frontier economics

Review of retail wholesale energy cost estimation methodology

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1 Context

Frontier Economics has been engaged by the Australian Energy Regulator (AER) to peer review its approach to calculating wholesale electricity costs (WEC).

1.1 The AER is responsible for setting a Default Market Offer annually

The AER regulates wholesale and retail energy markets, and energy networks, under national energy legislation and rules. As part of this function, the AER has, since 1 July 2019, set the maximum price that electricity retailers can charge small customers on standing offers for electricity.

This maximum price, the Default Market Offer (DMO), is the highest price that retailers can charge electricity customers on 'default' contracts known as standing offer contracts. The AER determines the DMO price each year.

The DMO applies to small business and residential customers in areas where there is no other retail price regulation, including South Australia, New South Wales and south-east Queensland. The DMO price for each area also acts as a 'reference' or benchmark price for residential and small business offers in that area. When advertising or promoting offer pricing, retailers must show the price of their offer in comparison to the DMO price. This helps customers more simply compare the price of different offers.

In the fourth quarter of 2020-21, there were over 580,500 residential and over 102,100 small business customers on standing offers in DMO areas (across New South Wales, South-east Queensland, and South Australia).

The *Competition and Consumer (Industry Code – Electricity Retail) Regulations 2019* (Regulations) sets out the legislative framework for the DMO. Part 3 of the Regulations requires the AER to determine:

- how much electricity a broadly representative small customer of a particular type in a particular distribution region would consume in a year, and the timing and pattern of that consumption (the 'model annual usage'), and
- a reasonable total annual price for supplying electricity (in accordance with the model annual usage) to small customers of that type in that region (the DMO price).

1.2 Setting an appropriate DMO requires an estimate of wholesale energy costs faced by retailers

To determine the inaugural DMO in 2019 (known as DMO 1), the AER set the DMO price through a 'top down' approach by choosing the midpoint of the median standing offer and the median market offer. For the next two DMOs (2020-21 DMO, or DMO 2, and 2021-22 DMO, or DMO 3), the AER determined the DMO price utilising an 'indexation' approach, which involved modifying the DMO 1 price by changes in specific cost components faced by retailers including:

- network costs,

- wholesale energy costs,
- environmental costs, and
- a 'residual' representing retailer operating costs and profit margin.

For the upcoming 2022-23 DMO (DMO 4), the AER's draft determination[1] indicates a cost build-up approach will be used to determine the price. The draft determination also indicates that this approach will be used in subsequent periods.

As part of the price review process for DMO 4, the AER has committed to a review of how the WEC component of this build up is calculated. This is partly in response to commentary on WEC-related issues from stakeholders in response to the AER's Options Paper released for public consultation. Stakeholder comments touched on a number of key issues in relation to the calculation of the WEC component of the DMO, including the following:

- Whether the assumed hedging strategy reflects the realistic risk appetite of retailers in the market. Most retailer comments agreed with the assumption of a risk-averse retailer seeking to avoid total exposure to the spot market.
- Whether the assumed hedge book build period reflects retailer practice and captures the cost of hedging appropriately.
- Whether the assumed accommodation for forecasting error in the WEC methodology is appropriate. On this issue, the AER has already indicated a shift from the previous methodology – the 75th rather than the 95th percentile of simulated WECs will now be used as the basis for the WEC. This indicates a reduction in the allowance for forecasting error, noting that the 95th percentile implies retailers can allow for almost a worst-case scenario every year.
- Whether adjustments may be necessary to the assumed hedging product mix due to the effect of a rapidly changing energy market with increasing solar PV penetration. This is driving extended periods of negative spot pricing, especially in South Australia. This can make hedging/managing risk with available instruments more difficult and more expensive.

1.3 The AER has committed to a review of the WEC estimation methodology

True wholesale energy costs are complex, uncertain, and will vary by retailer. There is a range of alternative approaches to estimating retail wholesale energy costs for the purposes of the DMO.

This report provides an expert review of the current WEC estimation methodology. It considers how a range of alternative approaches are likely to perform against the policy objectives of the DMO and other key criteria.

The assessments provided are strategic in nature and do not include a detailed modelling audit of the approach currently in use for the draft DMO, or any other possible approaches. Further, although ACIL Allen also estimate a range of environmental costs and "other wholesale costs", these cost components are less material and less open to alternative estimation methodologies. The focus of this report, therefore, is the estimation approach for wholesale energy costs.

