation. This is discussed in section 2.3 below.
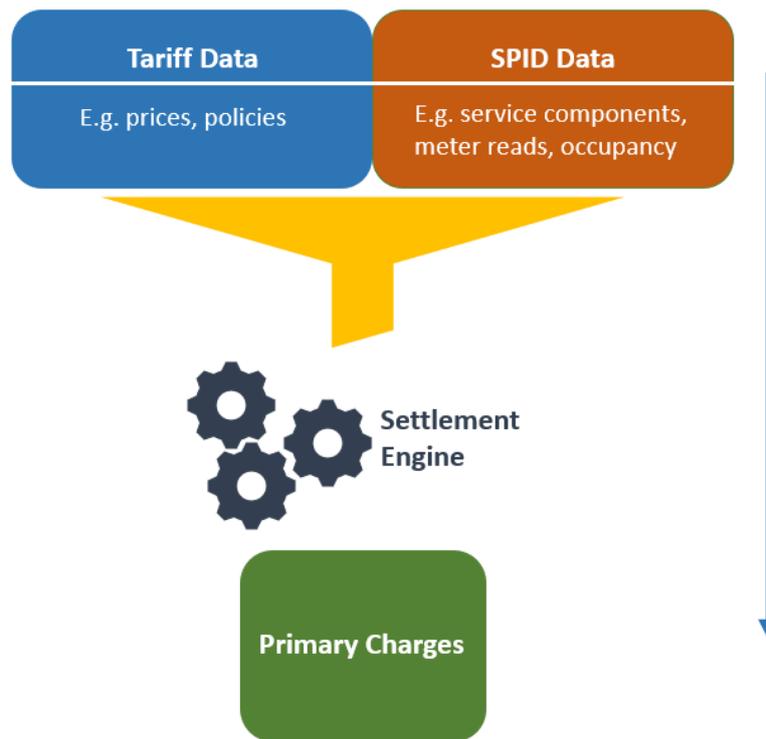
Figure 1: a simplified diagram of primary charge calculation

2.2 HOW IS VOLUME CALCULATED AND ESTIMATED?

Volumes, in respect of primary charges, are defined as either 'actual' or 'estimated'. Where meter reads are available for the relevant invoice period, CMOS will use the reads to calculate the volume consumed. Where this is not the case, CMOS must instead estimate the volume consumed. Both the calculation and estimation of volumes in CMOS is described in more detail below.

2.2.1 Meter Advance Period

Where an invoice period falls between two meter reads, referred to as the 'Meter Advance Period', consumption for the relevant days will be actual. CMOS uses the two reads either side of the invoice period to apportion volume equally across this period. It is important to note that for the days in which a premises is marked as vacant or temporarily disconnected, generally no volume will be apportioned[1].

> **Definition: Meter Advance Period**
>
> This is any period between two reads.

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[1] There are a limited number of cases where volumes are allocated to days where a site is vacant or temporarily disconnected. The most common case is where the period between two adjacent reads is solely a period of vacancy. CMOS calculates the volume, but whether this is charged for depends on the Wholesaler's charging policy for vacant sites.

2.2.2 Meter Pre-Advance Period

There are two periods in which CMOS will need to estimate volume. The first, referred to as the 'Meter Pre-Advance Period', occurs when the only read that exists for a meter is its initial read. As CMOS has no read history, it will use the supplied YVE to produce an estimated daily advance for periods after the meter's initial read. If no YVE has been supplied, then an Industry Level Estimate (ILE) will be used to estimate volumes. The ILEs are backstop estimates of sites' annual usage, based on meter size.

> **Definition: Meter Pre-Advance Period**
>
> This is any period after a meter's initial read, where it does not have any further reads.

2.2.3 Meter Post-Advance Period

The second period, the 'Meter Post-Advance Period', occurs when an estimate is needed for any days following the latest read at a meter. CMOS will attempt to produce an estimate from the average usage rate across a minimum set of reads spanning a 12-month period, working back from the latest read. If the meter does not have a read history spanning a 12-month period, then

> **Definition: Meter Post-Advance Period**
>
> For a meter that has at least two reads, this is any period after its latest read.

the average rate from the initial read to the most recent will be used. It is important to note that in producing this estimated volume, usage for the 12-month period is allocated to periods of occupancy. This is discussed further in section 5.2.

If the number of days that the premises is both occupied and not temporarily disconnected is less than 30, then the average rate is replaced with a weighted average derived from both the calculated average rate and the YVE (or ILE if no YVE has been supplied). Further detail on how YVEs and ILEs are used to estimate volumes can be found in section 3.

2.3 RECONCILIATION

Key Concept: Reconciliation
Trading Parties settle their primary charges through a sequence of settlement reconciliations ('settlement run'). Each settlement run is a calculation of charges for a specific invoice period. The first settlement run – P1 – is performed and published 16 business days before the invoice period and outlines estimated usage and associated charges.
The second settlement run – R1 – is performed and published four business days after the invoice period. At this point in time, it is likely that the majority of Supply Points will still not have had their meters read and so much of the R1 run will be based on estimated consumption.
Subsequent settlement reconciliation runs – R2, R3 and a final (RF) run – are performed at defined times following the invoice period.

The settlement process for an invoice period is repeated several times until the final (RF) settlement run which crystallises the charges[2]. The RF run is performed 16 months after the invoice period, when it is anticipated that reads spanning the invoice period will have been submitted by Retailers. This repetition of the settlement process allows for further submission of meter reads and recalculation of primary charges replacing estimated usage with actual usage.

2.4 THE EFFECT OF METER READS

Meter reads are essential for both volume calculation and volume estimation. As meter reads are added, subsequent settlement calculations for an invoice period may have days which fall between two meter reads when they previously had not. For these days, CMOS is then able to calculate actual volume when an estimate was previously used. When this occurs, the estimated volume is overwritten with actual volume, likely resulting in a difference to the total volume apportioned to a meter. This difference could result in either a higher or lower total volume, depending on the accuracy of the previously estimated volume.

