Hafren Dyfrdwy PR24 Cost Adjustment claims

June 2023

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Content

1. AMP8 Energy cost pressures: Need for a Cost Adjustment Claim, Real Price Effect adjustment and Uncertainty Mechanism

Energy unit costs are currently materially above the levels seen in the historical botex+ modelling data panel. Price increases have also significantly departed from the CPIH inflation index. This means that a large Real Price Effect (RPE) has appeared for both power costs and chemical costs (for which energy is large contributor to price inflation). Consequently, these future costs will not be accounted for in the AMP8 base cost forecasts derived from botex+ models (and then indexed by CPIH).

Table 2 Claim summary table

Claim component	Value	Description
Is the claim symmetrical?	No	Does not relates to costs historically incurred. Therefore, no costs in historical data panel to redistribute.
Can the cost be isolated from the botex+ dependent variable?	Yes	Power is separately out on its own opex line.
Is there a suitable explanatory variable available to describe the costs?	No	It might be possible to use an independent energy index (e.g. BEIS) as an explanatory factor. However, given that this does not materially vary from CPIH over the data panel timeseries, to is not likely to be very statistically significant.
Central case: Gross claim	£28.7m (Water) £4.6m (Waste) **£33.4m (Total)**	Net Claim + IA calculation
Central case: IA	£18.6m (Water) £2.7m (Waste) **£21.3m (Total)**	Difference approach
Central case: Net Claim	£10.1m (Water) £1.9m (Waste) **£12.0m (Total)**	Scaling the unit cost identified in the implicit allowance calculation
Range: Gross claim	**£25.7m-£37.2m (Total)**	Bottom range based on Cornwall Insight March forecast without REGO, Modelled historical IA, Historical % future IA and chemicals excluded. Top based on Cornwall Insight November forecast with REGO, with 'Direct, Median' historical IA, Modelled forecast IA and chemicals included.
Range: IA	**£15.7m-£21.3m (Total)**	Bottom range based on Historical % forecast IA method with chemicals excluded. Top based on Modelled forecast IA method with chemicals included.
Range: Net Claim	**£10.0m-£15.9m (Total)**	Bottom range based on Cornwall Insight March forecast without REGO, Modelled historical IA, Historical % IA and chemicals excluded. Top based on Cornwall Insight November forecast with REGO, with 'Direct, Median' historical IA, Modelled forecast IA and chemicals included.
Relevant Price Controls	All	

Normally, input price pressures can be dealt with by a RPE adjustment and associated ex-post true up (as per labour costs at PR19). However, this is not likely to be sufficient in AMP8. This is because there is a major jump in both the price of energy and the strength of the RPE relative to CPIH, which has occurred during AMP7 but is not fully reflected in the modelling dataset.

RPE adjustments have typically considered the year-on-year change of input prices relative to CPIH. Forecasts currently show that energy unit costs and the associated input price pressure will fall through AMP8 from the very high levels that are currently evident. It is right and proper that this anticipated relaxing of the input price pressure should be shared with customers. However, given that the base cost modelling data panel does not account for the price rises that have caused this price pressure, an in-AMP RPE adjustment would simply exacerbate the pressure further by removing expenditure that has not be allowed for by the models in the first place.

In summary, it is important that this cost adjustment claim is considered alongside any RPE mechanisms and is accompanied by an energy unit cost uncertainty mechanism. We have set out a possible approach that combines:

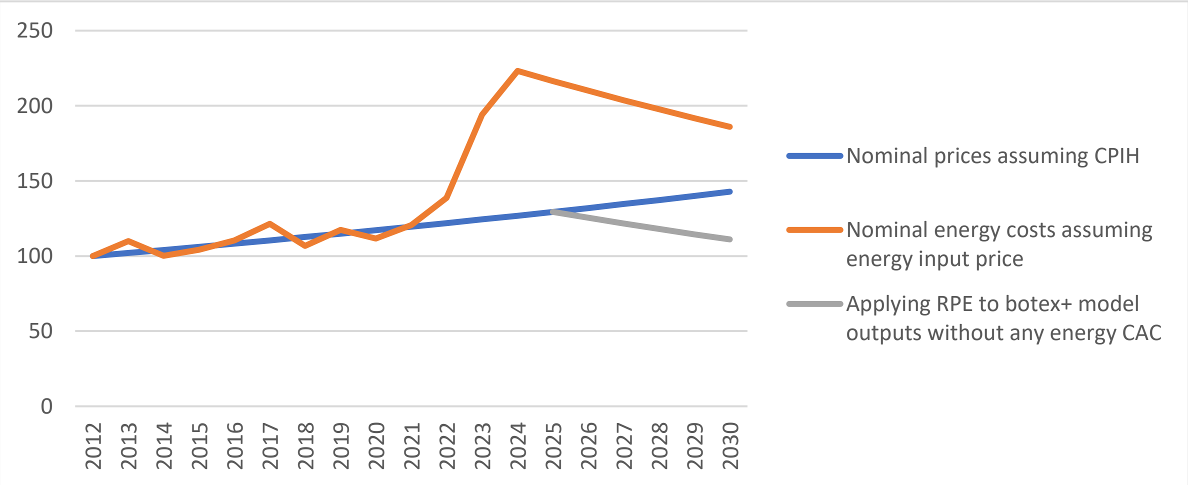
- a **cost adjustment claim** (to address to lack of coverage of current energy costs in the historic data panel);
- a **RPE adjustment mechanism** (to manage the forecasted change in the real price effect through AMP8); and
- an **uncertainty mechanism** that tracks outturn energy unit costs rather than total energy costs (to acknowledge the significant uncertainty associated with the forecasts and remove the likely windfall gains or losses that would result if an uncertainty mechanism was not in place).

The need for these mechanisms is illustrated graphically in ***Figure 3*** and ***Figure 4*** below.

We consider that this approach ensures that risk is appropriately shared between companies and customers. It should mean that inherent uncertainties related to forecasting the future energy markets should not lead to unfounded swings in efficiency out / underperformance. And it should also retain the fundamental incentive to effectively procure power and drive energy efficiency.

In this chapter we provide evidence of the energy real price effect we are likely to see in AMP8, set out how we have quantified the claim, and describe how the recommended mechanisms could work.

Figure 3 Illustrative example showing the forecast energy cost pressure in AMP8.

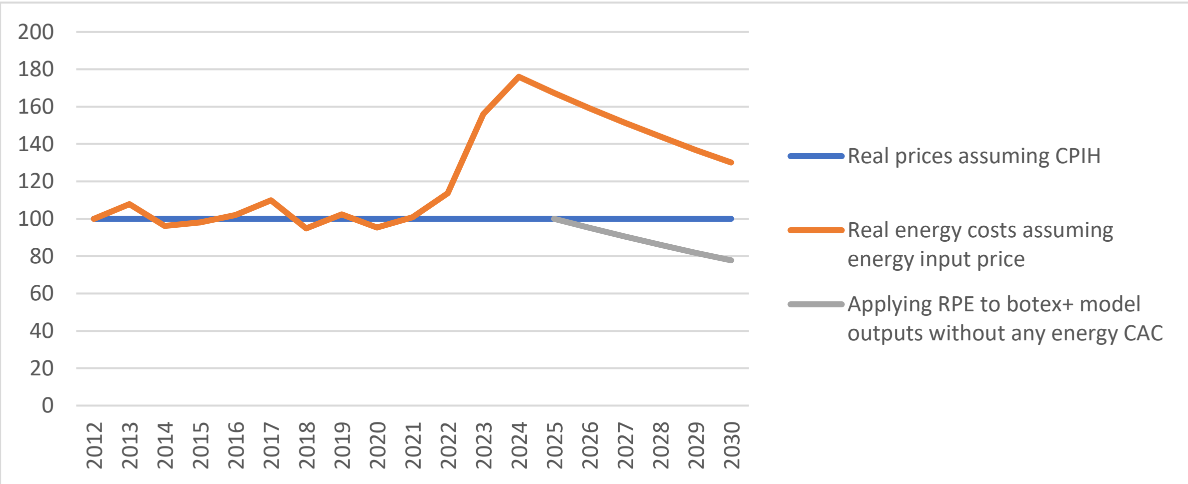


In ***Figure 4*** above, energy costs track CPIH in the period covering the botex+ model historical data panel (2011-12 to 2021-22). This means that the model will assume that energy inflation can be managed through the use of CPIH indexation. However, the orange line shows a material departure of energy prices after the end of the modelling data panel. Across AMP8 the example shows a real price reduction in energy. The interaction of these two factors will determine the amount of energy costs not accounted for in AMP8 forecasts derived from botex+ models.

This claim suggests that the forecasted pressure (gap between blue and orange lines) is material and should be addressed through an energy cost adjustment claim and corresponding RPE adjustment. If the RPE adjustment were to be applied without the energy CAC, the grey line would transpire. This would give a major under allowance for efficient energy costs.

Finally, we acknowledge that there is material uncertainty in both the height of the forecasted energy price at the start of AMP8 and then the likely reduction in energy RPE across AMP8. Therefore, we are proposing an uncertainty mechanism based on outturn energy unit cost (but not energy costs). This will manage the uncertainty whist retaining the incentive for energy efficiency.

Figure 4 As per figure 3 but in real terms (2022/23 prices)



The increase in energy costs has a direct impact on the costs of electricity and gas consumed, reported within power costs and the income from generation of gas and electricity, reported in negative opex. Higher wholesale energy prices also have an indirect effect on chemicals costs. Chemical unit prices have risen significantly during AMP7 and are materially higher than unit prices within historic costs used as part of botex+ modelling - chemicals inflation has departed significantly from CPIH inflation resulting in a large RPE. Consequently, future chemical costs are not adequately accounted for in AMP8 base cost forecast derived from botex+ models (and then indexed by CPIH).

There is a causal relationship between energy and chemical prices with energy costs making up a significant proportion of costs of manufacture for several key chemicals such as caustic and polyelectrolytes. Our cost adjustment claim for energy includes the impact of real price effects that will be seen indirectly through real price effects on chemical costs which is calculated based on the statistical relationship between historic energy and chemical real price effects.

1.1 Need for adjustment (necessary)

1.1.1 Unique circumstances

Criteria

- a) Is there compelling evidence that the company has unique circumstances that warrant a separate cost adjustment?
- b) Is there compelling evidence that the company faces higher efficient costs in the round compared to its peers (considering, where relevant, circumstances that drive higher costs for other companies that the company does not face)?
- c) Is there compelling evidence of alternative options being considered, where relevant?

The unique circumstances of the energy crisis will lead to exceptional increases to efficient power costs relative to the cost modelling data panel.

The circumstances that have led to the current energy crisis are both exceptional and material. They have been fundamentally driven by major global geopolitical events such as the invasion of Ukraine and 'perfect storm' circumstances of dramatically changing demand through the end of the COVID-19 pandemic coupled with atypical weather conditions leading to continent wide supply and demand challenges. These 'shocks' have also been superimposed on top of longer-term trends impacting on the UK energy supply market (for example the move to low carbon power generation). Together, the dramatically increasing resultant energy unit costs have led to a major impact on our cost base. Given that the global price of energy is fundamentally outside of our management control, this will lead to a material increase in the amount of efficient costs we will require in AMP8.

There will be some variation in both the magnitude and the impact felt by companies. For example: due to the amount of renewable energy generation by the company; and the extent to which companies' energy hedging policies serendipitously 'predicted' the time and extent of the crisis). However, the effect of the energy crisis will have been universally felt across the sector. Consequently, this claim relates, more to the fact that we face higher efficient costs relative to the coverage in the historic data panel, rather than us forecasting higher costs relative to our peers. This means that similar claims are likely to be applicable for all companies. However, a symmetrical adjustment is not appropriate. This is because there are no relevant costs within the modelling data panel that should be redistributed as a result of this claim.