[1] Available at: https://www.aer.gov.au/system/files/AER%20-%20Default%20Market%20Offer%20-%20Draft%20price%20Determination%202022-23%20-%2018%20February.pdf

2 Background – estimating the WEC

Wholesale energy costs vary by retailer because they depend on a range of individually complex factors including:

1. the load shape of the customers supplied by the retailer,
2. wholesale electricity spot prices,
3. the cost of hedging products, and
4. individual retailers' hedging approaches and risk appetites, including the mix of products used to hedge.

For this reason, the context in which the DMO is calculated is important, because different contexts (e.g. different load shapes for customers or different spot or contract prices) will result in different WECs. This section discusses the context in which the DMO is currently calculated.

2.1 Overview of ACIL Allen's approach to calculating WEC

ACIL Allen currently employs a 'market-based' approach to calculate the WEC with a "bottom up" methodology. This means that ACIL Allen uses the factors listed above to calculate the WEC. **Box 1** provides an overview of ACIL Allen's approach to estimating WEC.

Box 1: Overview of ACIL Allen's approach to estimating retailer WEC

ACIL Allen outlines a 6-step process for estimating the WEC in the context of the AER's DMO:

"*The key steps to estimating the WEC for a given load and year are:*

1. *Forecast the hourly load profile – generally as a function of the underlying demand forecast as published by the Australian Energy Market Operator (AEMO), and accounting for further uptake of rooftop solar PV. A stochastic demand and renewable energy resource model to develop 51 weather influenced annual simulations of hourly demand and renewable energy resource traces which are developed so as to maintain the appropriate correlation between the various regional and NSLP/CLP demands, and various renewable energy zone resources.*
2. *Use a stochastic availability model to develop 11 annual simulations of hourly thermal power station availability.*
3. *Forecast hourly wholesale electricity spot prices by using ACIL Allen's proprietary wholesale energy market model, PowerMark. PowerMark produces 561 (i.e. 51 by 11) simulations of hourly spot prices of the NEM using the stochastic demand and renewable energy resource traces and power station availabilities as inputs.*
4. *Estimate the forward contract price using ASX Energy contract price data, verified with broker data. The book build is based on the observed trade volumes and the price estimate is equal to the trade volume weighted average price.*
5. *Adopt an assumed hedging strategy – the hedging strategy represents a strategy that a retailer would undertake to hedge against risk in the spot price in a given year. It is generally assumed that a retailer's risk management strategy would result in contracts being entered into progressively over a two- or three-year period, resulting in a mix (or portfolio) of base (or flat), peak and cap contracts.*
6. *Calculate the spot and contracting cost for each hour and aggregate for each of the 561 simulations – for a given simulation, for each hour calculate the spot purchase cost, contract purchase costs, and different payments, and then aggregate to get an annual cost which is divided by the annual load to get a price in $/MWh terms.*"[2]

ACIL Allen also estimates and adds the following additional costs of wholesale electricity provision ("other wholesale costs"):

- NEM fees
- Ancillary services charges
- AEMO prudential costs
- Hedge prudential costs
- Reliability and Emergency Reserve Trader (RERT) costs
- Retailer Reliability Obligation (RRO) costs
- AEMO Direction costs
- Environmental costs
    - Large-scale Renewable Energy Target
    - Small-scale Renewable Energy Scheme

- New South Wales Energy Savings Scheme
- New South Wales Peak Demand Reduction Scheme
- South Australia Retailer Energy Productivity Scheme

- Energy losses

Source: ACIL Allen, 2022. "Default Market Offer 2022-23: Wholesale energy and environment cost estimates for DMO 4 Draft Determination"

2.2 Demand profile

The current methodology takes the past three years of half-hourly load profile data from AEMO and 'adds back' rooftop solar PV for each region[3]. It then applies 51 years of weather data to a matching algorithm that develops 51 sets of weather-influenced load profiles. These are scaled to ensure the energy forecast and annual seasonal peak loads match probabilistic peaks of the AEMO demand forecast. The profiles are then adjusted by subtracting solar PV back out, with the level of solar PV output based on a proprietary solar PV uptake model that accounts for trends in PV adoption.

2.3 Wholesale electricity spot prices

The current methodology uses ACIL Allen's proprietary *Powermark* model to forecast hourly electricity spot prices for the coming year across 561 simulated scenarios. Those simulations are developed by taking 51 weather-based demand scenarios and applying these over 11 potential outage scenarios.

2.4 Cost of hedging products

The current methodology assumes the cost of quarterly ASX futures contracts deployed to manage retailer risk is equal to the trade-weighted average ASX Energy daily settlement prices from the time the contract is listed until the time that the WEC is calculated.

2.5 Retailer hedging approach including products used to hedge

The current methodology assumes a risk averse retailer that leverages quarterly ASX base, peak and cap contracts to reduce spot exposure of some proportion of their load. See **Box 2** for key assumptions used by ACIL Allen in for the assumed hedging strategy.