Reads also assist in estimation in the Meter Post-Advance Period, as fluctuations in usage can be considered in forecasting. Whilst most businesses in the water market do not provide enough read data to build seasonal profiles, CMOS will use the most up-to-date data to provide reasonable estimated volumes.

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[2] Charges for invoice periods where RF runs have been completed may change for a limited time following the RF run, through the post RF unplanned settlement runs' process.

An example of the impacts of regular read submission on estimation is shown below. The steeper the gradient the higher the rate of consumption, as differences in read values (y-axis) equate to volume usage.
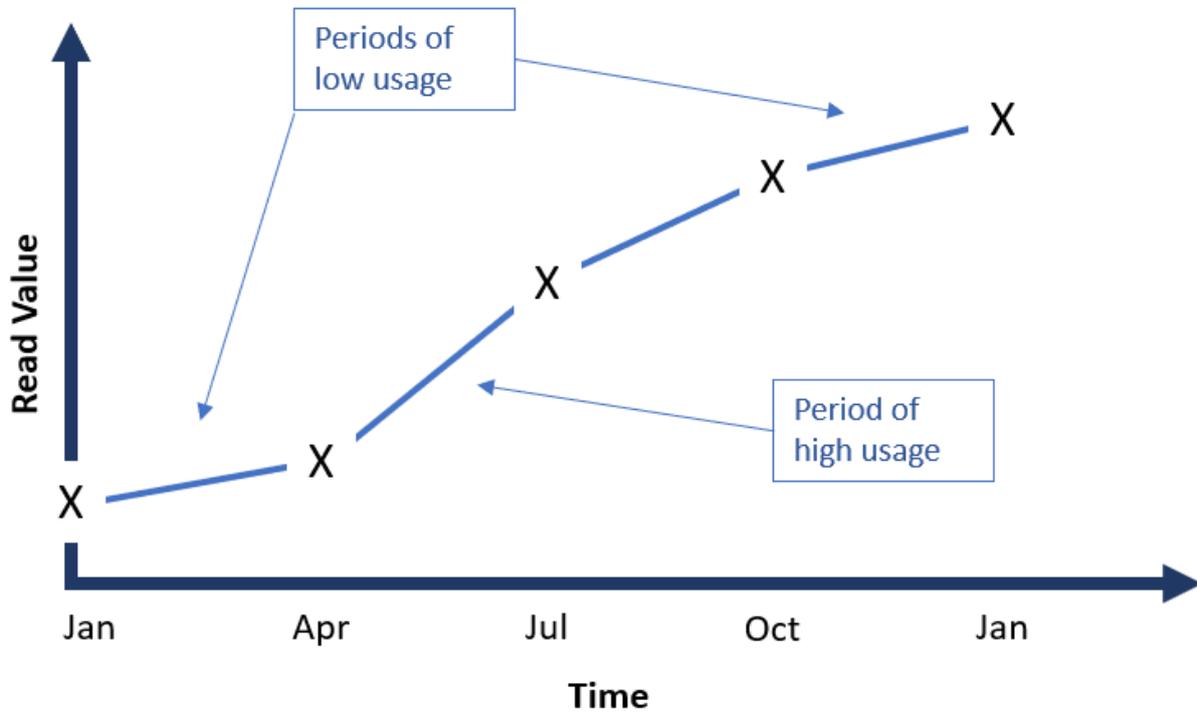
Figure 2: a meter which has four regular reads submitted each year

In the example above, reads are submitted at three monthly intervals. If there is higher usage between reads, the difference between meter reads will be higher and the gradient of the graph steeper. When estimating volumes for periods in the following year, CMOS will use the latest read and the read 12 months prior to it. The volumes estimated by CMOS change as more reads are submitted for the meter throughout the year. This is shown below.

Figure 3: a diagram showing changes in volumes estimated as reads are submitted

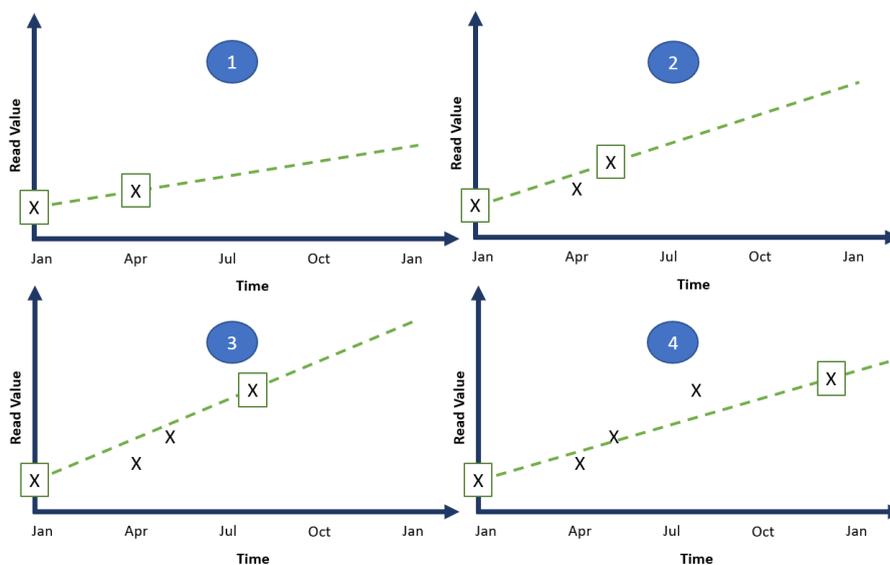In the example above, reads were added throughout the year from stage (1) to stage (4). The gradient of the green dotted line after the latest read in each stage was the future volume being estimated. This changed stage by stage as reads were submitted. The gradient of the green dotted line was dependent on the reads being chosen, which are shown in green boxes. From stage (2) onwards, note the volume difference between the latest two reads and what was estimated in that time period in the previous stage.

The effects of regular reads on estimation, with detailed calculation, are shown in Appendix A.

3   YEARLY VOLUME ESTIMATES (YVEs)

This section describes Yearly Volume Estimates (YVEs) and includes information on their submission and update.