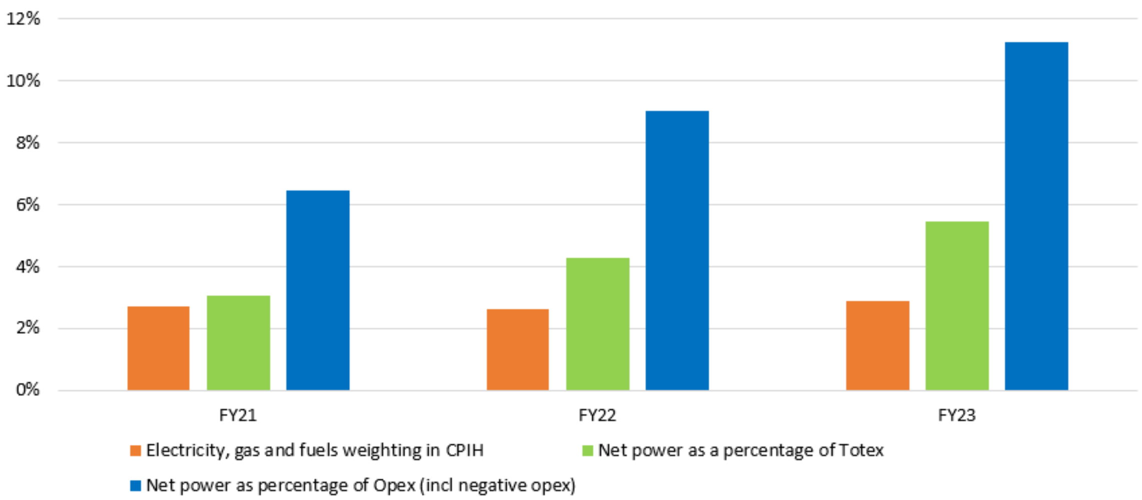
A real price effect adjustment alone will not adequately allow for the AMP8 pressure on efficient energy costs.

Increases in power unit costs have historically been allowed for through inflation indexation. However, current energy increases have created a material wedge between energy costs for the water sector and CPIH. This is fundamentally because energy is a larger cost centre to the water sector than it is in the CPIH basket.

As shown in ***Figure 5***, electricity, gas and other fuels makes up 3% of the CPIH basket from 2016 to 2022. In the March 2023 update of weightings the electricity, gas and other fuels contribution in the CPIH basket increased to 4%. Power costs make up a larger contribution to Hafren Dyfrdwy's costs than the weighting within CPIH; in 2021-22 electricity costs net of generation income (including renewable incentive income) make up 6% of Hafren Dyfrdwy operating expenditure and 3% of net totex. The significant increase in wholesale market energy prices we have seen since 2021, combined with the impact of hedging positions (which delay, but do not eliminate the impact of higher market prices) mean that power costs have reached peak of 11% of operating expenditure and 5% of net totex in 2022-23.

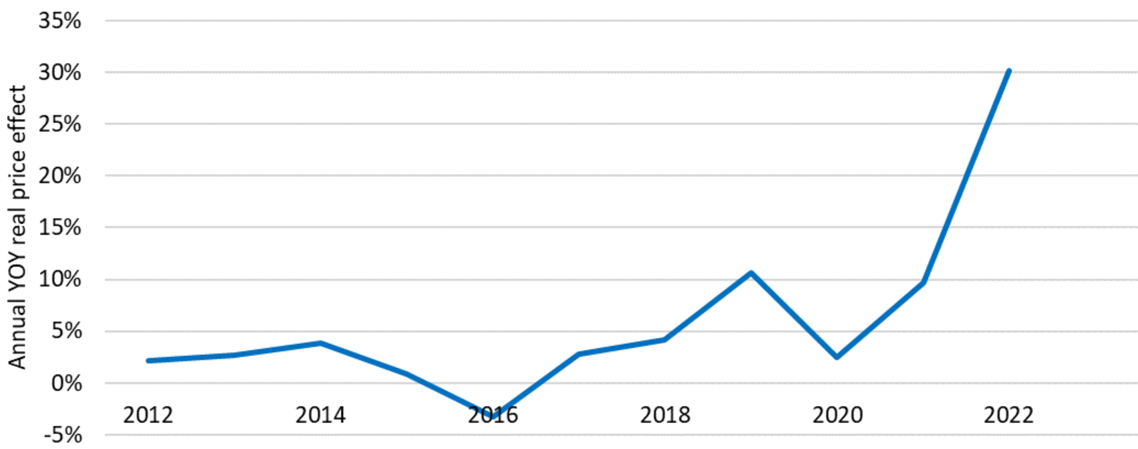
The divergence between the proportion of power costs within totex and the contribution of power to CPIH has also been driven by more generous government support schemes for domestic energy bills compared to support schemes for businesses, the timing of the impact of energy hedging trades and the control of other costs.

Figure 5: Hafren Dyfrdwy net power costs as a percentage of operating costs and net totex compared to the weight of energy costs within the CPIH basket



This material difference between water sector expenditure and the CPIH basket, coupled to the material increase in energy unit costs, has created a significant energy input price pressure which should be considered as part of PR24. As shown in ***Figure 6***, for the duration of the model data panel (back to 2011-12) wholesale energy prices have largely tracked CPIH , with an average annual real price effect of less than 3% up to the beginning of AMP7. Therefore, this current input price pressure will not be accounted for in botex+ models used to forecast AMP8 base expenditure.

Figure 6: Annual real price effects based on electricity price index for the industrial sector including CCL, (Source: Department for Energy Security and Net Zero (formerly Department for Business, Energy and Industrial Strategy (BEIS))



At PR19, Ofwat investigated the need to allow for material input price pressures.

- Ofwat reviewed wages, power, chemicals and materials.
- Wages was the only one of the four where Ofwat considered that there was likely to be a material input price pressure across AMP7.
- Ofwat allowed for a 0.5% input price pressure per year (i.e. water sector wages were forecast to increase at 0.5% more than CPIH).
- This was removed from the frontier shift efficiency challenge, but to acknowledge the inherent uncertainty in the forecast, is subject to a true-up at the end of AMP7.

As there was no energy RPE allowed at PR19, the energy input price pressures that we are currently having to manage in AMP7 will not be recoverable from customers (over and above the cost sharing incentive). However, we consider that the case for an energy cost adjustment claim and subsequent RPE adjustment for AMP8 is now compelling. We are reassured that Ofwat has already made steps to gather the necessary information to make an adjustment by asking companies to submit their view of energy input price pressures across AMP8 in table SUP11.

We are strongly of the view that an energy RPE must be accompanied with an equivalent cost adjustment claim. This is to make sure that allowances for energy costs at the start of AMP8 allow for the cost pressures that are not represented in the historical botex+ modelling data panel. This is critical to ensure that the RPE can then unwind from a representative starting point, given that energy prices are forecast to fall through AMP8.

Current forecasts show that market energy prices peaked in 2022/23 and they are forecast to fall in both nominal and real terms across AMP8. RPEs follow the long term trend of market energy prices but also include the impact of hedging. For SVE, the peak in energy prices and the associated RPE peak is forecast for 2023/24. Hedging during AMP7 reduced the impact of the spike in market energy prices in 2022/23 and shifted in peak in energy costs into 2023/24. Negative RPEs are forecast for 2024/25 and across AMP8 (i.e. as energy costs are forecast to fall in real terms). This means that the application of an energy RPE without an equivalent energy cost adjustment claim will likely amplify rather than mitigate the energy cost pressure issue currently faced.

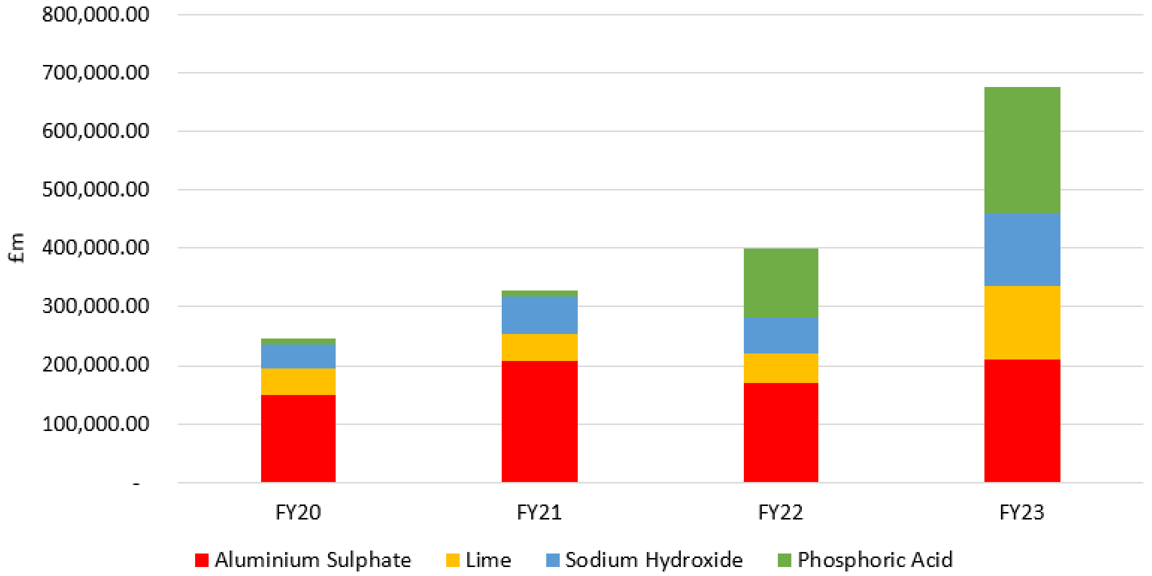
We are fully aware that both the timing, size and rebound of energy input price pressure is highly uncertain. Therefore, it would be very desirable for both companies and customers to have uncertainty mechanisms on both size of energy pressure in year 1 of AMP8, and the change in RPE across AMP8 (as set out in the data reported in table SUP11).

The unique circumstances of the AMP7 energy inflation has contributed to an exceptional increase to efficient chemicals costs relative to the cost modelling data panel.

During AMP7 we have seen an increase in chemicals costs that is both exceptional and material. The increase is fundamentally driven by major global geopolitical events such as the invasion of Ukraine and the impact on supply chains and the significant increase in energy costs which a large component of production costs of many of the key chemicals including caustic soda (sodium hydroxide), phosphoric acid and polyelectrolytes.

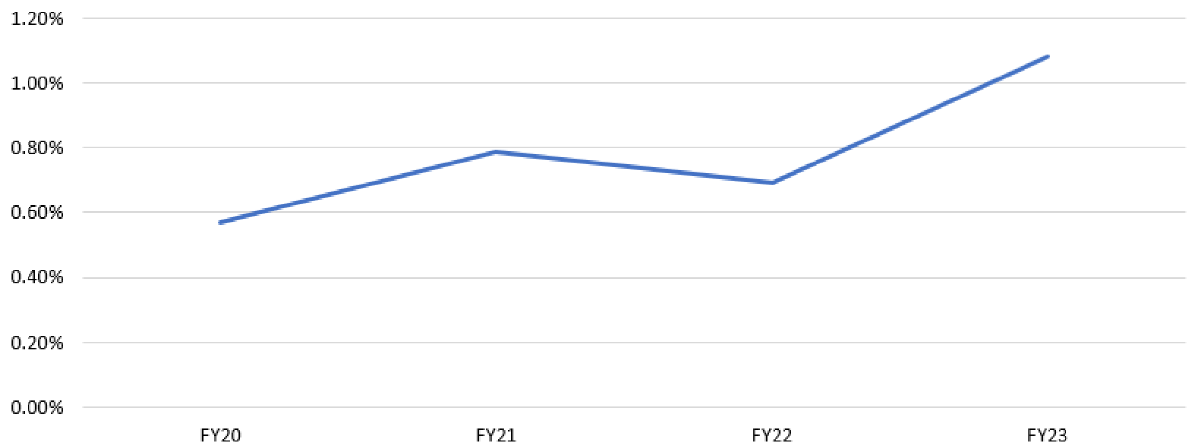
The factors driving chemical price inflation vary for each particular chemical depending on the supply – demand dynamics, the particular input costs of production, the potential for supply chain disruption and the competitiveness of the market. ***Figure 7*** shows the increase in costs since 2016/17 across the six which contribute most to operating costs. The most significant increase in costs has come from caustic soda, polyelectrolytes and phosphoric acid for which costs have increased by triple digit percentages since the beginning of AMP7 - with an increase of over 300% for caustic soda. These chemicals involve energy intensive production methods and energy costs form a significant proportion of their bill of materials.