[2] ACIL Allen, 2022. *"Default Market Offer 2022-23: Wholesale energy and environment cost estimates for DMO 4 Draft Determination",* p. 17.

[3] This results in something close to what AEMO calls 'native' demand

Box 2: Key hedging strategy assumptions used under the current WEC estimation methodology

ACIL Allen outlines the process for determining the hedge position in the context of the AER's DMO:

"The hedging methodology uses a simple hedge book approach based on standard quarterly base and peak swaps, and cap contracts.

Contract volumes for 2022-23 are calculated for each NSLP for each quarter as follows, and are largely unchanged from DMO 3:

- *The base contract volume is set to equal the 50th (Endeavour, Essential, SAPN), 60th (Energex, Ausgrid,) percentile of the off-peak period hourly demands across all 51 demand sets for the quarter.*
- *The peak period contract volume is set to equal the 50th (Ausgrid, Essential, Endeavour, SAPN), 60th (Energex) percentile of the peak period hourly demands across all 51 demand sets minus the base contract volumes for the quarter.*
- *The cap contract volume is set at 90 (SAPN), 100 (Energex, Essential, Endeavour), 110 (Ausgrid) per cent of the median of the annual peak demands across the 51 demand sets minus the base and peak contract volumes.*

In other words, the same hourly hedge volumes (in MW terms) apply to each of the 51 demand sets for a given NSLP and year, and hence to each of the 561 simulations. To be clear, we are not altering the hedge volume (in MW terms) on an ex-post basis for each of the 51 demand sets. Therefore, the approach we use results in a hedging strategy that does not rely on perfect foresight but relies on an expectation of the distribution of hourly demands across a range of weather-related outcomes.

Once established, these contract volumes are then fixed across all 561 simulations when calculating the wholesale energy cost."

Source: ACIL Allen, 2022. "Default Market Offer 2022-23: Wholesale energy and environment cost estimates for DMO 4 Draft Determination", p. 65

For more detail on the current methodology for estimating retailer wholesale energy costs, please see ACIL Allen, 2022. "Default Market Offer 2022-23: Wholesale energy and environment cost estimates for DMO 4 Draft Determination".

3 Objectives of the DMO and other criteria

We peer review of the approach to calculating wholesale electricity costs (WEC) by assessing the extent to which the current approach, and alternative approaches:

- meet the AER's stated policy objectives for the DMO,
- meet a number of other criteria that we consider are relevant for effective price regulation.

This section summarises the AER's objectives and sets out these additional criteria.

3.1 Stated policy objectives of the DMO

The AER's intention is that the DMO should serve as a consumer protection mechanism for those not engaged in the market. However, this should not mean that it becomes a substitute for a market offer. Stated policy objectives of the DMO are to:

- "reduce unjustifiably high standing offer prices and continue to protect consumers from unreasonable prices
- allow retailers to recover their efficient costs of providing services, including a reasonable retail margin and costs associated with customer acquisition and retention
- maintain incentives for competition, innovation and investment by retailers, and incentives for consumers to engage in the market."[4]

3.2 Additional criteria

In addition to the stated policy objectives of the DMO, above, there are additional criteria that we consider are relevant in assessing alternative approaches to estimating WEC, including:

1. **Practicality**. This relates to the complexity of the required modelling and analysis and the availability of data required to implement the approach. In our view, practicality is an important criterion because some approaches can require substantial time and effort to obtain the data required and for some approaches the data required may not be available at all.
2. **Transparency**. This relates to whether the approach can be easily understood, interrogated, verified, audited and reproduced by a third party. In our view, transparency is an important criterion in order to build public confidence and trust. Transparency is also often raised as an important criterion by stakeholders. To support transparency, the approach should ideally be based on publicly available information and should minimise the extent to which judgment calls about assumptions or methodology are required.
3. **Price stability**. This relates to whether the approach is likely to lead to large swings in the DMO price from one decision to the next. Price stability is often considered a relevant criterion

[4] Australian Energy Regulator, 2022. *Default market offer prices 2022-23: Draft Determination"*, p. 8

for price regulation because price stability can reduce bill shock for customers. However, where retailer's costs are changing, maintaining stable prices will likely come at the expense of other objectives, such as cost recovery and maintaining incentives.

3.3 Balancing the objectives and the criteria

In **Section 6** we assess the current approach to the DMO, and alternative approaches to determining the DMO, against the stated policy objectives of the DMO and the additional criteria.