3.1   DEFINITION

YVEs are non-negative integer estimates of the annual volume supplied to occupied premises, in cubic meters. They are used for both meters and calculated discharges. Only the metering aspect is discussed in this document.

Definition: Yearly Volume Estimates
These are Trading Party submitted estimates of annual usage at occupied premises.

As there are different types of meters in the market, YVEs are both mandatory and optional data items, depending on meter treatment type. Where a meter does not have a YVE, the Industry Level Estimate (ILE) associated to a meter of that size will be used in settlement.

Wholesalers can submit an initial YVE upon meter installation, through transaction[3] T104.W (Submit Meter Installation) and Retailers can thereafter amend the value, through transaction T146.R (Submit Yearly Volume Estimate). Unlike ILEs which are fixed values, YVEs may vary over time by using effective from and to dates. It is the responsibility of the customer's Retailer to maintain and update YVEs where necessary, e.g. after changes in business use.

Definition: Industry Level Estimates
These are backstop estimates of sites' annual usage, based on meter size. They are used for meters which do not have YVEs specified.

The example below shows a scenario where different YVEs are submitted and updated for the same meter.

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[3] Trading Parties can submit and amend data in CMOS by submitting transactions to it. Refer to the glossary for further information.
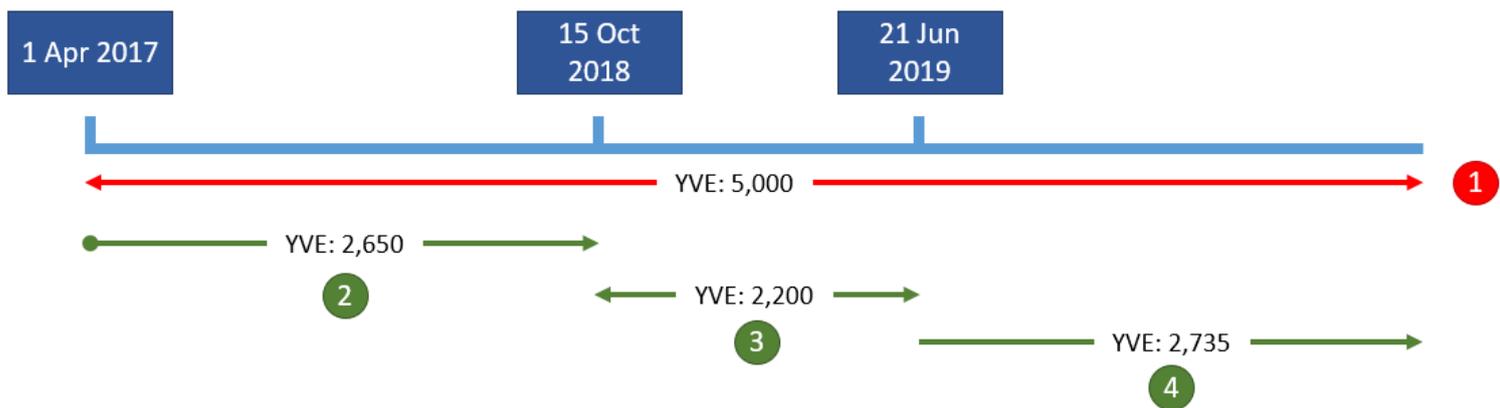
Figure 4: YVE submission and update

In the example above, the Wholesaler installed the meter on 1 April 2017 with a YVE of 5,000, shown as step 1. This was overwritten by the Retailer in the following few years as the Retailer undertook steps 2 to 4.

3.2   EFFECTS OF YVES ON SETTLEMENT CALCULATION

Key Concept: Estimation with YVEs

Settlement only uses YVEs for estimating in two cases:

1)   Where a meter has been installed with an initial YVE and estimation is required ('Meter Pre-Advance Period'). and
2)   Where volumes are being calculated for a period after a meter's latest read and estimation is required ('Meter Post-Advance Period').

For information on how YVEs can be used to manage forward estimation, refer to page 14.

YVEs have no impact on volume calculation for periods between reads ('Meter Advance Period'), as volumes are not estimated in these periods. The code provisions for estimation in the Meter Pre-Advance Period and Meter Post-Advance Period are in CSD 0207 Appendix A.3 and A.5 respectively.

3.2.1   Meter Pre-Advance Period

This is where a Wholesaler has installed a meter with an initial read, and may have provided an initial YVE, but the Retailer has not yet provided any subsequent reads. As described in section 2.2.2 above, any period after the meter's initial read is termed as a 'Meter Pre-Advance Period'. The Retailer may also amend the YVE after installation. The meter's YVE is used in the Meter Pre-Advance Period to estimate volume on a pro rata basis.

For every day in the Meter Pre-Advance Period, CMOS calculates the estimated usage using the YVE value specified for that day, on a prorated basis, i.e. it is divided by 365 to estimate the daily usage.

If the meter's YVE is unspecified for any days in the invoice period, the ILE associated to its meter size is used to estimate volumes for that day instead. The figure below shows estimation in the Meter Pre-Advance Period using a YVE.
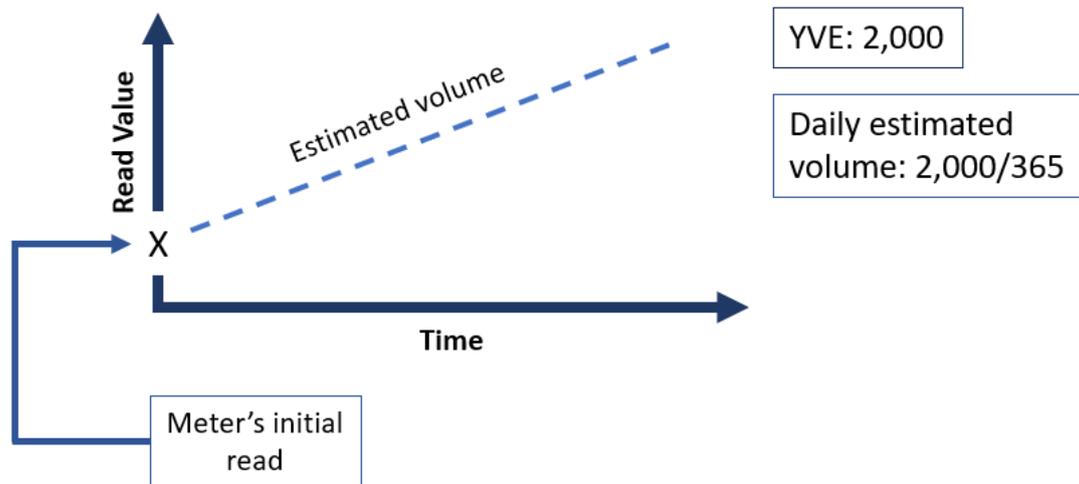
Figure 5: estimation upon meter installation using a YVE