Figure 7: Hafren Dyfrdwy costs of top four chemicals 2016-17 to 2022-23 forecast



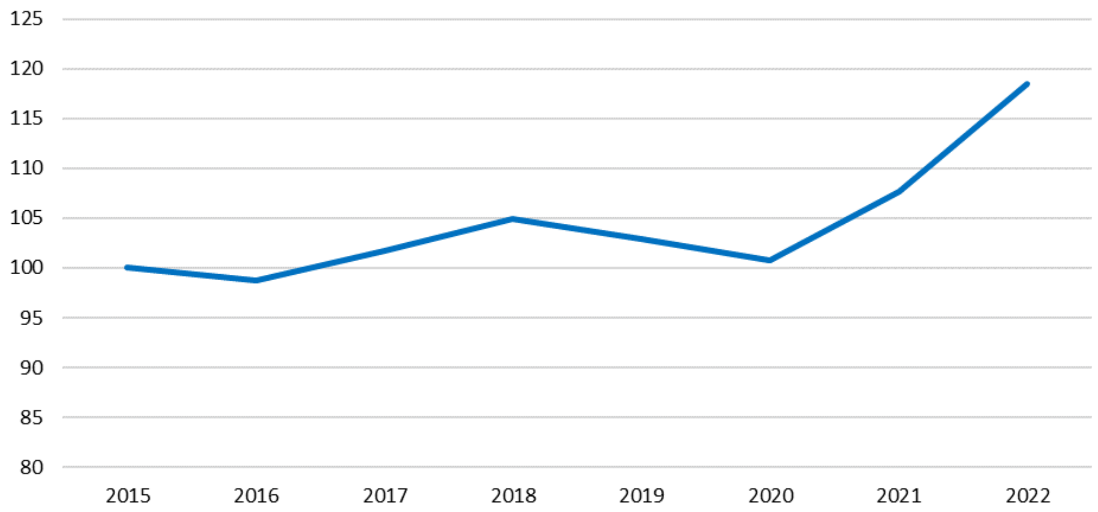
Chemical costs have become a more material component of totex during AMP7 and as shown in ***Figure 8***, chemicals cost as a percentage of net totex have increased from 2.0% at the end of AMP6 to 3.4% of net totex in 2023/24. It is important to note that the increase in chemicals costs is driven by both price and volume. In this energy cost adjustment claim we consider only the impact of energy prices on chemical unit costs and not the impact of volume, this avoids any potential double counting with the P REOC claim.

Figure 8: Hafren Dyfrdwy chemicals as a percentage of net totex



The trends of chemical inflation from internal Hafren Dyfrdwy data is matched by the trends shown in independent indices of chemical inflation. ***Figure 9*** shows the trend shown in the 'inputs of chemicals' index within the ONS producer price inflation index. In real terms there is minimal increase in chemicals costs from 2015 to 2021, this then followed by a significant increase in costs with a real terms increase of 18% across 2020 to 2022.

Figure 9: Chemical input index (FSQ7) component of Producer price inflation index, deflated by CPIH, 2015 = 100 (Source: ONS)



1.1.2 Management control

Criteria
• d) Is the investment driven by factors outside of management control?
• e) Have steps been taken to control costs and have potential cost savings (eg spend to save) been accounted for?

Management control – Power costs

Power costs are a function of the amount of energy used (MWh) and input price of power (£/MWh). The amount of energy used over time is fundamentally a function of:

- demand (water delivered / sewage treated) and
- energy efficiency (making sure that energy is not wasted / assets are operating as efficiently as possible).

The former is largely an exogenous factor driven by the customer base as well as the geographical/ environmental opportunities or challenges faced to deliver the core service to customers. The latter is within management control and is subject to much focus given its impact on our cost efficiency performance.

We continually invest in improving energy efficiency and we have a dedicated Energy Management Team focused on driving operational change to reduce energy. This is supported by a network of energy champions across our business, overseen by an Energy Steering Group.These capital schemes include proactive maintenance on our most energy-intensive assets, such as pumps and air blowers, and investment in improved controls and monitoring to reduce energy use. Through our energy management and efficiency work, we invest on people and assets, find more efficient innovative alternatives, reduce waste and offset rising demands for energy.

Our energy management policy and programme follows the best practice laid down in ISO50001, the international energy management standard. We are also reducing the volumes of water we need to pump and treat by reducing leakage and catchment management helps us avoid unnecessary energy-intensive treatment. We use our half-hourly meter data, regular internal communication and performance reporting to understand energy efficiency and drive behaviour, minimise waste and identify opportunities and we have energy e-learning for all employees. ***Table 3*** sets out some examples of activities we have undertaken to improve energy efficiency.

Table 3: Case studies illustrating some of the actions taken to improve energy efficiency

Description	Details
Pump renewal	The majority of our electricity is used to pump water. We have a proactive testing regime for all our large pumps and these tell us about the efficiency performance of the assets and the pump systems we operate. From these tests we can prioritise operational changes, for example to prioritise more efficient pumps or operate at the most efficient duty point for longer, and we can also target proactive refurbishment or replacement of pumps or motors where this is cost beneficial.
Intelligent monitoring and optimisation	We install monitoring and control to more effectively optimise the amount of energy required for wastewater treatment.
Water network optimisation	We constantly scrutinise our network and pumping arrangements to see if we can minimise the movement and hence pumping cost of water.
Energy efficient assets	We replace energy intensive assets such as the air blowers used for wastewater treatment with more efficient alternatives which reduces energy use.
Energy efficiency internal communications	We have run internal comms campaign directed across all levels in the organisation to encourage energy efficient working practices and to generate ideas for improving energy efficiency. Energy efficiency has been discussed at leadership events for all managers and forms part of e-learning completed by all employees.

This leaves the input price of power as a major external pressure. Companies have the ability to hedge the price that they pay for power costs through physical forward purchase of energy, financial hedging arrangements or longer term power purchase agreements. Hedging provides a way of managing risk, reducing exposure to changes in market energy prices over the hedged period. However, hedging does not provide management with a way of avoiding the impact of rising energy prices over the long term. While hedging provides management with a way of managing exposure to market energy prices there is a cost associated with hedging – there is a premium for securing certainty over future costs. The costs associated with hedging increases the further into the future that fixed prices are secured with the buy-sell spread on forward energy purchase increasing further out on the forward curve as liquidity in the energy market reduces.

Hedging decisions have partly mitigated the impact of the spike in energy costs during AMP7 but have shifted the peak of energy costs for Hafren Dyfrdwy from 2022/23 to 2023/24. The differences in AMP7 hedging strategies is likely to result in large differences in reported power costs between water companies across 2022/23 to 2024/25 and cause a divergence in forecast real price effects across different companies into the start of AMP8.

Management control – Chemicals

As this cost adjustment claim includes the impact of higher energy prices on chemicals costs we are also considering the extent to which management can control chemicals costs.

Chemicals costs are a function of the volume of chemicals used (tonnes) and unit price of each particular chemical (£/tonne). The volume of chemicals used over time is fundamentally a function of:

- demand (volume of water treated/ volume of sewage treated); and
- tightening of permit conditions drive an increase in chemicals consumption. Permit limits can be met through a variety of methods but chemical dosing is a key tool in ensuring compliance with

permit limits. Tightened phosphorus limits as part Water Industry National Environment Programme (WINEP) will drive higher an increase in chemical volumes during AMP8.

Both of these factors are largely outside of management control, with the former driven by the customer base as well as the geographical/ environmental opportunities or challenges faced to deliver the core service to customers. The latter is only partly within management control; while non chemical dosing methods play an important part on meeting permit conditions use of chemicals remains a key tool in meeting limits on phosphorus, BOD and ammonia in sewage treatment.

This leaves the input price of chemicals as a major pressure on chemicals costs. Management has the ability to negotiate chemical unit costs with suppliers, however, there is a limit to the ability to control prices and unlike with energy costs their no potential to hedge chemical prices over the long term. During the spike in chemicals prices, linked to the increase in energy prices during 2022, many suppliers only provided prices valid for only three months.

1.1.3 Materiality

Criteria

- f) Is there compelling evidence that the factor is a material driver of expenditure with a clear engineering / economic rationale?
- g) Is there compelling quantitative evidence of how the factor impacts the company's expenditure?

Power is a very material component of our cost base

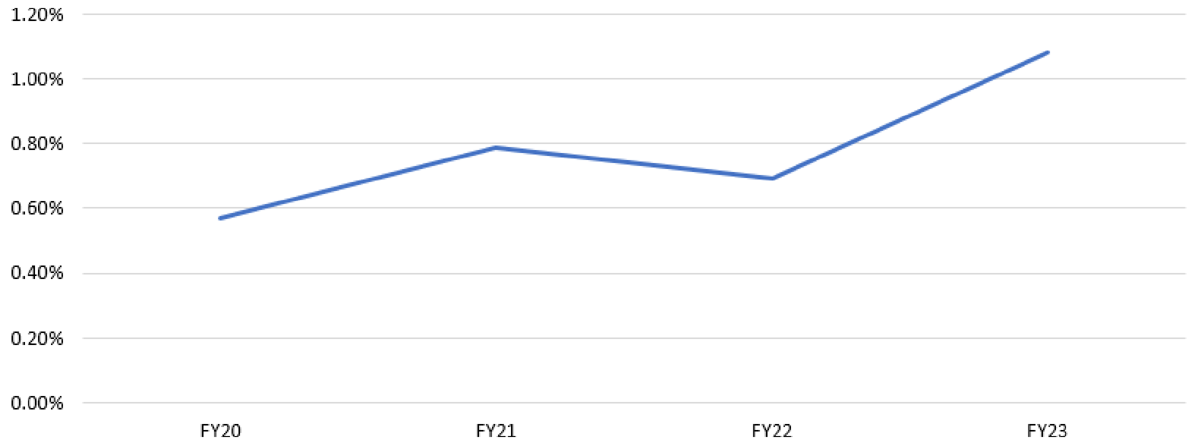
Power costs as a percentage of total operating costs and as a percentage of totex have increased significantly since the beginning of AMP7, primarily due to the large real price effects on energy. The proportion of power costs within totex is significantly higher than the contribution of power to CPIH.

The significant increase in wholesale market energy prices we have seen since 2021, combined with the impact of hedging positions (which delay, but do not eliminate the impact of higher market prices) mean that net power costs have reached 11% of operating expenditure and 5% of net totex in 2022/23.

The significant contribution of energy inflation to chemicals costs has increased the percentage contribution of chemicals to totex

As shown in ***Figure 10***, chemical costs have become a more material component of totex throughout AMP7. At the end of AMP6 chemicals represented 0.6% of Hafren Dyfrdwy totex and this has increased to 1.1% by 2022/23. This is primarily due to significant real price effects which increased chemical costs nearly 50% in 2022/23 compared to 2021/22. Chemical costs increased progressively throughout 2022/23 and so the full year impact of higher chemical cost is not expected to hit until 2023/24.

