Dŵr Cymru Welsh Water

IAP Response

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RCV Run-Off Rates Methodology

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Contents

1. Introduction

The purpose of this document is to describe the analysis undertaken by Jacobs to determine the overall RCV run-off rates for Dŵr Cymru Welsh Water (DCWW). This piece of work is in response to Ofwat's initial response to DCWW's PR19 submission, specifically action WSH.RR.A6 which states:

- The company should provide further evidence to support the calculation of RCV run-off rates and demonstrate that the rates are consistent with the approach set out in the business plan.

We have recently completed development of the new MEAV Tool, which contains a large volume of DCWW data including extracts from SAP and the Unit Cost Database. This tool includes information on asset lives, asset age and gross MEAV, making it an appropriate platform to analyse RCV run-off rates. This document provides the results of the analysis and describes the methodology that has been used to generate the RCV run-off rates.

2. Overview of the MEAV tool

The RCV run-off rates have been calculated using the newly developed MEAV tool. This section provides a brief description of how the MEAV tool functions and describes some of the key concepts related to the RCV run-off rate analysis. Further detailed information on the MEAV Tool can be found in the “DCWW MEAV Tool Methodology”.

2.1 MEAV tool gross valuation

The MEAV tool has been developed to conduct gross and depreciated valuations of all non-infrastructure assets and the gross valuation of infrastructure assets. To complete this, the tool contains extracts of data from DCWW’s SAP Asset repository and Unit Cost Database. Within SAP, assets are represented in a hierarchy with Sites being comprised of Processes and Processes being comprised of Equipment. The MEAV tool values assets at the Process level. The heart of the MEAV tool is the linking of each process with one or more cost models. SAP holds data on many thousands of processes. For this reason, and because of the limited fidelity of data available in SAP and the limited number of cost models available, it is not practical to value each process as the unique asset that it is in real life. Instead, asset classes are defined to capture the main properties of each type of asset.

These asset classes are idealised representations of what each asset could be, if another brand-new asset were built in its place to perform the same function. In other words, each asset class defines a modern equivalent asset, based on the cost models available.

The MEAV tool contains a number of classifications including site class and RAG upstream classifications that allow the valuation to be broken down at a number of different levels.

2.2 MEAV tool asset life

A weighed asset life is calculated from the DCWW-supplied Capex Repeats data which accompanies the Unit Cost Database. Most cost models have pre-calculated capex repeat years. Where a cost model has multiple asset lives (to represent, for example, civils and M&E components) it also provides the split for each asset life. The tool uses these splits to obtain a single weighted average asset life for each asset. As an example, if a cost model has capex repeat years as follows:

- 80% Civils at 60 years;
- 20% M&E at 20 years

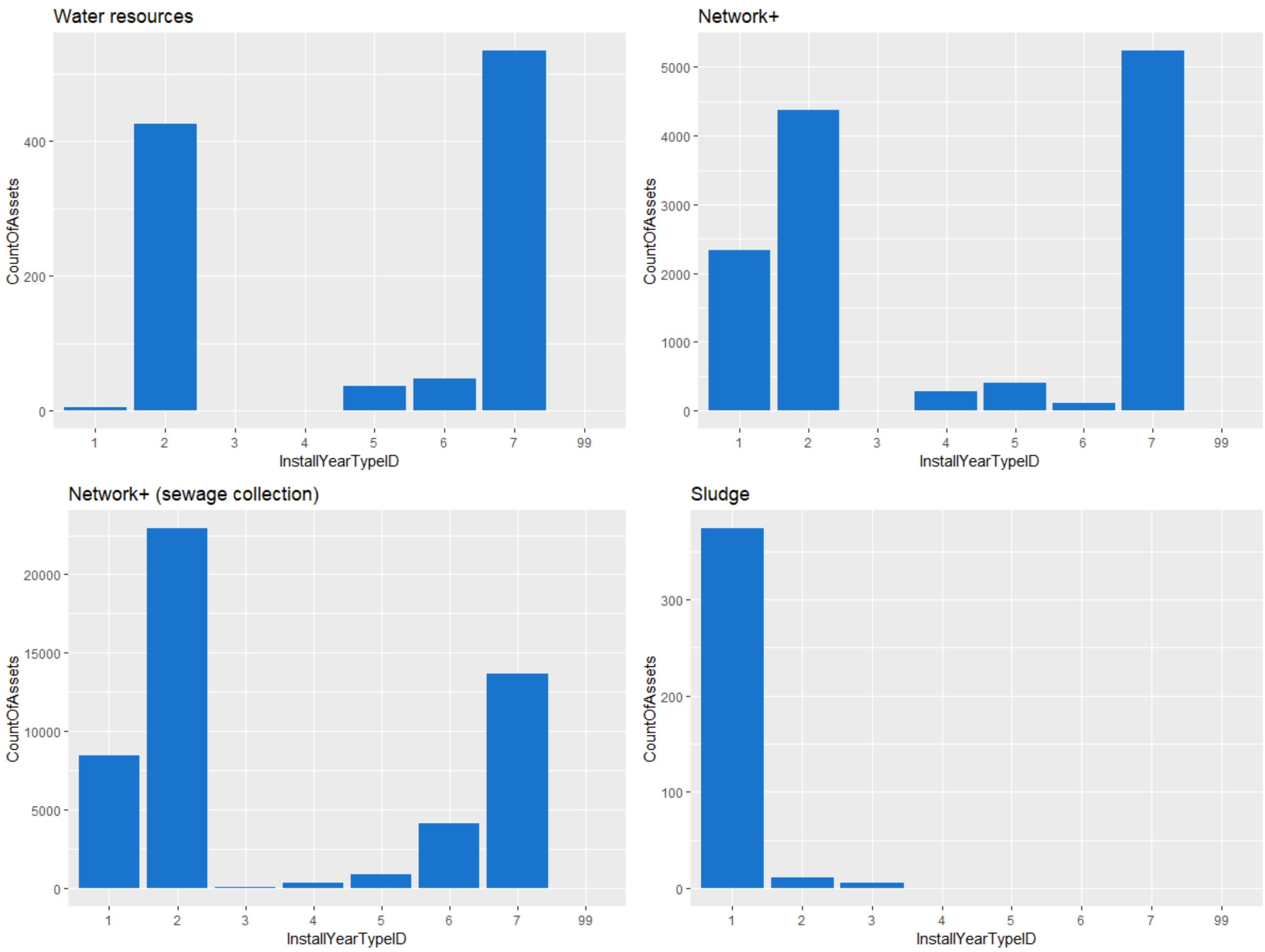
The weighted average asset life used in the model is 52 years (0.8 x 60 + 0.2 x 20).