3.2.2 Meter Post-Advance Period

This is where volumes are being estimated after a meter's latest read, referred to as the 'Meter Post-Advance Period'. There are two types of estimates that are calculated internally by CMOS, and the lower of the two is used for charge calculation.

1) **Uncapped Estimate**: generally, this estimate is based on a meter's previous actual volume, i.e. volume between reads. CMOS attempts to take a year's worth of actual volume. Where this is not possible due to a lack of reading history, CMOS uses as much history as possible. The historic usage is then extrapolated forward, as shown below.
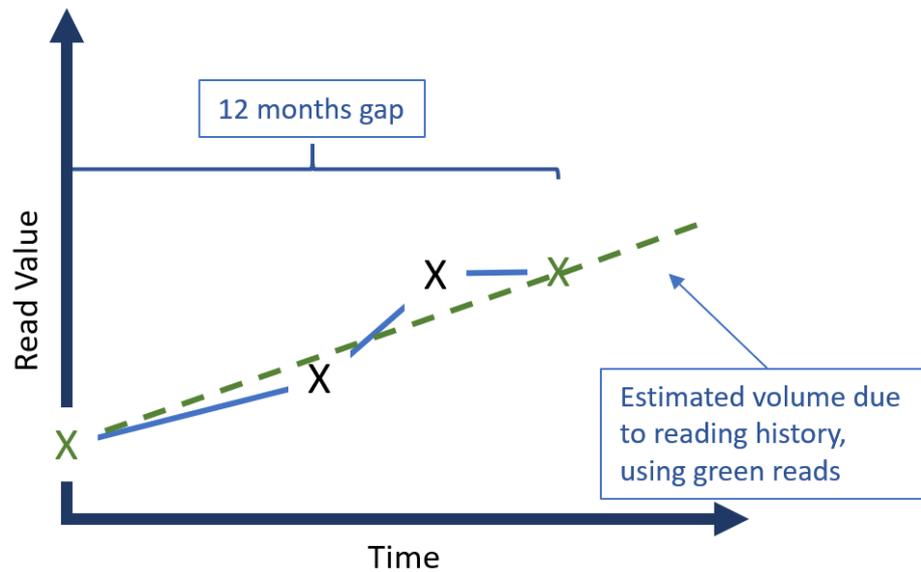
Figure 6: graphical representation of the Uncapped Estimate

2) **Capped Estimate**: this estimate is either a meter's YVE*3 or, where a YVE doesn't exist, its associated ILE*10. This estimate is usually much larger than the Uncapped Estimate so in most circumstances, CMOS chooses the Uncapped Estimate instead of the Capped Estimate. The Capped Estimate is a protection against inaccurate reads in CMOS inflating forecasted volume usage, which would result in incorrect settlement charges.

> **Therefore, in the Meter Post-Advance Period, the YVE generally only has one role: to cap the Uncapped Estimate.**

The figure below shows the estimation routine in this period.

Figure 7: simplified diagram of estimation in the Meter Post-Advance Period

4 USE OF CAPPED YVE TO IMPROVE FORECASTING ACCURACY

This section describes how YVEs can be used in the Capped Estimate mechanism to improve forecasting accuracy in the Meter Post-Advance Period. This may be necessary where there is sudden and significant change in consumption (e.g. due to changing business use at premises, restrictions in pandemic situations) such that historic co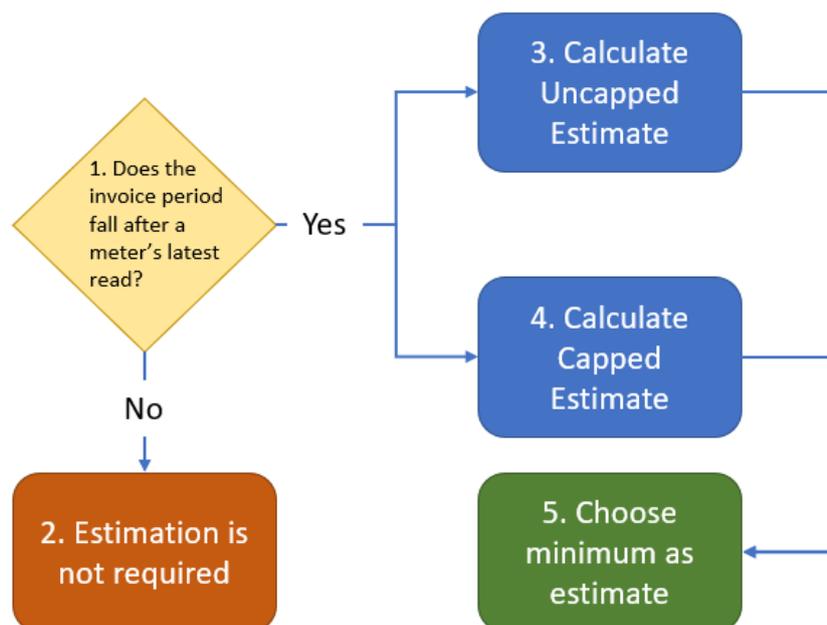nsumption is no longer an appropriate basis for estimation. This is consistent with guidance issued by MOSL and Ofwat, where there is an acknowledgement of these mitigation steps for extreme situations.