Figure 10: Hafren Dyfrdwy chemicals costs as a percentage of totex



Energy price inflation has been a significant contributor to CPIH inflation, however energy costs and the indirect energy component of chemical costs comprise a much larger proportion of totex than the weighting of energy within CPIH. For this reason, energy real price effects can have a significant impact on totex cost pressures with high energy price inflation not being adequately compensated by CPIH indexation.

Forecasting energy prices and energy real price effects in AMP8

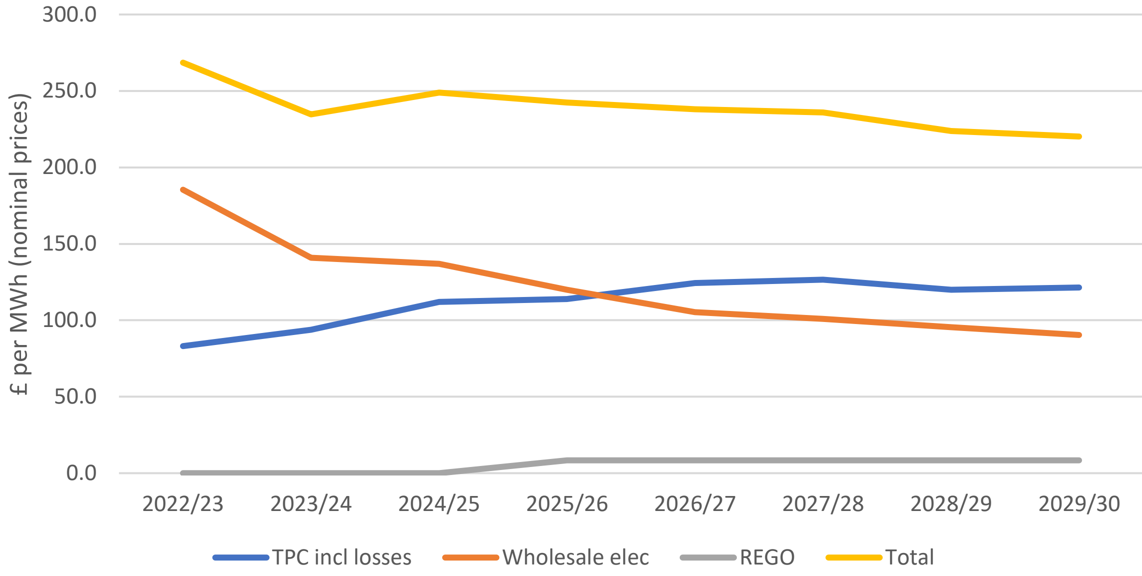
Energy price forecasts must be understood in the context of the energy crisis that has been experienced across the UK energy market during AMP7. Energy prices spiked to a record high during 2022 with geopolitical events in Europe exacerbating underlying pressures on energy prices. Market energy prices have fallen since the peak in 2022 but remain at historically high levels.

Our central forecast for energy prices (***Figure 10*** and ***Figure 11***) is based on independent, external forecasts of electricity prices from energy consultant Ameresco. These show significantly increased energy prices relative to the historic average at the start of AMP8, followed by a real-terms fall in energy prices across AMP8 but with prices remaining elevated in real terms compared to historic norms. The prolonged uplift in energy prices with only a partial reversal of the 2021/22 spike in energy costs is due a structural shift in the source of energy across Europe this includes:

- a move away from reliance on imported Russian gas;
- a move towards imported LNG, an increased reliance on gas storage; and
- a long-term transition to renewable energy.

This fundamental shift in energy supplies across Europe has a direct impact on the UK energy market and means that we are likely to experience a prolonged real-terms increase in energy prices along with an increase in price volatility.

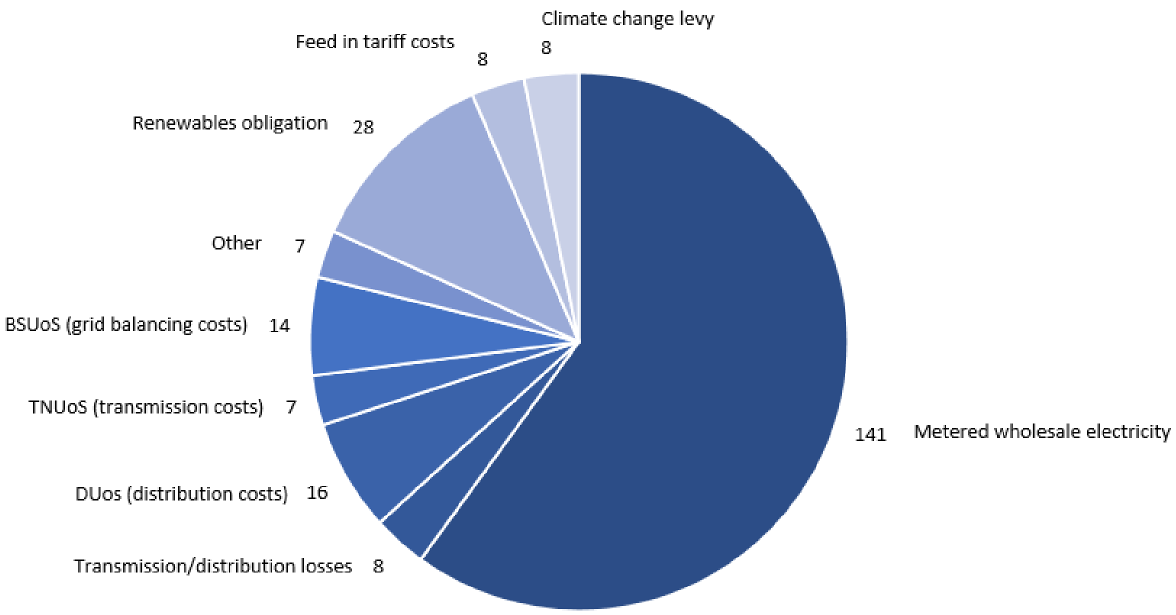
Figure 11: Current energy price forecast (Ameresco April 2023, nominal prices. Note: historic model IA of around £100/MWh for total energy price



Our central forecast for energy unit costs includes the wholesale energy component of energy costs as well as the third party, non-energy component. As shown in ***Figure 12***, the third party costs include the elements of the electricity costs to recover transmission, distribution and grid balancing costs as well as green levies.

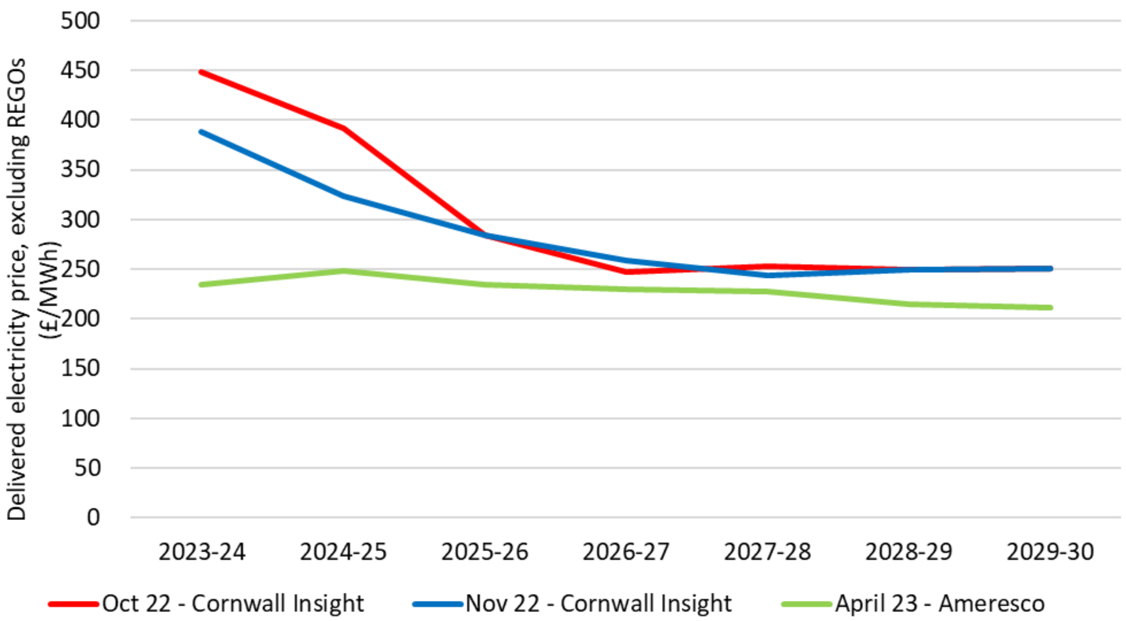
For 2023/24 the non- energy component of electricity costs represents 40% of the total unit electricity price. The significant increase in power costs that has been seen during AMP7 is largely due to an increase in the price of wholesale energy component, and this is where there is most price volatility. However the non-energy component is a non-trivial element of energy costs and the forecast reduction in wholesale energy costs across AMP8 is partly offset by a forecast increase in third party costs with increased grid balancing and capacity market costs. These elements of electricity costs are forecast to increase by 59% and 149% respectively from 2023/24 to first year of AMP8, due to changing mix of UK electricity generation with an increase in intermittent renewable generation.

Figure 12 Components of Ameresco electricity cost forecast for 2023/24, values show the £/MWh unit price



There has been significant volatility in forward electricity prices during 2021/22 and into 2022/23 with prices falling as some of the fears that developed during the 2021/22 energy crisis have eased. Our central forecast for energy real price effects and for the gross cost adjustment claim is based on the most recent long term forecast available to us and reflects the reduction in expected market wholesale prices (albeit still significantly higher than historic prices). As shown in ***Figure 13***, the Ameresco forecast used in this cost adjustment claim represents the lowest prices of the long term forecasts available to us from independent energy consultants.

Figure 13: Long term forecasts of delivered electricity price, excluding the cost of REGOs from Cornwall Insight and Ameresco



While forward market energy price volatility has reduced since the start of 2023 there remains considerable uncertainty over the trajectory of energy prices across AMP8 with both upside and downside risks. Market energy could increase from the current forecasts or reduce closer to pre energy crisis levels. There is also the potential for changes in legislation that could change components of the third party elements of energy costs, such as green levies. Such intervention could potentially move costs in either direction compared to our central forecast.

Given the magnitude of the potential movements in energy prices we consider that the current AMP7 cost sharing mechanism alone is not sufficient to balance risk to customers vs shareholders. We therefore propose an ex-post mechanism to true-up allowances for energy costs based on external, independent reported unit costs for large non-domestic energy consumers. This is set out in the customer protection section.

Understanding changes to energy prices and how this will likely manifest in AMP8

As part of process for developing forecasts for AMP8 energy prices we have considered the following:

- Historic trends (both long term structural changes to energy markets and the impact of the 2021/22 energy crisis)
- Factors impacting future energy inflation (including the extent to which factors that have influenced historic trends are likely to also impact future real price effects and the impact of non-wholesale cost component on energy price inflation)
- External forecasts of energy price inflation across AMP8 - including both the wholesale and third-party cost components of energy costs.

Analysis of the long-term trends suggests that real price effects on energy costs are driven by structural changes to energy markets on the supply or demand side and that these structural changes have a long-lasting impact. There have been significant periods of certainty – particularly in the time period of the historic cost modelling data panel. However, this is no longer the case.