However, we do not seek to identify a preferred approach in Section 6. The key reason for this is that there are trade-offs involved in achieving the stated policy objectives and the additional criteria, and the preferred approach should be that approach that achieves the best balance between the stated policy objectives and the additional criteria. For example, an approach that results in a lower DMO may be more likely to protect customers on standing offers from paying unreasonably high prices but, at the same time, may threaten the capacity of retailers to cover their efficient costs. Similarly, an approach that results in a DMO that does not change materially from decision to decision will be more likely to deliver price stability but, because it is more likely to deliver a DMO that deviates from retailers' costs, is less likely to allow retailers to recover efficient costs and is less likely to maintain incentives for competition, innovation and investment by retailers and incentives for consumers to engage with the market. These trade-offs and the right balance to strike are factors for consideration by the AER.

4 Approaches in other jurisdictions

In this section we briefly review approaches to electricity tariff regulation in other jurisdictions, to inform our identification of potential alternative approaches to setting the WEC for the DMO. Different institutional, market and regulatory settings in these jurisdictions mean that there is little to be gained in considering the regulatory approaches in too much detail; however, at a high level there are nevertheless potential options that could be adopted in the context of the DMO.

4.1 Alberta

In the Canadian province of Alberta there are both regulated and unregulated retailers. While unregulated retailers are free to provide only competitive market offers to customers, regulated retailers must also provide a Regulated Rate Option (RRO) to small customers. The RRO is the default for such small customers who do not proactively sign up to a market offer.

RROs are provided by three large private retailers – ENMAX, EPCOR, and Distributed Energy Retail Services. The RROs of these large private retailers are regulated by the Alberta Utilities Commission.[5]

Within the RRO cost build up, the cost to the retailer of wholesale electricity is provided as a discrete charge on the bill, called the energy or commodity charge. The charge for a given month is based on the volume weighted average price of hedge products purchased in the 120 days before the month in question for the retailer's forecast load for that month. As a result, the RRO customer can pay fluctuating prices month to month for the same usage.[6]

The regulatory framework in Alberta does not specify in detail what methodology should apply to calculate this charge. It is up to the retailer to propose, justify, and transparently apply a methodology to do so. A retailer's proposed price setting plan is submitted for approval by the Alberta Utilities Commission. These price-setting plans contain very detailed, tightly prescribed formulas or methods for forecasting load, the hedge quantity, the energy procurement process to be followed, and also provides other inputs to the overall energy charge such as a pre-determined Energy Return Margin and Retail Adjustment Margin.

In its essence, the approach to WEC within the regulatory framework in Alberta shares many similarities with the current approach to WEC for the DMO. In particular, both approaches are focused on the cost of a retailer's hedge position for managing a forecast of load. There are procedural differences – such as the approach being a propose-respond approach, and the approach establishing an accepted methodology that is then implemented over a period of time – but these procedural differences do not necessarily govern the basic approach for calculating the WEC.

5 There are other regulatory arrangements in place for RROs provided by other types of retailer such as municipally owned services.

6 However, a review of the RRO in 2017 by The Alberta Market Surveillance Administrator showed that the major drivers of month-to-month variation in energy charges are seasonal and consumption volume factors rather than hedge product costs themselves. See Market Surveillance Administrator, 2017. Available at: https://www.albertamsa.ca/assets/Documents/2017-08-11-Options-for-Enhancing-the-Design-of-the-Regulated-Rate-Option-MSA-Final-Report.pdf

Perhaps the most interesting feature of regulation in Alberta is that regulated prices can vary from month to month. In principle, the DMO could also be varied more frequently than annually. This is a variation to the current approach to the WEC for the DMO that we consider in Sections 5 and 6.

4.2 France

In France the market is open to competition and there are both market offers and regulated tariffs. Regulated tariffs are proposed by the incumbent operators (EDF and 62 local distribution companies) and set by the government.

Regulated tariffs are set based on a building block component which includes wholesale costs, network costs, marketing costs and a normal rate of return. The intention is to ensure that the tariffs can be challenged by "alternative" suppliers.

The WEC component of regulated tariffs is ARENH. The ARENH mechanism allows alternative retailers (i.e. those who aren't EDF) to secure regulated access to energy produced by EDF's existing nuclear fleet. It places an obligation on EDF to sell up to 100 TWh of nuclear power annually (about 25% of its production in France) at a regulated price of €42/MWh. This is meant to represent EDF's cost of producing electricity from existing nuclear plants. The regulated ARENH price is used (in addition to a component for the capacity guarantee) as the WEC component of regulated tariffs.

ARENH is stable over time, and there have been periods when wholesale prices have been both lower and higher than ARENH. When wholesale prices have been lower than ARENH there has been less take-up of ARENH volumes and there has been greater growth by alternative retailers.