4.1 SUBMISSION OF YVE

Where there is appropriate evidence to do, in line with the MOSL-Ofwat joint statement, Retailers may use YVEs to estimate volumes in the Meter Post-Advance Period for their metered customers' sites where there has been a significant change in consumption. Normally the YVE should reflect expected annual consumption, but in these situations the YVE should reflect one third of expected annual consumption There are three principle steps to this approach, as shown in the figure below.
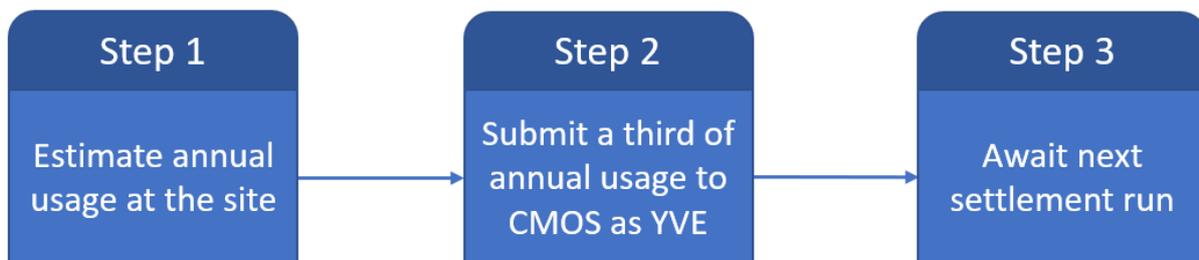
Step 1	Step 2	Step 3
Estimate annual usage at the site	Submit a third of annual usage to CMOS as YVE	Await next settlement run

Figure 8: flow diagram of the three principle steps to manage volume estimation using Capped YVEs

1) **Use as much relevant data as possible to estimate annual usage at the metered site**
   o This estimate should be based on the best information available to the Retailer, including discussion with the site's customer, recent meter readings, comparison with similar sites and information provided by the relevant Wholesaler.
   o Trading Parties should collaborate constructively in setting YVEs to help the Retailer estimate as accurately as possible, reflective of the site's circumstances. For example, Wholesalers may have easier access to better evidence on actual consumption at particular Supply Points than is currently reasonably available to Retailers. This could include data from: Wholesaler field visits; Automated Meter Reading (AMR) device reads; smart meters; and data loggers.
   o Retailers should keep records of how estimates were derived for metered sites, including relevant supporting evidence, as they possibly may be audited for compliance.
   o Retailers should also note the dates of significant decreases or increases in site usage, as these will inform the Effective From Date (EFD) and Effective To Date (ETD) data items in step (2) below.
   o **Note**: if there are several meters at a site, the Retailer should determine how best to split site usage across them.

> **Output**: Retailer derives best estimate of annual usage

2) Calculate a third of this value and submit it to CMOS

o   Retailers may submit a third of the estimated annual usage figure derived in step (1) above to CMOS as the meter's YVE. A third of the annual figure should be submitted so when CMOS calculates the Capped Estimate (YVE*3), this will likely be lower than the Uncapped Estimate based on historical readings and will therefore be used to estimate usage.

o   There are two transactions through which Retailers can amend YVE data: T146.R and TCORR146.R.

   1)   T146.R should be used in cases where a change to a site's usage is needed since a point in time in the past two to three months[4].

   2)   TCORR146.R should be used in cases where a change to a site's usage is needed from a point in time more than two to three months in the past. This transaction can also be used by the Retailer to set the ETD of the YVE change.

o   Setting the EFD of the YVE change correctly is very important.

   ▪   Generally, if the meter's latest read was taken on or after the site ceased consumption, it is safe to set the EFD of the YVE change as the same date of the latest read. This is because volume between the latest read and the read prior to it will be calculated based on those two reads' values, and for any day after the latest read CMOS may use YVE*3 as a basis for estimation.

   ▪   If the meter's latest read is before the EFD of the YVE change, the days in between may have their volumes estimated based on historic usage.

   ▪   Note: the EFD date should not be set as the date of the settlement run nor when it is published. It should be set as the point in time from which significant changes in usage occurred, i.e. business closure, extreme reduction in operation etc.

o   If the Capped Estimate is lower than the Uncapped Estimate when estimating volume in the Meter Post-Advance Period, CMOS will choose this estimate in its charge processing.

> **Output**: Retailer submits transaction to amend YVE data in CMOS

3) Await the next settlement run for the period affected

o   Each month, there are cut-off points for data to be included in settlement runs. If the Retailer makes a YVE change in step (2) above for a period where charges are being recalculated in settlement, the submission of the transaction must be before the cut-off point. Otherwise, the Supply Point's Retailer and Wholesaler must wait for the next settlement run for the period affected. The table below outlines the cut-off dates of the settlement runs for the February 2021 invoice period. The cut-off time and date for all 'R' settlement runs is 18:00 on the last calendar day in the month preceding the run's

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[4] 'T' transactions that amend data can generally only be submitted two to three months after the effectuation date. For T146.R, the Effective From Date submitted must be in the current month or the previous two months. It must also be in the past, as is the case for all almost transactions submitted to CMOS.

processing. The cut-off time and date for P1 runs is generally 18:00 on the day immediately before the report issuance.

Run	Month of Run	Cut off point	Report issued[5]
P1	January 2021	18:00 7 January 2021	8 January 2021[6]
R1	March 2021	18:00 28 February 2021	4 March 2021
R2	May 2021	18:00 30 April 2021	7 May 2021
R3	November 2021	18:00 31 October 2021	4 November 2021
RF	July 2022	18:00 30 June 2021	6 July 2022

Table 1: settlement runs for February 2021

4.2 RESULTS TO EXPECT IN SETTLEMENT

As mentioned in the sections above, timing when a YVE change transaction is submitted is crucial, as well as the effective dates of the new YVE and its value. Assume the following conditions are met.