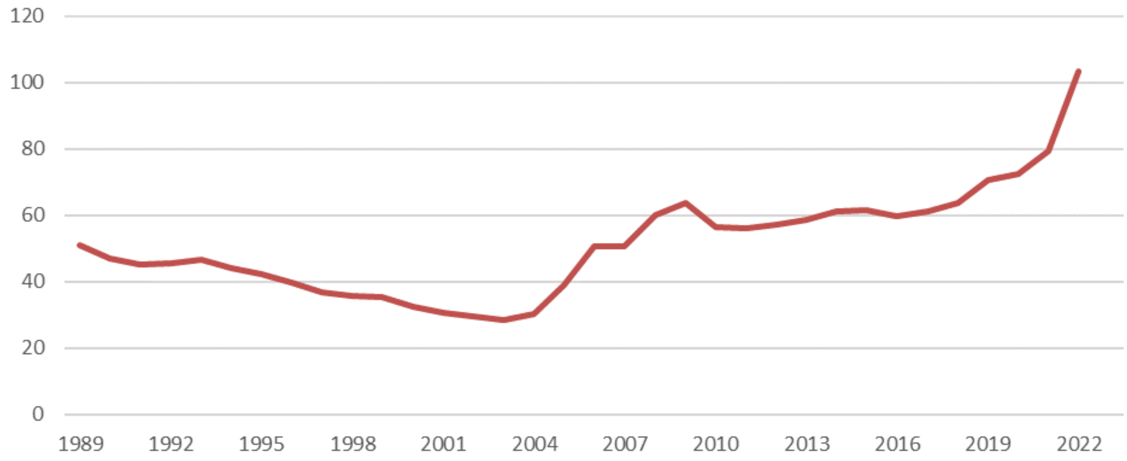
Considering ***Figure 14***, the following long-term trends of energy prices for the industrial sector can be explained:

- The fall in energy prices followed the privatisation of the domestic electricity market in the 1990s which resulted in increased competition in the energy market.
- Newly privatised companies shifted generation towards gas and benefited from the increasing gas production from the North Sea. Gas output from the North Sea peaked in 2000 with the UK a net exporter of gas. This resulted in plentiful domestic energy supplies keeping energy prices low[1].
- There was steep upwards trajectory during the mid-2000s due to the decline of UK Continental Shelf gas production, the introduction of the EU Emissions Trading scheme, a reduction in UK gas storage facilities and closure of coal and nuclear power stations.
- There has then been relative stability in real terms energy prices from 2010 until the energy crisis which started during 2021. This coincided with the Botex+ historic cost modelling data panel.

A common theme in the long term trend of UK electricity prices is the impact of gas supply and price. This is because in the UK marginal electricity generation comes from gas fired power stations and so the price of gas powered electricity generation sets the market electricity price.

[1] UK Energy Policy 1980-2010, The Institute of Engineering and Technology, 2012

Figure 14: Electricity price index for the industrial sector including CCL, deflated by CPIH (Source: Department for Energy Security and Net Zero (formerly Department for Business, Energy and Industrial Strategy (BEIS))

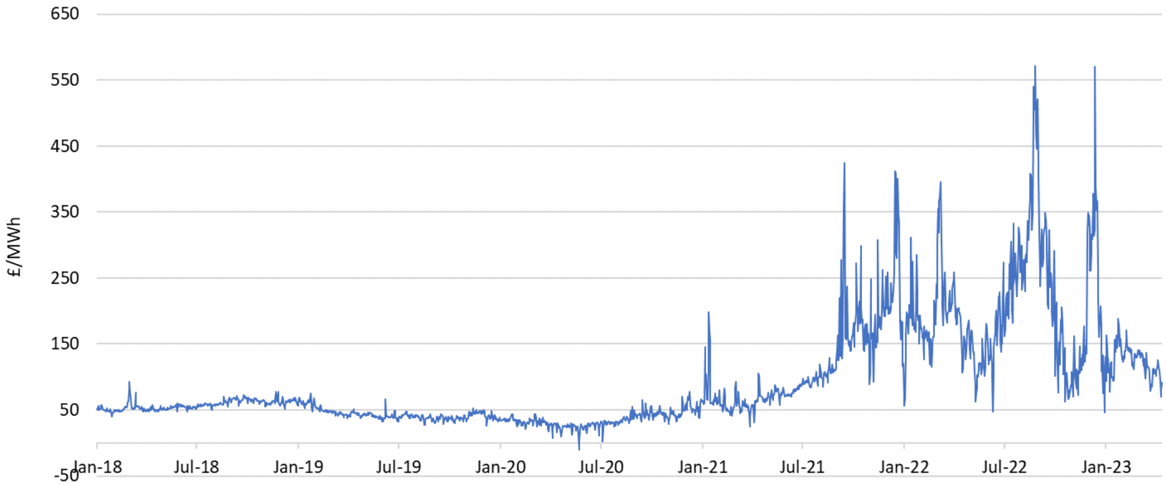


The punctuated nature of energy inflation following structural changes means that the evidence for real price effects from historic data depends on the time horizon used for the analysis. Where there are periods of stability, with no sudden shifts in supply/demand dynamics there is no clear support for a real price effect. This was evident from work completed for PR19 where it was identified that evidence for real price effects based on historic data was dependent on whether pre 2010 data was included.

However, it is clear that the increase in energy prices during AMP7 are exceptional. The real terms increase during 2022 is the highest year-on year increase across the entire period of analysis from 1989, since the end of AMP6 there has been a 44% real terms increase in the electricity price and since the end of AMP5 a 68% real terms increase.

As shown in ***Figure 15***, during 2021 and 2022 we have seen a dramatic increase in the cost of energy compared to historic norms with day ahead wholesale electricity prices peaking at a high of £571/MWh, over 1000% higher than average wholesale prices at the beginning of the AMP. In October 2022, at the height of the energy crisis when there were real fears over the security of energy supplies into Europe for the Winter of 2022/23 forward prices peaked in excess of £1000/MWh. This unprecedented shock to the energy market has had a significant impact on cost pressures during AMP7. While forward prices have fallen compared to the peak in October 2022, they remain elevated compared to pre energy crisis creating a significant inflationary pressure for AMP8.

Figure 15: UK wholesale electricity prices (source: Nordpool N2EX day ahead auction prices)



The Ukraine war and the reduction in flows of Russia gas into Europe that followed from this conflict is the most significant factor behind the dramatic increase in energy costs we have experienced over during 2022. However there are a number of other contributors to the increase in energy prices:

- Reduction in output of French nuclear reactors due to maintenance and checks relating to corrosion issues. This contributed to a 16% reduction European nuclear generation.
- Reduction in European hydroelectric output – During 2022 Europe experienced its worst drought in 500 years resulting in a 19% year-on-year reduction in hydro generation.
- Increase in energy demand following recovery following COVID-19 – Global demand for energy rebounded in 2021, reversing the reduction in consumption in 2020. As a result global inventories of fuel declined putting upwards pressure on energy prices.
- Low wind speeds – The move towards renewable sources reduces reliance on imported gas but has the potential for increasing volatility in energy prices with generation output dependent on weather conditions. During 2021 low wind speeds across Europe reduced wind generation and increased demand from natural gas plants, contributing to a depletion of storage and an increase in wholesale gas and electricity prices.
- Depletion of European gas storage –Gas storage levels in Europe were significantly depleted during 2021 and early 2022. Storage was at lower levels than have been seen across the previous ten years. Gas storage levels have a more persistent impact on price compared to short term changes in supply or demand.

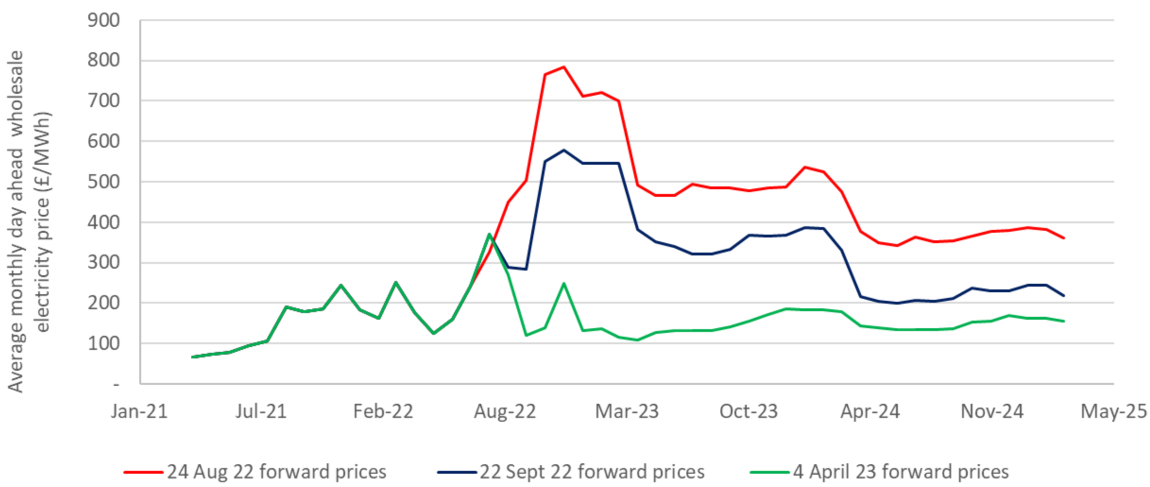
The various factors contributing to the 2021-22 energy crisis have non-additive interactions – they are more than the sum of their parts. For example, the impact of low wind speeds and reduced nuclear output is exacerbated by low gas storage levels. These non-additive interactions are important to consider when looking forward at future forecast energy prices and the long-term impact of the Ukraine war. The end to European reliance on imports of Russian gas has resulted in fundamental changes to the sources of European energy with increased reliance on LNG imports and gas storage. There is increased fragility to European energy supplies and as a result increased exposure to energy market shocks and price volatility. The transition to renewable energy generation which are inherently less reliable has a similar effect, increasing the potential for price volatility linked to extreme weather.

Considering the strength of recovery from the 2021-22 energy crisis

Since the peak of the energy crisis in 2022, there has been a downward trend in both the outturn of market electricity prices (shown in ***Figure 16***) as well as a downward trend in forward market prices out to March 2025 (as shown in ***Figure 17***). The downward trend is evident in longer term forecasts as described previously when explaining our central forecast.

Figure 16: Downward trend in day ahead wholesale electricity prices

Figure 17: Downward trend in forward wholesale electricity prices from August 22 to April 23



This may suggest that the fears in the energy market that caused the spike in energy prices have been alleviated meaning that energy prices will return to be more in line with historic norms. However, there are a number of temporary factors that have contributed to the fall in prices that offset underlying inflationary pressures that are likely to be more long lasting:

- Europe experienced unseasonably mild weather during October and the third warmest January on record. This delayed and reduced the heating season helping gas storage levels to reach 95% -- significantly above the European Commission target of 80%. This led to a reduction in both day ahead prices as well as forward prices as concerns over gas storage levels for the next heating season reduced.

- Europe was able to import approximately 60 bcm of gas from Russia to fill storage facilities during 2022. The decline in flows of gas from Russia was gradual. However, from the summer of 2022, Russia interrupted and eventually completely halted all gas supplies through the Nordstream 1 pipeline. Going forward Europe will only receive a maximum of 20 bcm from Russia and there is the strong potential for flows to be halted completely.
- COVID-19 lockdowns in China combined with an economic slowdown reduced Chinese demand for gas during 2022 and as a result LNG imports by China reduced by 20% compared to 2021. This helped European countries secure LNG imports required to fill gas storage and meet demand for gas. However, a rebound in Chinese demand for gas in the Summer of 2023 will put pressure on global LNG supplies.

These particular circumstances, which have helped to avoid a more adverse crisis during Winter 2022/23, hide to some extent the longer-term challenges where countries across Europe are having to make fundamental shifts to the source of their energy – Moving away from reliance on cheap Russian gas through pipelines, to imported LNG for which the price is more sensitive to global supply-demand dynamics. There remains major uncertainty over how Europe will manage the rapid transition away from Russian gas. With imported Russian gas having been a significant contribution to gas storage during 2022, the full effects of this are not likely to have been felt yet. The structural changes in the energy markets associated with fundamental changes to the sources of energy across UK and Europe together with long term challenges and uncertainty that remains following the 2021/22 energy crisis are the primary reasons why energy prices are not forecast to return to historic norms.