The approach to price regulation in France is clearly significantly different to the current approach to setting the WEC for the DMO. However, even though the NEM does not have any equivalent of the ARENH mechanism, a similar approach could be adopted by setting the WEC on the basis of the LRMC of electricity generation (recognising that an important difference with the approach in France is that there would be no mechanism in the NEM by which retailers could purchase at this LRMC). An LRMC approach to the WEC for the DMO is consider in Sections 5 and 6.

4.3 Maine

In Maine, customers are able to purchase electricity from competitive electricity suppliers or are able to purchase under standard offer rates supplied by a default supplier.

The electricity supply component of standard offer rates, which is equivalent to WEC, is set through a competitive bid process conducted by the Maine Public Utilities Commission. The competitive bid process is conducted annually, with the successful bidders becoming the default supplier. The electricity utilities then bill their customers on behalf of the default supplier for the electricity supply component (as well as billing their customers for the delivery component).

Given the very different institutional arrangements in the NEM we can't see how a competitive bidding process like that used in Maine to set regulated wholesale prices could be adopted in the NEM without significant regulatory change. For this reason, we have not assessed a competitive bidding process in Sections 5 and 6.

4.4 Great Britain

In Great Britain, price caps have recently been reintroduced. Beginning in 2017 the Prepayment Meter Price Cap was introduced for customers using prepayment meters. Beginning in 2019 the Default Tariff Cap was introduced for customers on standard variable tariffs. From 2021 these programmes were combined into a single Default Tariff Cap. The Office of Gas and Electricity Markets (OFGEM) sets the cap biannually to ensure it reflects the costs of energy provision. [7] Customers are also able to purchase from competing retailers at market rates.

The Wholesale Cost Allowance methodology of the Default Tariff Cap sets wholesale costs (for electricity or gas) based on three parts:

- **Core direct fuel allowance**: this component is based on forward contracts for electricity and gas. The approach for calculating the core direct fuel allowance is referred to as a 6-2-12 semi-annual approach, in which contract prices are observed to a 6-month period, there is a 2 month lag between the observation period and the forward view period, the forward view period is a 12 month period, but the resulting cap only applies for a 6 month period. The core direct fuel allowance is calculated based on a 70/30 split between baseload and peakload forward electricity contracts.
- **Additional direct fuel allowance**: this component "uplift[s] the core direct fuel allowance by an additional set percentage to reflect the expected costs of converting less to more granular forward contracts closer to delivery, transaction costs, losses and other sources of uncertainty, and forecasting error leading to imbalance" [8]. For electricity this total additional allowance is 7.4%. This component is indexed as a percentage of direct duel costs.
- **Capacity market payments**: this component reflects the costs of the capacity market, based on auction clearing prices with forecasts of gross peak demand. [9]

Ofgem has recently proposed adjusting the price cap quarterly rather than biannually.

In the face of recent significant increases in wholesale gas and electricity prices in Great Britain, 29 suppliers serving 4.3 million households have exited the market. Following these significant increases in wholesale costs, there have also been recently announced significant increases in the Default Tariff Cap.

In its essence, the approach to Wholesale Cost Allowance within the regulatory framework in Great Britain shares many similarities with the current approach to WEC for the DMO. In particular, both approaches are focused on the cost of an efficient retailer's hedge position for managing a forecast of load, and both make use of average contract prices over an 'observation period' to determine cost.

As with Alberta, one of the key differences to the DMO is that regulated prices vary more frequently – currently every six months in Great Britain but potentially every three months in future. In principle, the DMO could also be varied more frequently than annually. This is a variation to the current approach to the WEC for the DMO that we consider in Sections 5 and 6.

[7] https://www.ofgem.gov.uk/publications/default-tariff-cap-level-1-april-2022-30-september-2022

[8] https://www.ofgem.gov.uk/publications/price-cap-consultation-potential-impact-increased-wholesale-volatility-default-tariff-cap

[9] https://www.ofgem.gov.uk/publications/price-cap-consultation-potential-impact-increased-wholesale-volatility-default-tariff-cap

4.5 Singapore

In Singapore, contestability has recently been introduced for residential consumers. Residential consumers now have the option to buy electricity from a retailer at a market rate, or to buy electricity from SP Group, which is regulated by the Energy Market Authority (EMA). The EMA sets the regulated electricity tariff each quarter, with the aim of reflecting the actual cost of electricity.

The regulated tariff consists of two key components:

- **Fuel cost**: this component is the cost of imported natural gas (which is used to generate electricity in Singapore). The fuel cost is calculated using the average of daily natural gas prices in the first two-and-a-half months of the previous quarter. For instance, average prices for April, May and the first half of June are used to set the fuel cost component of regulated tariffs for July to September.
- **Non-fuel cost**: this component is the cost of generating and delivering electricity to homes. The power generation component of the non-fuel cost is based on the cost of operating power stations, which includes capital costs and operating and maintenance costs.