1) The revised annual usage at a site is significantly lower than its previous usage.
2) The Retailer has submitted a YVE of a third of the revised annual usage to CMOS.
3) The YVE change is effective from the meter's latest read onwards.
4) The YVE change transaction is submitted before the next settlement run for the invoice period. This period will necessarily need to be after the meter's latest read, as all periods before it will have actual volumes calculated.

In this case, Retailers can expect CMOS to choose the Capped Estimate (YVE*3) instead of the Uncapped Estimate based on historic usage, on a pro rata basis for daily estimated volume in the invoice period. An example of this is shown below.

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[5] The settlement timetable for 2021-23, which outlines report publication dates, is available on the MOSL website.

[6] P1 settlement runs are processed in advance of invoice periods. As such, all metered volumes in P1 reports are estimated.

Read	Date
0	2 January 2019
243	5 July 2019
512	10 February 2020
570	19 March 2020
600	30 October 2020

Retailer maintained a YVE of 480 throughout.

Step 1

With current circumstances, Retailer estimates annual usage of 42 m3

Step 2

On 5 Nov 2020, Retailer submits a YVE of 14 to CMOS, effective from 30 Oct 2020

Step 3

Submission of **new (lower)** YVE was before P1 Dec 2020 cut-off date, so **new** YVE included in calculation. For Oct and Nov 2020, Retailer must wait for R2 Oct and R1 Nov[7].

Run	Cut-off Time and Date	Report Issued
P1 Dec 2020	18:00 8 Nov 2020	9 Nov 2020
R1 Nov 2020	18:00 30 Nov 2020	4 Dec 2020
R2 Oct 2020	18:00 31 Dec 2020	7 Jan 2020

Volume Estimation for P1 Dec 2020

Uncapped Estimate calculation
- Reads of 600 and 243 will be used as this is at least 12 months' history from latest read.
- Volume = 357 m3
- Difference in days between 30 Oct 2020 and 5 Jul 2019 = 483
- Daily Uncapped Estimate = 357/483 = 0.74 m3

Capped Estimate calculation
- YVE for days in Dec 2020: 14 m3
- Daily Capped Estimate: (14/365)*3 = 0.115 m3

Assessment
- Minimum of Uncapped Estimate and Capped Estimate: Capped Estimate
- Volume in P1 Dec 2020: 0.115 * 31 = 3.57 m3

[7] As Oct 2020 would have only 1 day of estimated volume, reconciliation in R2 Oct 2020 will be minimal. However, reconciliation in R1 Nov 2020 will be greater, as the previously estimated volume in P1 Nov 2020 of 38.69 m3 (=(570/442)*30) will be replaced by 3.45 m3 (=(14/365)*3*30).

Figure 9: an example of the steps a Retailer took to use Capped YVE to manage estimation, with the CMOS calculation on the bottom right

When business sites' usage return to normal levels, Retailers should raise the relevant meters' YVE values appropriately and allow CMOS to estimate volumes through its standard routines. Capped YVEs should not be used in normal market operating conditions to forecast site usage.

5   OTHER AREAS OF CONSIDERATION

5.1   NON-NEGATIVE VOLUMES

For a single meter which is not linked to a network, CMOS does not estimate negative volumes in the Meter Pre-Advance Period nor the Meter Post-Advance Period. The volumes estimated are capped at a lower limit of zero.

5.2   VOLUME SHIFTING DUE TO VACANCY

There is a fundamental principle in settlement that volume usage at a site is allocated to days where it was occupied, as it is unlikely for usage to occur in periods of vacancy. If there is, these may act as indicators of leakage, faulty meters or inappropriate usage by other parties.

Where two meter reads span periods of occupancy and vacancy, the daily volume that would normally be allocated by CMOS to the period of vacancy is instead allocated to periods of occupancy. This has two main impacts:

1) **Charging**: if the two reads span multiple invoice periods, volume may be shifted from one period to another, with subsequent fluctuations in charges. Holistically, the volumes will amount to the total volume used by the customer and no overcharging or undercharging of the Retailer will occur.

2) **Volume estimation**: when assessing historic usage for estimation in the Meter Post-Advance Period, periods of vacancy are excluded. This means the Uncapped Estimate is a reflection of usage allocated to periods of occupancy. If the site's occupancy data is set incorrectly for the year previous to the meter's latest read, this may cause the Uncapped Estimate to be unexpectedly large and not a true reflection of usage in times of occupancy. This is one of the cases where CMOS generally chooses the Capped Estimate over the Uncapped Estimate, as it is usually lower. The Capped Estimate acts in its correct capacity as a protection mechanism.

Charging for vacancy only occurs where a premises is vacant for all days between two reads. Whether this volume is charged for depends on the relevant Wholesaler's charging policy, which is public information set out in its wholesale charges scheme.

5.3   PROCESS STEPS

This document outlines how YVEs can be amended through transactions and the subsequent effects on settlement charges. YVE amendment is a type of data amendment and the relevant sections of the codes should be referred to when considering general process steps; specifically, section 2.5 of CSD 0105: Error Rectification, which outlines the parties a data owner must notify of proposed changes and reach agreement with.

APPENDIX A

A.1 ILE TABLE

The table below outlines the ILEs, which are in [CSD 0207](#) Appendix F.1.

Lower Meter Size (mm)	Upper Meter Size (mm)	Estimate (m³/annum)
0	19	250
20	24	500
25	29	1,000
30	39	2,500
40	49	3,500
50	79	7,500
80	99	20,000
100	149	35,000
150	199	150,000
200	249	350,000
250	299	1,200,000
300	449	2,000,000
450	∞	3,500,000

Table 2: the ILE table

A.2 EXAMPLE OF VOLUME ESTIMATION AND RECONCILIATION

This section provides details of a meter where volumes were estimated in a settlement run and reconciled in subsequent settlement runs. CMOS calculated the Capped Estimates in this example, but their calculation is omitted as the Uncapped Estimates were chosen in all cases.