The impact of AMP7 hedging on real price effect forecasts and the impact on cost adjustment claim

Companies have the ability to hedge against wholesale energy price volatility by entering into physical trades to purchase energy in advance, financial energy hedging swap contracts and power purchase agreements, these reduce a company’s exposure to changes in wholesale energy prices.

Hedging provides a way of reducing the impact of wholesale energy price volatility however it does not provide a way of avoiding long term changes in energy prices outside of the time period considered in hedging risk management strategies such as those caused by structural changes to the energy market as we have seen during AMP7. Hedging also does not provide a mechanism for avoiding above inflation increases in third party components of energy costs such as network balancing and capacity market cots that are forecast to increase as the mix of renewable generation increases in the UK.

Our real price effect forecast included within SUP11 includes the impact of hedging positions taken in AMP7, this ensures that post real price effect power forecast reflect our expectations of costs, including hedging to 2024/25. Hedging trades taken during AMP7 result in the peak of energy costs being shifted from 2022/23 to 2023/24 with weighted average costs being favourable to market rates during 2022/23 but adverse to market rates in 2034/24.

Our gross claim for this cost adjustment claim considers only the impact of higher forecast energy prices compared to the implicit allowance during AMP8. The forecast energy prices for AMP8 used in the calculation of the cost adjustment claim do not include any hedging positions and so reflect a market view of future energy costs.

The cost adjustment claim considers the impact of higher energy prices over just the AMP8 period. It does not make any claim for the impact of energy real price effects in AMP7 and the resultant higher energy costs compared to allowances in the PR19 final determination.

Forecasting the impact of energy real price effects on chemicals costs in AMP8

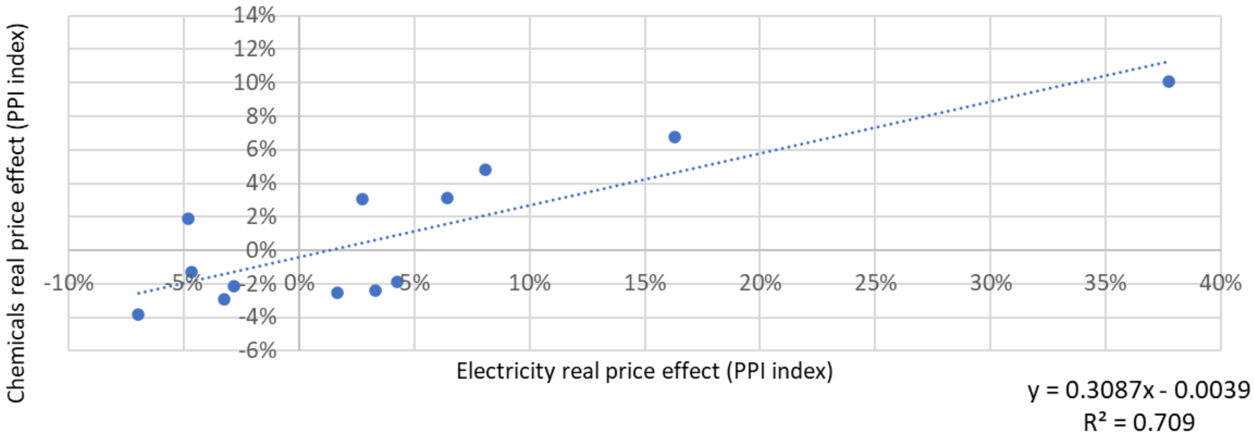
Forecasting chemicals inflation is complicated by lack of reliable external forecasts and the fact that a large number of different chemicals are used across water and waste treatment which each have different drivers of inflation. As shown in ***Table 4*** there are a number of different chemicals which make up total chemical costs.

Table 4: Chemicals

Chemical	Use
Polyelectrolytes	Chemical flocculants used in Water and Wastewater treatment.
Ferric sulphate	Coagulant used in both wastewater and water treatment to remove solids and colloids in water. During wastewater treatment ferric sulphate removes phosphate through chemical precipitation.
Caustic (sodium hydroxide)	Used for PH control in water and wastewater treatment.
Phosphoric acid	Orthophosphoric acid is used during water treatment to prevent water discolouration from the effects of groundwater exposure to iron and manganese, to reduce scale formation and corrosion in the water distribution system and to reduce soluble lead in potable water.
Aluminium sulphate	Coagulant used in both wastewater and water treatment to remove solids and colloids in water.

Our forecast for chemical real price effects during AMP8 and for our central assumptions for our cost adjustment claim are based on the relationship between energy real price effects and chemicals real price effects. These have been calculated based on ONS producer price inflation (PPI) indices for 'Inputs into Production of Electricity, Transmission and Distribution Services' (GHHP) and 'Inputs of Chemicals' (FSQ7).

Figure 18: Relationship between energy real price effects and chemicals real price effects



The ONS 'Inputs of Chemicals' index is based on a survey of manufacturing companies across different sectors. The input chemicals index will include the impact of inflation across a great variety of chemicals. The contribution of different chemicals to the chemicals input index will not exactly match the particular chemicals used by Hafren Dyfrdwy or other in the water sector, however it is considered appropriate to use the generalised chemical input index as a proxy measure for Hafren Dyfrdwy chemicals inflation given that Hafren Dyfrdwy uses a diverse range of chemicals as part of water and waste treatment processes. In addition there is strong positive correlation between the input chemical index from the ONS and inflation trends for particular chemicals based on supplier price data with correlation co-efficient above 0.7 for ferric sulphate and aluminium sulphate.

The relationship between energy real price effects and chemicals real price effects based on historic data has been applied to forecast energy real price effects to calculate a forecast view of chemical real price effects.

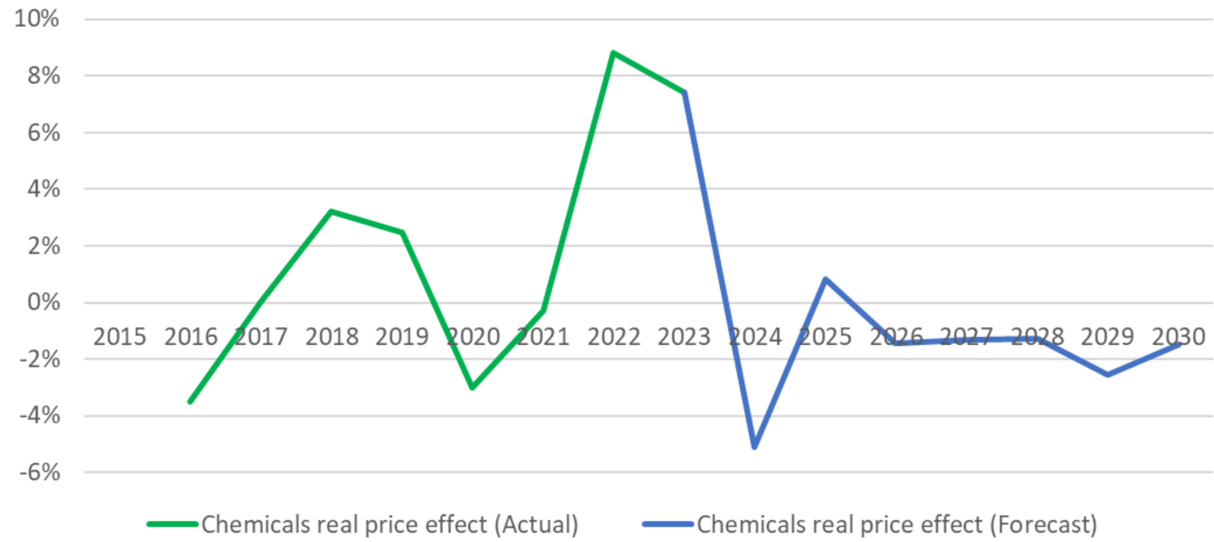
Forecast chemical real price effects have been calculated as:

$$Chemical\ real\ price\ effect = (Electricity\ real\ price\ effect * 0.3087) - 0.0039$$

The electricity real price effect is calculated in line with the forecast energy prices used in the energy cost adjustment claim, using a forecast of wholesale electricity prices and third party electricity prices from Ameresco.

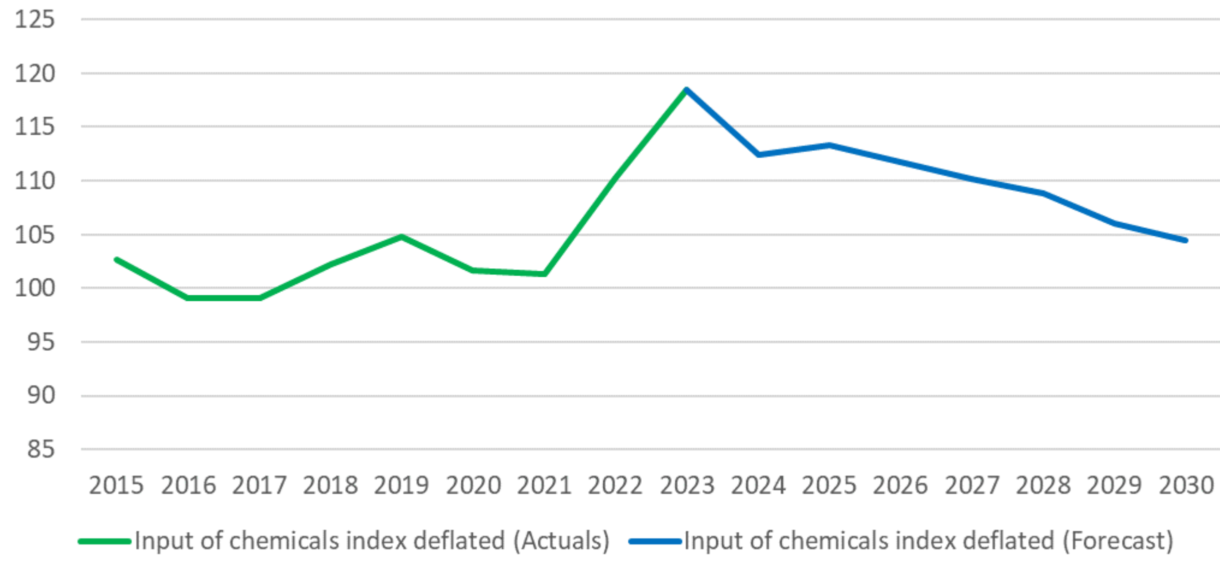
As shown in ***Figure 19*** this approach results in a large negative forecast real price effect for chemicals of 5.1% in FY24 (linked to the negative real price effect forecast for energy) and a small negative real price effect each year across AMP8.

Figure 19: Actual and forecast chemical real price effects



When the chemicals real price effect forecast is applied to the ONS 'Input of chemicals' index from the PPI index the trend overall trend is a real terms increase in the chemicals index in 2022-23. As shown in ***Figure 20.*** This is followed by a real terms decrease in the chemicals index from 2024-2030, however prices in real terms do not return to levels seen before the energy crisis and associated pressures on chemicals prices. This trend is consistent with the forecast energy real price effect trend.

Figure 20: Forecast chemicals input index (deflated to 2024/25 prices)



It is important to recognise that there can be a lag between changes in market energy prices and how these flow into chemicals prices. Chemical manufacturers can hedge against market price volatility and so may not immediately see higher increased input costs when energy prices increase. In the same way when market energy prices fall chemicals manufacturers may be tied into paying higher than market prices due to hedging positions or fixed price contracts and so less willing or able to pass through unit price reductions. To some extent the lag effect would be expected to be incorporated within the statistical relationship that we have observed between energy and chemicals indices. Our approach in our cost adjustment claim for forecasting the impact of negative energy real price effects on chemicals costs is cautious and assumes that the impact on reducing chemicals costs is seen in the same year as the reduction in energy prices.