2.3 MEAV tool asset age

The SAP database contains install date information for equipment and processes. These were used to estimate asset install date, with the preference to use an approach checking the install year for all equipment and selecting the most common install year for each process. However, this information is not present or reliable in all cases, so a rules-based approach was used, drawing on various sources of information from SAP to find the most accurate install year estimate for each asset. Asset age is then calculated by subtracting the asset installation year from the valuation year. For the purposes of the RCV Run-Off-Rate analysis the valuation year was set to 2018.

The plots provided in Figure 1 show a breakdown of how reliable the data is for each upstream market, with an install type of 1 representing the most reliable source of data and install type 7 representing the least reliable source. It is notable that the majority of sludge assets use the most reliable source of data but there is a mix of reliable and unreliable sources for the other upstream markets.

Figure 1: Source of installation year by upstream market (Install type 1 is most reliable and install type 7 is least reliable)



The asset age analysis used for this RCV analysis includes one key assumption which has a significant effect on the RCV run-off rate. In cases where asset age is greater than asset life, the asset is assumed to have zero remaining life. In these circumstances, the asset is assumed to have zero economic life and is excluded from the RCV run-off rate calculations. An alternative approach to this is to assume that when an asset age exceeds the asset life, the “clock” is reset to zero and the assigned asset age is the equivalent of the remainder of asset age beyond the asset life. Using this alternative approach results in greater RCV run-off rates.

2.4 Uncertainty

The MEAV tool generates upper and lower 95 percentiles around a mean for both gross and depreciated valuations. There are multiple sources of uncertainty and the tool currently considers uncertainty in the cost models, capacity data, asset age and asset life.

For asset age, uncertainty has been determined by comparing the calculated asset age obtained from each source of data with known ages where available. From this, the mean error percentage has been calculated for each source of data and these errors are applied to each calculated age.

For asset life, there is no formal uncertainty provided for the capex repeat data in the Unit Cost Database and it is not possible to calculate uncertainty for this without knowledge of the source data. For the purposes of this analysis we have assigned +-75% uncertainty on all asset lives which is intended to represent the high level of uncertainty in the asset life data. We have not assigned an Ofwat accuracy grade 6 (+-100%) to the asset lives because this would result in asset lives being 0 at the lower bound. We have tested different confidence grades for asset life and the RCV run-off rates are relatively insensitive to it. Changing the uncertainty on asset life from 10% to 75% has relatively little effect on the run-off rates.

Cost model uncertainty is calculated using the formal uncertainty data provided in the unit cost database which provides the upper and lower 95 percentiles for many of the cost models. Where this formal uncertainty is not provided for a cost model, the mean upper and lower deviations are used.

Uncertainty in the capacity data is assigned using confidence grades in SAP which are associated to each piece of capacity information. Where there is capacity data but with no corresponding confidence grade, the tool will use a default confidence grade assigned to each type of capacity, this is usually the Ofwat accuracy grade of 6.

3. Method

The RCV run-off rate analysis has been undertaken in R, connecting directly to the MEAV tool's database. Figure 2 provides an overview of the steps in the analysis and the following sections provide further detail.