A meter was installed on 31 May 2017 with no specified YVE. The following reads were live in CMOS as of 18:00 6 February 2019.

Read No.	Date	Read
1	31/05/2017	11,750
2	26/08/2017	12,125
3	24/11/2017	12,311
4	26/04/2018	12,531
5	23/07/2018	12,780
6	28/10/2018	13,167
7	25/11/2018	13,201
8	16/12/2018	13,210
9	28/01/2019	13,219

Table 3: reads existing as of 6 February 2019

P1 March 2019

P1 March 2019 was processed and issued on 7 February 2019. At this point in time, there were no reads spanning March 2019 and volumes for all of its days needed to be estimated. As these nine reads were live in CMOS as of 18:00 6 February 2019 – the cut-off time and date – they were used to estimate volume for March 2019, as shown below.

$$\frac{Read\ 9\ Value - Read\ 3\ Value}{Differences\ in\ days\ between\ Read\ 3\ and\ Read\ 9} * 31\ days\ of\ March$$

$$= \frac{13,219 - 12,311}{430} * 31 = \frac{908}{430} * 31 = 2.112 * 31 = \mathbf{65.46}$$

Equation 1: volume estimation for P1 March 2019

Read 9 was chosen as it was the meter's latest read. Read 3 was chosen as it was the first read that represented at least 12 months' volume from Read 9. As this Uncapped Estimate – 65.46 – was lower than the Capped Estimate based on the meter's ILE, this estimated volume appeared in the settlement report for P1 March 2019. The Retailer paid the Wholesaler the associated volumetric charge.

R1 March 2019

R1 March 2019 was processed on 1 April 2019. Since the P1 run, the Retailer had submitted two more reads:

Read No.	Date	Read
1	31/05/2017	11,750
2	26/08/2017	12,125
3	24/11/2017	12,311
4	26/04/2018	12,531
5	23/07/2018	12,780
6	28/10/2018	13,167
7	25/11/2018	13,201
8	16/12/2018	13,210
9	28/01/2019	13,219
10	17/02/2019	13,260
11	24/03/2019	13,328

Table 4: reads existing as of 1 April 2019

Read 11 was within March 2019. The days prior to 24 March 2019 were in the Meter Advance Period, where actual volume was calculated. The remaining eight days – 24 March inclusive to 31 March – needed to have their volumes estimated. This is shown below.

$$Actual\ Volume = \frac{Read\ 11\ Value - Read\ 10\ Value}{Difference\ in\ days\ between\ Read\ 10\ and\ Read\ 11} * 23\ days$$

$$= \frac{13,328 - 13,260}{35} * 23 = \frac{68}{35} * 23 = 1.943 * 23 = \mathbf{44.686}$$

$$Estimated\ Volume = \frac{Read\ 11\ Value - Read\ 3\ Value}{Difference\ in\ days\ between\ Read\ 3\ and\ Read\ 11} * 8\ days$$

$$= \frac{1,017}{485} * 8 = 2.097 * 8 = \mathbf{16.775}$$

$$Total\ Volume = Actual\ Volume + Estimated\ Volume = 44.686 + 16.775 = \mathbf{61.46}$$

Equation 2: calculation of actual volume, estimated volume and total volume in R1 March 2019

Read 11 was chosen as it was the meter's latest read. Read 3 was chosen as it was still the first read that represented at least 12 months' volume from Read 11. As the volume that appeared in R1 March 2019 differed from P1 March 2019 volume, reconciliation was required. The Wholesaler paid the Retailer the charge associated to the difference in volumes, which was (65.46 – 61.46 =) 4 m³.

R2 March 2019

R2 March 2019 was processed on 1 June 2019. Since the R1 run, the Retailer had submitted two more reads:

Read No.	Date	Read
1	31/05/2017	11,750
2	26/08/2017	12,125
3	24/11/2017	12,311
4	26/04/2018	12,531
5	23/07/2018	12,780
6	28/10/2018	13,167
7	25/11/2018	13,201
8	16/12/2018	13,210
9	28/01/2019	13,219
10	17/02/2019	13,260
11	24/03/2019	13,328
12	28/04/2019	13,474
13	26/05/2019	13,573

Table 5: reads existing as of 1 June 2019

March 2019 was then completely spanned by meter reads and no days needed to have their volumes estimated. The presence of Read 11 meant there were two distinct Meter Advance Periods. The calculation of volumes is shown below.

$$Actual\ Volume\ 1 = \frac{Read\ 11\ Value - Read\ 10\ Value}{Difference\ in\ days\ between\ Read\ 10\ and\ Read\ 11} * 23\ days$$

$$= \frac{13,328 - 13,260}{35} * 23 = \frac{68}{35} * 23 = 1.943 * 23 = \mathbf{44.686}$$

$$Actual\ Volume\ 2 = \frac{Read\ 12\ Value - Read\ 11\ Value}{Difference\ in\ days\ between\ Read\ 11\ and\ Read\ 12} * 8\ days$$

$$= \frac{13,474 - 13,328}{35} * 8 = \frac{146}{35} * 8 = 4.171 * 8 = \mathbf{33.371}$$

$$Total\ Volume = Actual\ Volume\ 1 + Actual\ Volume\ 2 = 44.686 + 33.371 = \mathbf{78.08}$$

Equation 3: calculation of actual volume and total volume in R2 March 2019

As the volume that appeared in R2 March 2019 differed from that in R1 March 2019, reconciliation was required. The Retailer paid the Wholesaler the volumetric charge associated to the difference in volumes, which was (78.08 – 61.46 =) 16.62 m³.

This increase in charge to the Retailer is partially due to no reads existing between 24 November 2011 and 26 April 2018. In R1 March 2019, CMOS looked for the first read that showed at least 12 months' worth of volume from 24 March 2019, which resulted in the same read that was used in P1 March 2019 – Read 3 – for volume estimation. This shows the importance of regular read submission in the volume estimation process: volume that could have been allocated between February to March 2018 through reads – which would have resulted in higher volume estimated for March 2019 – was instead spread over a much longer time period (November 2017 to April 2018).