Other factors that will also contribute to upward chemical price pressures that are not included in this claim

There is significant uncertainty over chemicals inflation over the final two years of AMP7 and across AMP8. Our central forecast assumes that the historic relationship between chemicals and energy real price effects continues into the future and assumes that the energy prices will follow the downward trajectory as forecast by Ameresco. Factors that could disrupt the relationship between energy and chemical real price effects and would contribute to a different outturn for chemicals real price effects compared to our central forecast include:

- Increased demand for chemicals from the water sector putting upward pressure on prices. There may be particular pressure on ferric sulphate prices given that the UK water sector is the largest market for ferric sulphate and usage is expected to increase during AMP8 due to tightening phosphorus consent levels in line with WINEP.
- Further disruption of chemical production or supply chains in Europe linked to geopolitical tensions or alternatively may impact chemical prices independently of energy prices. Alternatively an easing of geopolitical issues in Europe may put downwards pressure on chemicals prices.
- Global economic output and the related demand of products from the chemical industry has an impact on supply, demand and price of chemicals used in water and waste treatment. In

particular, the price of caustic for water treatment is sensitive to demand from other industries, particularly construction, with demand for PVC impacting the levels of chlor-alkali production and the supply of caustic which is a downstream product of this industrial process.

We have taken a cautious approach to cost pressures on chemicals by including only the impact of energy real price effects on higher chemical costs within the cost adjustment claim.

1.1.4 Adjustment to allowances (including implicit allowance)

Criteria

- h) Is there compelling evidence that the cost claim is not included in our modelled baseline (or, if the models are not known, would be unlikely to be included)? Is there compelling evidence that the factor is not covered by one or more cost drivers included in the cost models?
- i) Is the claim material after deduction of an implicit allowance? Has the company considered a range of estimates for the implicit allowance?
- j) Has the company accounted for cost savings and/or benefits from offsetting circumstances, where relevant?
- k) Is it clear the cost allowances would, in the round, be insufficient to accommodate the factor without a claim?
- l) Has the company taken a long-term view of the allowance and balanced expenditure requirements between multiple regulatory periods? Has the company considered whether our long-term allowance provides sufficient funding?
- m) If an alternative explanatory variable is used to calculate the cost adjustment, why is it superior to the explanatory variables in our cost models?

We have developed a methodology to quantify the size of the energy cost pressure that we consider will not be accounted for in AMP8 forecasts generated from botex+ econometric models. Fundamentally:

- The **gross claim** relates to the total energy requirements assumed in AMP8 (i.e. modelled amounts from the botex+ models + the price pressures over and above CPIH that that the models do not account for.
- The **implicit allowance** relates to the allowance for energy costs assumed by botex+ models for AMP8.
- The **net claim** relates to the power pressure (over and above CPIH) assumed across AMP8 that is not allowed for in botex+ models.

We describe the premise we have followed below. However, we have identified a wide range of scenarios for how it can be applied which can materially change the size of the claim. These are subsequently described. Finally, we set out in detail the central scenario of the quantified claim.

Premise for quantifying the claim

We find the energy cost per MWh implicit in the historical data. This has been done in two ways:

- Either directly by dividing the total historical energy spend in the industry by the total historical energy usage.
- Implicitly by finding the difference between the modelled allowance for full Botex+ models and Botex+ models with energy removed. For both water and waste, this is ~£100/MWh by either

method. This is the value of energy, on average, in our historical data, which is clearly not relevant to the present day.

We then generate the forecast implicit allowance for energy. Either:

- By taking the proportion of modelled allowance that was historically attributable to energy, ~10.6% in water and ~12.0% in waste for the industry as a whole. Or
- By finding the difference between the modelled allowance for full Botex+ models and Botex+ models with energy removed.

The 'central case' energy price forecast (provided by Ameresco) puts 2024-25 energy prices (including both wholesale energy cost and third party components of price) at ~£248/MWh in 2017-18 prices. This reduces across AMP8 as a result of forecast negative RPEs due to falling wholesale energy prices.

The Cost Adjustment Claims for Wholesale Water and Waste are calculated by multiplying the ratio of forecast energy costs per MWh by the implicit historical energy costs present within the dataset.

We then remove the RPE from the Pre-RPE Claim to get the actual claim value.

This is calculated as follows (note that the Cumulative RPE will be negative):

$$Claim = \left(\frac{2024-25\ ForecastPrice}{ImplicitHistoricalPricePerMWh} * (1 + CumulativeRPE)\right) * ModelledEnergyCosts$$

The specific calculation choices, and the selection of our central case, are set out in ***Figure 21*** and ***Table 5***.

The gross claim amount in this cost adjustment claim has been quantified using an Ameresco forecast of wholesale and third party unit electricity prices. This forecast has been used across both Wholesale Water and Waste. For Wholesale Water and Waste electricity costs make up over 95% of reported power costs with gas, used for property heating, making up an insignificant proportion of power costs.

Application of efficiency

As set out in the methodology section, we have sought to challenge ourselves when quantifying the claims. As this claim is quantified from information derived from cost models, we have set the efficiency challenge as the more most stringent of:

- The PR19 efficiency challenge for the relevant set of models,
- The 4th company (water) / 3rd Company (waste) efficiency from the PR24 consultation modelling suite, or

For this claim, the PR19 efficiency challenge has been applied for water and the 3rd company of the PR24 consultation models in waste.

For the implicit allowance we have applied the same efficiency challenges as the net claim (the PR19 challenge for water and the PR24 challenge for waste). This is because the net value of the claim is not affected by the implicit allowance, meaning that the efficiency stretch will not be impacted.

Quantifying the claim

Figure 21: Option tree showing how the various options for quantifying the claim interact. Central case selections highlighted in bold.

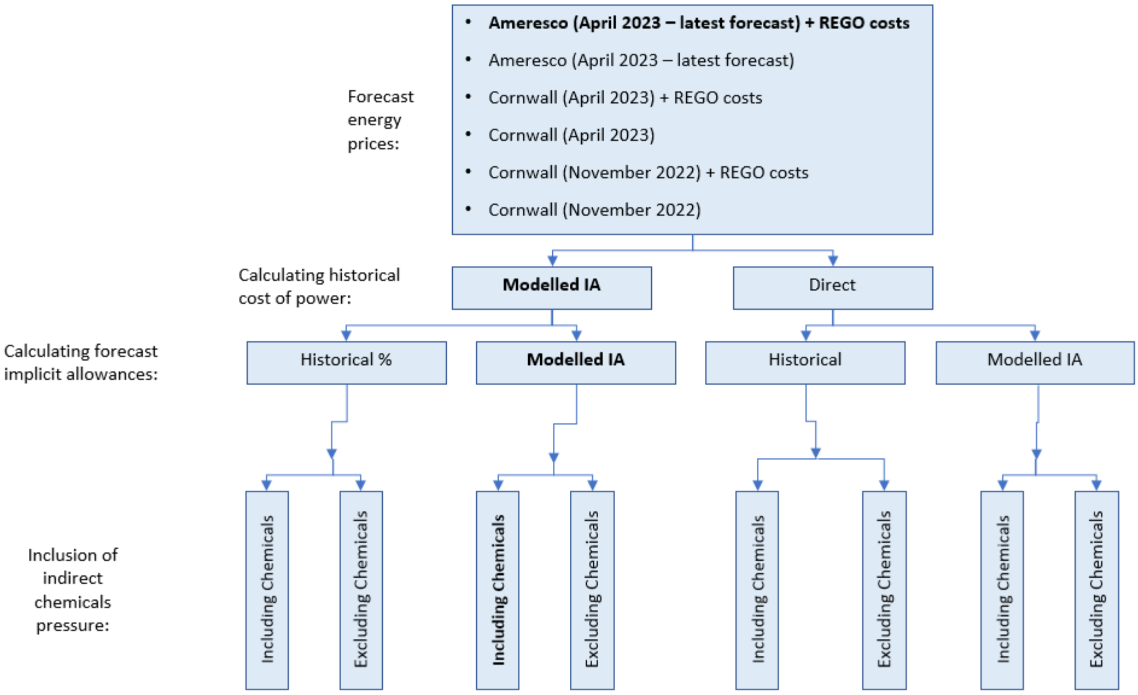


Table 5

Subject matter	Claim calculation choice	Description
Forecast energy prices through to 2029/30.	Ameresco (April 2023)	Independent forecast form April 2023 – Our latest forecast, therefore **central case**
	Cornwall Insight (March 2023)	Independent forecast form March 2023
	Cornwall Insight (November 2022)	Independent forecast form November 2022
Approach to calculating historical cost of power (£/MWh)	Direct, Mean	Reported Power cost divided by MWh used
	Direct, Median	Median reported power cost
	Modelled	Modelled power cost (botex+ models with than without power) divided by MWh used. This is what the models assume the historical cost of energy to be. The value of this will therefore depend on the final suite of models – **Our central case**
Approach used to calculate forecast IA Modelled allowance for Power in botex+ models	Modelled	Model with power and model without power – **Our central case**
	Historical %	The % of botex+ that is power
Consideration of Green tariff energy incremental costs	Included	Cost of green tariff energy included as a cost pressure – **Our central case**

	Not included as a legitimate pressure	Cost of green tariff energy not included as a cost pressure
Chemicals	Included	Chemicals cost pressures are highly related to energy. This part of the claim captures these pressures – **Our central case**
	Not included	The knock on costs of energy on chemicals are unaccounted for

We consider our selection of choices for the central case to be appropriate. Our reasoning is summarised below.

- **Forecast energy prices**: We have selected the most recently available independent energy price forecast to give our 2024/25 nominal price and RPEs. We have used market costs and RPEs to remove the impact of hedging decisions.
- **Calculating historical cost of power:** We select the direct approach to calculating the historical cost of power because it reduces the uncertainty caused by any potential model misspecification, and is also simply a direct measure of what companies have spent on energy in the past, and therefore what the model has available to make its estimates.
- **Calculating forecast implicit allowances:** The modelled approach is suitable to forecast implicit allowances, however, as it allows for any potential increases in the energy proportion of expenditure as a result of changes in operating circumstances (e.g. we would not expect historical proportions to hold if APH is rapidly increasing).
- **Green tariff energy:** We include the incremental green tariff energy costs in our calculation due to a commitment to net zero making this essential going forward. We do not consider that net zero will be achievable without green energy supply.
- **Chemicals pressures:** Chemicals are another significant cost pressure, which indirectly contain some of the energy cost pressures, but this is not included in the power line. Therefore we have added them to the claim.

When all the various permutations are considered, there are 24 versions of the claim quantifications. These are summarised in the table below and are their detailed calculations can be found through the calculation spreadsheet.

Table 6: Summary of quantified energy claim (22/23 prices), HDD;

£m AMP8 total	Water	Waste	Bio	Total
		Central scenario		
Gross Claim	£28.7m	£4.6m	-	£33.4m
Implicit Allowance	£18.6m	£2.7m	-	£21.3m
Net Claim	**£10.1m**	**£1.9m**	**-**	**£12.0m**
		Net claim range: Max (Min)		
Gross claim	£33.4m (£22.0m)	£3.8m (£3.7m)	- -	£37.2m (£25.7m)
Implicit Allowance	£19.0m (£13.6m)	£2.2m (£2.1m)	-	£21.2m (£15.7m)
Net claim	**£14.4m (£8.4m)**	**£1.6m (£1.6m)**	**-**	**£16.0m (£10.0m)**

Central case: £12.0m (Ameresco April with REGO; Modelled historical IA; Modelled forecast IA; Including chemicals pressures),

Max: £16.0m (Cornwall Insight November with REGO; Direct historical IA (Median); Historical % forecast IA; Including chemicals pressures),
Min: £10.0m (Cornwall Insight March without REGO; Modelled historical IA; Historical % forecast IA; No chemicals pressures).