Figure 2: Overview of the analysis

3.1 MEAV data

To conduct this analysis, a specific valuation was run in the MEAV tool which set the value for all infrastructure assets to zero. This excludes infrastructure assets from the valuation and ensures that the uncertainty calculated for the depreciated valuation contained only uncertainty relating to the assets that depreciate (the gross value of infrastructure assets is included in the total depreciated value and therefore capacity and cost model uncertainty for these assets would contribute to the overall depreciated uncertainty).

Following the valuation, the latest run results are extracted from the MEAV tool into R from the following table:

- FrontEnd.LatestRunResults (where Depreciate = 1)

This data contains results for all individual assets valued in the MEAV analysis, including infrastructure and non-infrastructure assets. To make sure the RCV rates are only calculated for assets that depreciate, this data is filtered using the Depreciate tag.

Uncertainty data is also loaded into R from the following table in the MEAV tool:

- FrontEnd.LatestUncertaintyResults (where FilterType = UpstreamMarket or FilterType = Total)

This table contains aggregated uncertainty for the gross and depreciated valuations. To aggregate uncertainty, the MEAV tool uses a least-squares approach and calculates uncertainty at an overall level (Total) and also broken down by several classifications. In this case, we also extract aggregated uncertainty for each Upstream Market.

Only complete cases from both sets of data are taken forward in the analysis. This filters out any records with missing data (the MEAV tool includes all assets in its outputs including assets which it has not been possible to value).

3.2 Weighted averages

The company's approach is to base run-off rates on useful lives, generated using an assessment of the engineering lives of each asset class and weighted using the gross MEAV. The latest run results from the MEAV tool allow us to calculate an average asset age and average asset life, weighted by gross MEAV at an asset level. The weighted asset age and asset life can then be used to calculate the weighted average remaining life from which the run-off rate can be determined.

The weighted average is calculated for all assets ("total") where the average is weighted by the total gross MEAV for all assets included in the RCV run-off rates analysis. The weighted average is then also calculated separately for all assets in each upstream market, where the average is weighted by the total gross MEAV for all assets within each upstream market. The weighted average asset age can be represented as:

$$w = \sum a \times \left({}^{g}/_{\sum g} \right)$$

where:

w = weighted average asset age;
a = asset age;
g = gross MEAV;
y = number of assets (either total or within each upstream market).

The weighted average asset life and weighted average remaining life are also calculated in the same way (although remaining life could be calculated simply as the difference between the weighted average asset life and weighted average asset age).

3.3 Uncertainty in remaining life

Uncertainty in the RCV run-off rates is calculated using the overall uncertainty in the depreciated valuation calculated by the MEAV tool. The MEAV tool uses a least-squares approach to aggregate uncertainty and calculates this at several different levels within the tool. Uncertainty here is defined as a proportional deviation from the mean representing the lower and upper 95 percentiles.

We believe that this is the most appropriate way to determine uncertainty in the RCV run-off rates. Uncertainty in the depreciated valuation, represents uncertainty in the depreciation which is represented by the RCV run-off rate.

Two types of depreciated valuation are calculated in the MEAV tool: straight-line depreciated value; and economic life depreciated value. The latter uses discount rates to determine the depreciation. For the purposes of the RCV run-off rates, the lower and upper deviations from the economic life depreciated valuation have been used for uncertainty.

To apply this uncertainty to the analysis, the latest aggregated uncertainty data from the MEAV tool was applied to the calculated weighted average remaining lives:

$$w_l = w \times d_l$$

$$w_u = w \times d_u$$

where:

w_l = weighted average remaining life lower bound
d_l = depreciated valuation lower deviation from the mean
w_u = weighted average remaining life upper bound
d_u = depreciated valuation upper deviation from the mean
w = weighted average remaining life

4. Results

The results of the analysis are provided in the accompanying Excel spreadsheet (RCV Runoff Rate 2019-03-13.xlsx). A summary of the results is provided below:

Figure 3: Summary of the results

	Weighted Average Asset Age	Weighted Average Asset Life	Remaining Life - Lower	Remaining Life - Weighted Average	Remaining Life - Upper	Rate - Lower	Rate - Weighted Average	Rate - Upper
Total	20.84	42.66	28.83	21.82	15.50	0.0347	0.0458	0.0645
Water resources	34.59	59.29	49.98	24.70	0.00	0.0200	0.0405	-
Network+	20.06	41.81	34.32	21.75	10.56	0.0291	0.0460	0.0947
Network+ (sewage collection)	21.81	43.72	29.64	21.91	15.13	0.0337	0.0456	0.0661
Sludge	14.63	35.56	28.38	20.94	10.88	0.0352	0.0478	0.0919

The results show an overall RCV run-off rate of 4.58% with lower and upper bounds of 3.47% and 6.45%.

It has not been possible to calculate an upper bound for Water Resources because of the wide variation in remaining life. As shown in Figure 1, the asset ages for Water Resources assets are based on poor quality installation year data, with very few assets aged using the highest quality data. This contrasts with Sludge assets which have high quality source data, resulting in a smaller range between upper and lower remaining lives.