Reconciliation between the Wholesaler and Retailer for March 2019 is shown below. Any further settlement-affecting data amendments that were made by either Trading Party to March 2019 would have been captured in subsequent settlement runs, i.e. R3 March 2019 and RF March 2019. In this instance, no further amendments occurred.
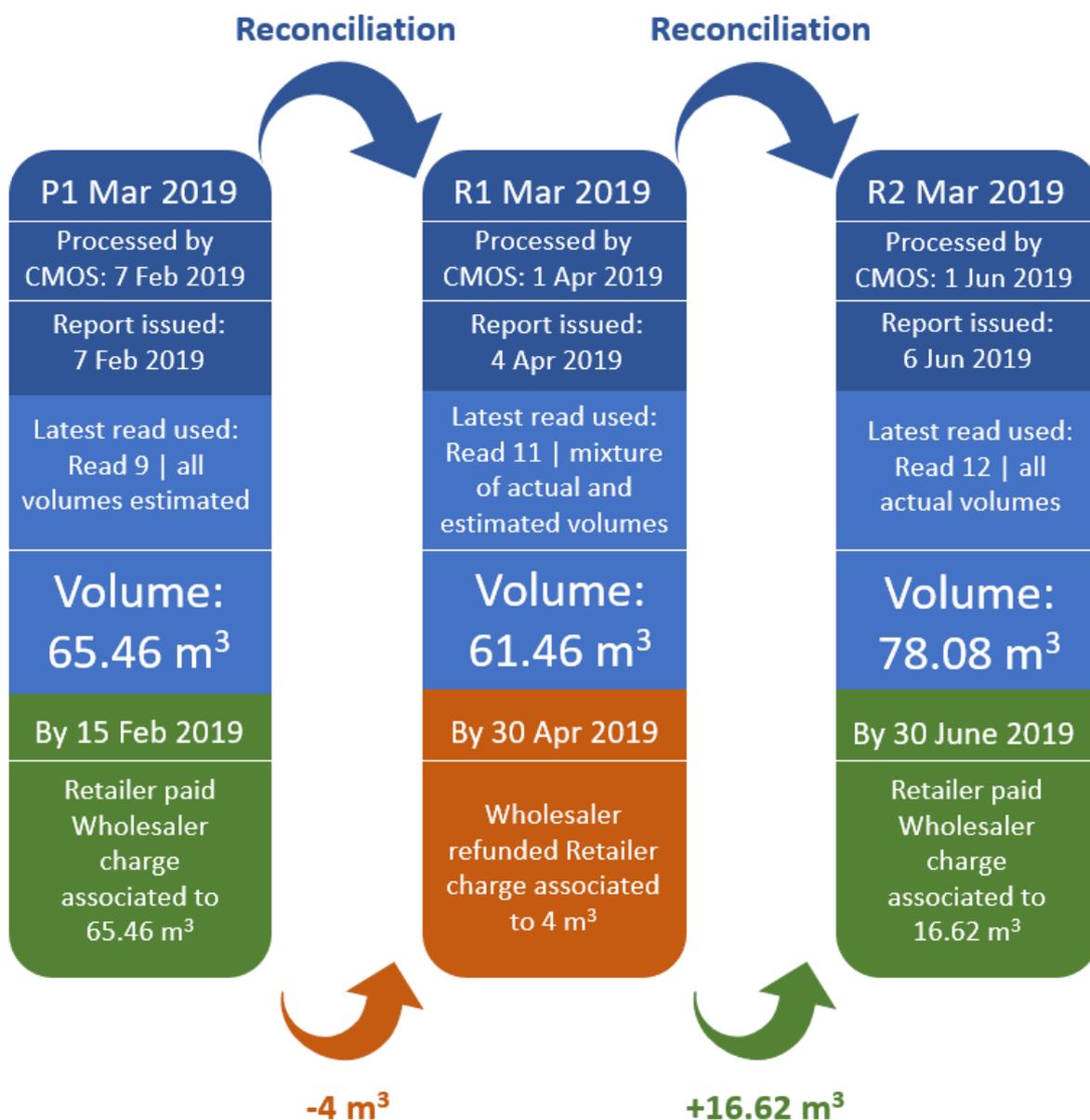

Figure 10: reconciliation for March 2019

GLOSSARY

Term	Definition
AMR	Automated Meter Reading device. These devices create communication channels between customers and other organisations, to send meter reads.
Capped Estimate	Refers to either Capped ILE or Capped YVE.
Capped ILE	The Industry Level Estimate multiplied by 10.
Capped YVE	The Yearly Volume Estimate multiplied by three.
CMOS	The Central Market Operating System, which stores market data centrally and runs several processes, including registration, switching and settlements. Also referred to as the Central Systems in the market codes.
Effective From Date (EFD)	Where this is included in a transaction submitted to CMOS, this is the date that new data or any change to data included in the transaction is effective from.
Effective To Date (ETD)	Where this is included in a transaction submitted to CMOS, this is the date that new data or any change to data included in the transaction is effective to.
Industry Level Estimate	The average industry estimate for metered usage, grouped by meter size. It is used in the Meter Pre-Advance Period and Meter Post-Advance Period for days where the YVE is not specified.
Invoice Period	The calendar month for which volumes and charges are being calculated.
Meter Advance Period	Any period between two meter reads.
Meter Pre-Advance Period	Where a meter has been installed and only has its initial read, any period following this read.
Meter Post-Advance Period	Where a meter has at least two reads, any period after the meter's latest read.
Settlement Run	The process through which charges are calculated for invoice periods.
Trading Party	Wholesalers and Retailers who have Wholesale Contracts in place and can trade.
Transaction	The mechanism through which Trading Parties can amend data in CMOS and receive any relevant notifications, as set out in CSD 0301.
T104.W	The transaction Wholesalers can use to set up meters in CMOS.
T146.R	The transaction Retailers can use to amend YVE data in CMOS.
Yearly Volume Estimate	An estimate of the annual volume passing through a meter, when the site is occupied.