The approach to price regulation in Singapore is clearly significantly different to the current approach to setting the WEC for the DMO. The approach is Singapore is similar to that in France, with the WEC component of regulated tariffs being based on the costs of generation, rather than market prices for electricity. A generation LRMC approach to the WEC for the DMO is consider in Sections 5 and 6.

5 Alternative approaches to estimating retailer WEC

As we have seen in the jurisdictional review, there is a range of alternative approaches to estimating retailer WEC. This section describes four alternative approaches. In the following section we each assess the current approach and each of these alternatives against the DMO policy objectives and the additional criteria.

In line with the focus of this report, the alternative approaches described below focus only on the wholesale component rather than "other wholesale costs" or environmental costs as these are less material and there is smaller scope for methodological variation.

5.1 Option 1: Adjust key components of the current market-based approach

Option 1 leaves the existing approach conceptually unchanged (i.e. retain the current "market-based approach" that is based on the costs of a retail hedging position), but involves altering one or more of the four key steps in the methodology. As noted in Section 2, there are four key aspects of the current method that could be altered, including:

1. The assumed load profile, including:
   a. which load profiles are considered, and
   b. how the load profile is developed.
2. The assumed spot prices, and how these are developed.
3. The assumed contract prices including:
   a. how these are developed, and
   b. links to the book build period.
4. The assumed hedging approach adopted by retailers, including:
   a. which instruments are considered, and
   b. the deployed hedging strategy (or mix of strategies).

There is one additional aspect of the approach that can be changed and that is the frequency with which the DMO is set. As seen in our jurisdictional review, regulated tariffs are updated more often (monthly, quarterly or biannually) in other jurisdictions.

The current methodology could trial many combinations of changes in these key components. We suggest the following five for simplicity and to provide the best exploration of the impact of changing key components.

5.1.1 Option 1.1: simpler approach to price and load forecasting

The current approach incorporates steps to account for expected trends in load and prices. In respect of load, the approach adopted by ACIL Allen incorporates a mechanism to account for

the expected effect that increases in solar PV adoption will have on future load. In respect of prices, the approach adopted by ACIL Allen incorporates market modelling of electricity prices to account for expected changes in future electricity prices, such as the effect that increased solar PV adoption will have on daytime prices.

While these methodologies may better account for expected trends in load and prices, they do so at the expense of added complexity and reduced transparency. The alternative is to rely more heavily on recent historical outcomes (albeit accounting for expectations of future average spot prices as indicated by ASX Energy prices) and to trust that these recent historical outcomes will reasonably capture longer-term trends in load and prices. This is the approach that is used in determining the WEC for the ESC's Victorian Default Offer.

5.1.2 Option 1.2: account for the portfolio benefits from a mix of customers

One clear methodological amendment could involve shifting the focus to the costs of the retailer's overall position rather than their costs with respected to their small customer load only. Retailers in eastern Australia typically serve a mix of customer types, including residential customers, small business customers and larger commercial and industrial customers. These different customer types typically have different consumption patterns, and hence there are often portfolio benefits, such as a less-peaky load in aggregate, from serving different customer types.

This could be incorporated into the current market-based approach by considering load shapes that encompass a combined residential, small business and commercial load, rather than just small customers. In effect, this approach would therefore focus on what it costs a retailer *who serves a mix of customer types* to hedge its whole load and how a subset of those costs are allocated to the residential load.

By doing this, Option 1.2 could examine the portfolio effects some retailers may benefit from by serving a diverse customer base. These could represent real hedging cost efficiencies insofar as the diversity in that customer base provides a 'natural' risk management mechanism.

A similar point applies to the geographical, or inter-jurisdictional characteristics of the retailer's total customer base. Option 1.2 could examine whether having customers in different NEM regions provides a natural hedging effect that offsets the need for and/or costs of hedging through ASX futures or other products.

5.1.3 Option 1.3: account for alternative hedging instruments

The current methodology assumes all hedging occurs through some combination of ASX base, peak and $300 cap contracts. ACIL Allen's method also checks these products against broker data covering non-ASX financial products ("over the counter" or OTC contracts).

However, we know that in reality, retailers choose to manage risk through a wide array of mechanisms, including power purchase agreements, physical ownership of generation, or other types of derivatives. Under Option 1.3, it could be assumed that retailers adopt an alternative, more varied hedging strategy that extends beyond currently available ASX products.