More detail on or central estimate is shown in ***Figure 22*** and ***Table 7*** below.

Figure 22: April 2023 Ameresco forecast with REGO, total. The Gross claim (i.e. total AMP8 energy costs) relates to all costs below the orange line. The implicit allowance (i.e. costs allowed for by botex+ models) relates to all costs below the blue line. The Net claim (i.e. the adjustment needed to allow for the calculated forecast energy pressure) relates to costs between the blue and orange lines.

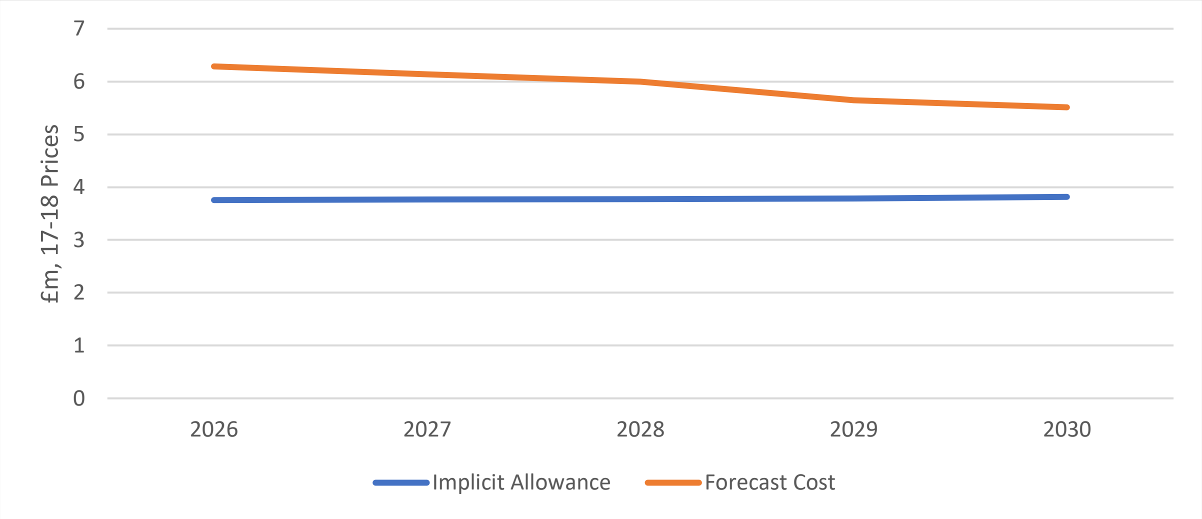


Table 7: Central Case calculation of claim. April 2023 Ameresco forecast with REGO, total, HDD (Efficiency not applied in this table for the 22/23 claim number)

Year	Post Efficiency Modelled Costs (Water and Waste)	Post Efficiency Modelled Costs, No Power (Water and Waste)	Energy costs (Water and Waste)	Pre-RPE Energy Costs (Water and Waste)	RPE	Post-RPE Energy Costs	Claim	Claim + Chemicals
Calculation	Model output	Model output	Model with Power – Model without power	= Energy costs / historic unit price * forecast peak unit price	Forecast year on year reduction of energy costs from peak	Pre RPE energy cost *cumulative RPE	Post RPE energy costs – Energy costs + Bio adjustment	Claim with the addition of chemicals cost pressures
2026	26.3	23.6	2.8	6.2	-3%	5.2	2.4	2.5
2027	26.5	23.7	2.8	6.2	-3%	5.1	2.3	2.4
2028	26.6	23.8	2.8	6.3	-3%	4.9	2.1	2.2
2029	26.7	23.9	2.8	6.3	-7%	4.6	1.8	1.9
2030	26.9	24.0	2.8	6.4	-4%	4.5	1.7	1.7
TOTAL	**137.9**	**119.0**	**19.0**	**31.3**	**82%**	**24.3**	**10.3**	**10.7**
Total 22/23 prices)							**12.2**	**12.6**

1.2 Cost efficiency (necessary)

Criteria

- a) Is there compelling evidence that the cost estimates are efficient (for example similar scheme outturn data, industry and/or external cost benchmarking, testing a range of cost models)?
- b) Does the company clearly explain how it arrived at the cost estimate? Can the analysis be replicated? Is there supporting evidence for any key statements or assumptions?
- c) Does the company provide third party assurance for the robustness of the cost estimates?

We are confident that the claim values submitted are efficient. This can be considered in terms of both the unit cost energy and volume of energy assumed to arrive at the claim value.

Energy unit cost efficiency

- The claim does not account for the AMP7 energy price pressures we are facing. The claim predicts the energy pressure at the start of AMP8 from reputable independent sources. Our current costs (which are in part driven by hedging policies) are being absorbed internally and therefore will not get locked into the claim values.
- Our forecasts have been provided by Ameresco, and alternative forecasts have been provided by Cornwall Insight, both of which are independent and market leaders in this space. We have obtained a number of forecasts at regular periods over time, and have selected the most recent for our central case which makes most use of up to date forward market price information.
- We have used the highest historical prices between outturn and modelled implicit allowances which reduces the value of our claim.

Energy volume efficiency

- This has been is determined by the models the PR24 consultation models rather than a bottom up assessment. We have identified the implicit allowance volume of energy being assumed by the models. This is then projected into AMP8 by the botex+ model scale drivers and other explanatory factors.
- We have an energy efficiency team to find opportunities for efficiency and invest accordingly (see management control section).

1.3 Need for investment (where appropriate)

This claim relates to all base expenditure currently accounted for in the models. Consequently the need for investment is inherent.

1.4 Best option for customers (where appropriate)

We have little choice to incur energy costs. We have the following fundamental leavers to manage energy cost. We set out in turn why this claim does not impact on our incentives to manage our energy costs responsibly in these areas.

- Hedging - Hedging is more expensive in the long term. It also cannot insulation against sustained price rises. But we remain incentivised to use hedging to reduce volatility in the short term. We also suggest that the uncertainty mechanism should have dead band within which companies need manage their energy risk appropriately

- Energy efficiency – We propose that uncertainty mechanism should apply to the unit price only, meaning the incentive to be energy volume efficient remains.

1.5 Customer protection (where appropriate)

There is a large degree of uncertainty over the trajectory for energy prices across the remainder of AMP7 and across AMP8. The central forecast used for this cost adjustment claim is based on recent, independent forecasts of wholesale energy prices and the third party component of energy costs, however the outturn could potentially be materially higher or lower than this central forecast depending on how the energy market evolves and on the potential impact of government interventions in the energy market . It is therefore important that an uncertainty mechanism is put in place so that customers benefit from any future reductions in energy prices but also that companies are fairly compensated for the energy costs incurred in providing Water and Waste services. An uncertainty mechanism must cover:

- Uncertainty of the energy price at the start of AMP8 – our cost adjustment claim currently assumes £248.90/MWh as per our Ameresco forecast. This will determine the size of the cost pressure relative to the data panel feeding the botex+ econometric models (2011/12 to 2021/22 currently).
- Uncertainty in how unit prices will charge across AMP8 as shown in RPEs. - our cost adjustment claim currently assumes a unit price of £220.20/MWh by the end of AMP8. This fundamentally relates to the speed and extent to which the power costs returns back to historical levels.

We have demonstrated that both aspects are subject to material uncertainty and largely outside of management control.

In is important that any uncertainty mechanism fulfils the following criteria:

- An uncertainty mechanism must maintain the incentive to increase energy efficiency in Water and Waste price controls. This can be achieved by establishing a true up mechanism based on unit costs of consumption and not absolute power costs/power income.
- An uncertainty mechanism incorporating a true up mechanism for variances between outturn energy prices and forecast prices used for PR24 allowances must be based on an external source of energy price data that is relevant to large, non-domestic energy consumers but is independent from water company unit costs.
- The industrial price statistics published by the Department for Energy Security and Net Zero (previously Department for Business, Energy and Industrial Strategy) is considered an appropriate independent, external benchmark for energy price inflation[2]. Data is published on a quarterly basis showing average unit rates for extra large consumers of electricity (annual consumption >150 GWh) and an electricity price index for the industrial sector is also published on a quarterly basis[3]. These price and energy inflation statistics are compiled from a Department for Energy Security and Net Zero survey of energy suppliers and is based on the average unit rates, excluding VAT of delivered energy to industrial consumers.

[2] Industrial energy price statistics - GOV.UK (www.gov.uk)
[3] Industrial energy price indices - GOV.UK (www.gov.uk)

- Unit prices and energy inflation indices published by Department for Energy Security and Net Zero will be less volatile than wholesale market electricity prices they incorporate the impact of hedging trades and fixed contracts placed by industrial consumers. Use of this data source is considered particularly suitable for use in a true up mechanism as it provides a way of ensuring that power costs and generation income within PR24 allowances are not materially out of line with the average unit costs of energy across large consumers.
- An uncertainty mechanism must maintain management incentive to manage an appropriate level energy price risk through hedging. It is not considered appropriate for the uncertainty mechanism to eliminate the need for management to enter into hedging arrangements to manage energy price risk. It is also not considered appropriate for an uncertainty mechanism to incentivise management to be overly risk adverse and fully fix energy price risk across the whole of the AMP given that there is an inherent cost of hedging which increases the further ahead prices are hedged where there is less liquidity in forward energy markets
- The uncertainty mechanism could incorporate a deadband where totex allowances are only adjusted for cases where outturn energy real price effects are in excess of specified threshold. Incorporating a deadband would ensure that the management are still incentivised to reduce exposure to energy price risk and would mean that the uncertainty mechanism is only enacted for where there is a material change to market energy prices compared to forecasts.
- An uncertainty mechanism must include the impact of potential variance of outturn unit prices versus unit prices assumed in PR24 allowances for each year of the AMP. Design of an uncertainty mechanisms must take account of the fact that AMP7 hedging strategies are likely to result in different outturn unit rates for 2024/25 and different expectations of real price effects for the first year of AMP8.
- An uncertainty mechanism should include the impact of energy real price effects on chemicals costs. We see two potential options for this:
    - A separate true up mechanism for outturn chemical price real price effects based on an independent external source of chemical inflation data. We consider the ONS 'Inputs of Chemicals' index, part of the Producer price inflation index to be a suitable source[4]. This index is based on ONS surveys of the chemical input costs incurred by manufacturing companies. This index will include the impact of a variety of different chemicals, some of which will include a large energy component as part of their bill of materials and some which will not. It is considered suitable to use a general chemicals inflation index given that the Water and Waste controls also consume a number of large variety of different chemicals.
    - The statistical relationship between energy and chemicals real price effects could be used to apply an appropriate true up to allowances for chemicals costs using outturn energy unit price data from Department for Energy Security and Net Zero data. The historic relationship between energy and chemicals real price effects shows that chemicals respond to 31% of an energy real price effect. From this you could infer that 31% of chemicals input costs on average is energy with the remainder CPIH linked input costs.
    - A true up mechanism for the impact of energy real price effects on chemicals will necessitate a method for identifying an efficient value of chemicals costs to which to apply a chemicals

[4] Inputs of Chemicals - Office for National Statistics (ons.gov.uk)

real price effect true up. Currently chemicals costs are not separately reported[5] and so there is no visibility of costs subject to inflationary pressures. Potential solutions to this include:

- Additional reporting requirements in Annual Performance Reports to disclose chemicals costs.
- Identifying an appropriate percentage of totex to be allocated to chemicals costs.

There are range of potential options for an uncertainty mechanism to address uncertainty over AMP8 energy unit prices. We are willing to engage further to help develop a suitable mechanism.

[5] Chemicals costs are reported within 'Other operating costs' within APRs.