This approach would strive to better mirror the real-world hedging behaviour of retailers and the costs of those hedging strategies. Accordingly, this approach may need to chart a difficult path to "indicative" retailer costs though what would be substantial variation in the hedging strategy across retailers, the reality that not all retailers may be in a position to manage risk other than through ASX contracts, and deal with informational limitations relating to non-ASX derivatives.

5.1.4 Option 1.4: alternative contract price assumptions

The current methodology uses contract prices based on all available ASX energy trade data. That is, the contract prices that are used to calculate WEC are trade-weighted prices for contracts traded on ASX Energy from the time that the contracts are first listed for trade up until the time that WEC is calculated. This is generally a period of around 3 years. ACIL Allen refer to this as the hedge book build period.

The contract prices that are used to calculate WEC could be based on average contract prices over a different period of time.

The rationale that is generally provided for using average prices from the time that the contracts are first listed, or at least for using average prices over a year or two, is that this will reflect the contracting behaviour of retailers. That is, retailers will generally enter into hedging agreements a number of years in advance. Retailers will do this in order to manage the risk that contract prices can increase.

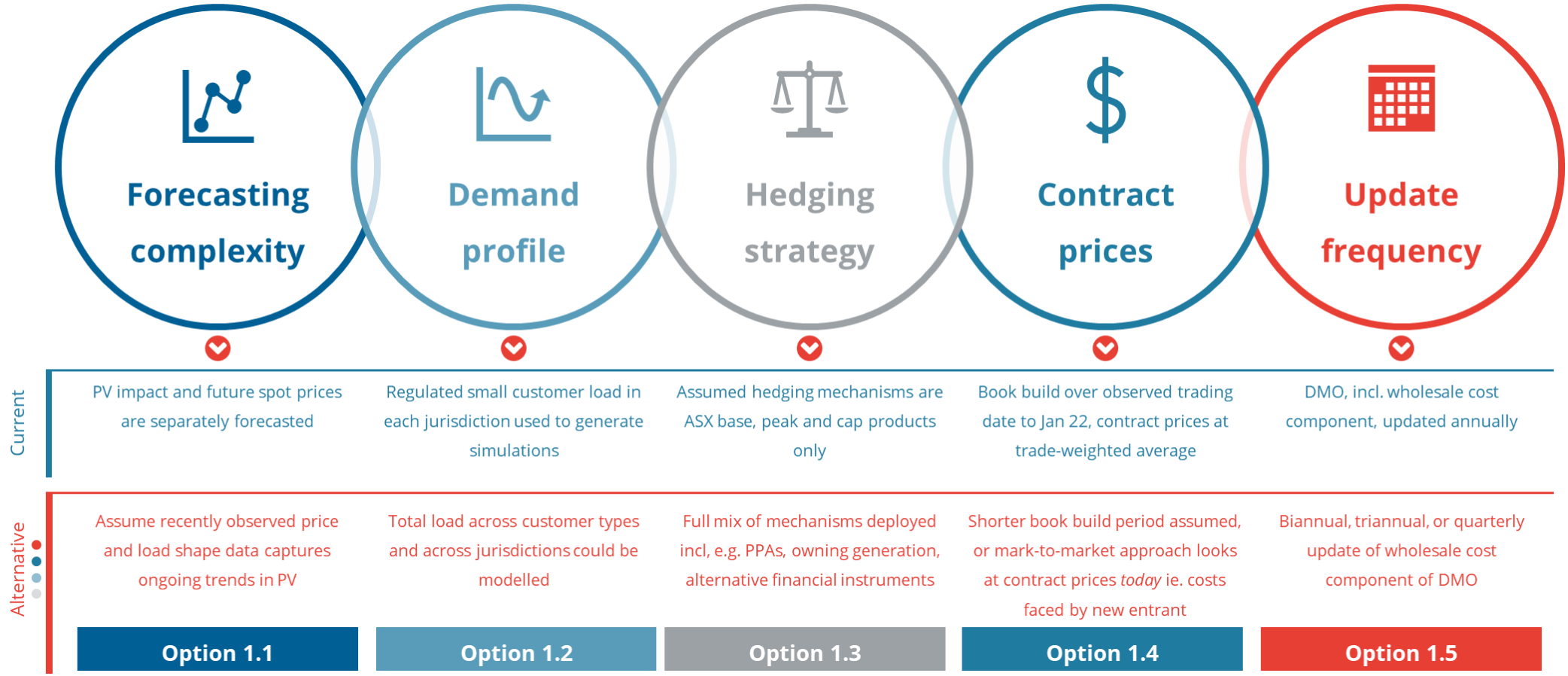
There are alternative ways of determining contract prices that are used to calculate WEC:

- Contract prices could be averaged over a shorter period of time, and potentially without trade-weighting the contract prices. For instance, even if the objective is to maintain an approach in which the contract price averaging period reflects the typical contracting behaviour of retailers, typical contracting behaviour for small customer load could be investigated empirically. Accounting for vertical integration and longer-term PPAs may suggest that retailers in fact contract for a longer period than is suggested by ASX Energy trade. Or, it may be that for small customer load, retailers in fact are prepared to contract over a shorter period of time.
- Contract prices could be marked-to-market. In a competitive market it would be expected that prices will reflect opportunity cost. The opportunity cost of hedging contracts is the price at which they can be sold – that is, the market price. Therefore, rather than calculating the WEC on the basis of average contract prices over time (to reflect the accounting costs that retailers incur) the WEC can be calculated on the basis of marked-to-market contract prices (to reflect the opportunity cost to retailers of those contracts).

5.1.5 Option 1.5: update the DMO more often

A variant of the current approach (or indeed any of the alternative options) would be to change the frequency with which the WEC is calculated and the DMO is set. For instance, like some overseas jurisdictions, the WEC could calculated and the DMO set quarterly or biannually. Doing so would mean that prices would change within a year, which would be expected to result in prices that more closely reflect costs throughout the year, but would also result in increased price volatility for customers.

Figure 1: Overview of potential changes to inputs of current WEC estimation



Source: Frontier Economics

5.2 Option 2: Determine WEC based on the cost of generation / LRMC

A conceptually different approach could avoid modelling hedging strategy and costs altogether and use the long run marginal cost of generating additional electricity in the current market context as the basis the WEC. Conceptually, this approach considers what it would cost a retailer to build their own generation as a physical hedge. This approach would still be forward looking but would draw on estimates of generation costs as data inputs to the LRMC modelling (capital costs, operating costs, fuel costs etc).

This option could be appropriate in an energy market context where more and more retailers are increasingly vertically integrated, and where real retailer cost bases no longer mostly resemble a portfolio of financial hedging costs. This may also better reflect the costs of retailers relying on PPAs, which should reflect LRMC of generation.

The approach could be implemented based only on the notional retailer's regulated load, or could be based on LRMC of the next increment of system demand ignoring existing generation.

5.3 Option 3: Determine WEC based on backward-looking efficient costs of a benchmark retailer

Option 3 is backward-looking, using actual data from the previous year on hedging contract prices and load to determine how a hypothetical efficient retailer would have behaved in the previous year, and use this as the basis for the coming year's WEC. The backward-looking estimate of WEC could use the same basic procedure as the current approach, but using actual historical data rather than forecasts.

This option is a variant of Option 1, and would set a lagging estimate of retailer costs rather than trying to forecast the future, in essence a 'backward looking' WEC.

This simple approach circumvents the need to forecast entirely. While it may not reflect actual retailer costs, it is possible that over time retailers would still recover costs on average as the market rises or falls in the next year.

5.4 Option 4: Determine WEC based on backward looking actual costs of retailers

Option 4 is also backward-looking, but involves investigating retailers' actual costs, actual load profiles, and actual hedging strategies. This would require information from retailers on their actual costs, actual load profiles and actual hedging strategies – for instance, from the most recent year available. This information could then be used to set the WEC for the next year.

This approach is more likely to reflect real costs behind retail offers, but will inevitably require further decisions on how to distil data into a single WEC estimate, given substantial variation among retailers. It may also present cost allocation challenges where the data cannot clearly show which costs are attributable to just the regulated load.

Like Option 1.2, this approach would give useful insight into the extent of real portfolio benefits seen by retailers from diverse customer bases, and the impact this has on the cost of hedging. Like Option 1.3, this approach would also provide a window into the use of other (non-ASX)

financial products and whether these are providing the same risk management at a lower cost or a different level of risk.

6 Assessment of alternative options for calculating the WEC

This section provides our assessment of the current approach and the alternative options for estimating retailer WEC that were identified in **Section 5**. We perform this assessment against each of the DMO policy objectives and the additional criteria, which were discussed in **Section 3**. This Section begins with a high-level summary of our assessment (**Section 6.1**), before providing our assessment of the current approach and each of the alternative options in more detail in the sections that follow.

6.1 Summary of assessment

We assess the current approach and each alternative option for calculating the WEC against the DMO objectives, which are to:

- "reduce unjustifiably high standing offer prices and continue to protect consumers from unreasonable prices
- allow retailers to recover their efficient costs of providing services, including a reasonable retail margin and costs associated with customer acquisition and retention
- maintain incentives for competition, innovation and investment by retailers, and incentives for consumers to engage in the market."

We also assess each alternative option for calculating the WEC against the additional criteria:

- practicality of the approach
- transparency of the approach
- impact on price stability.

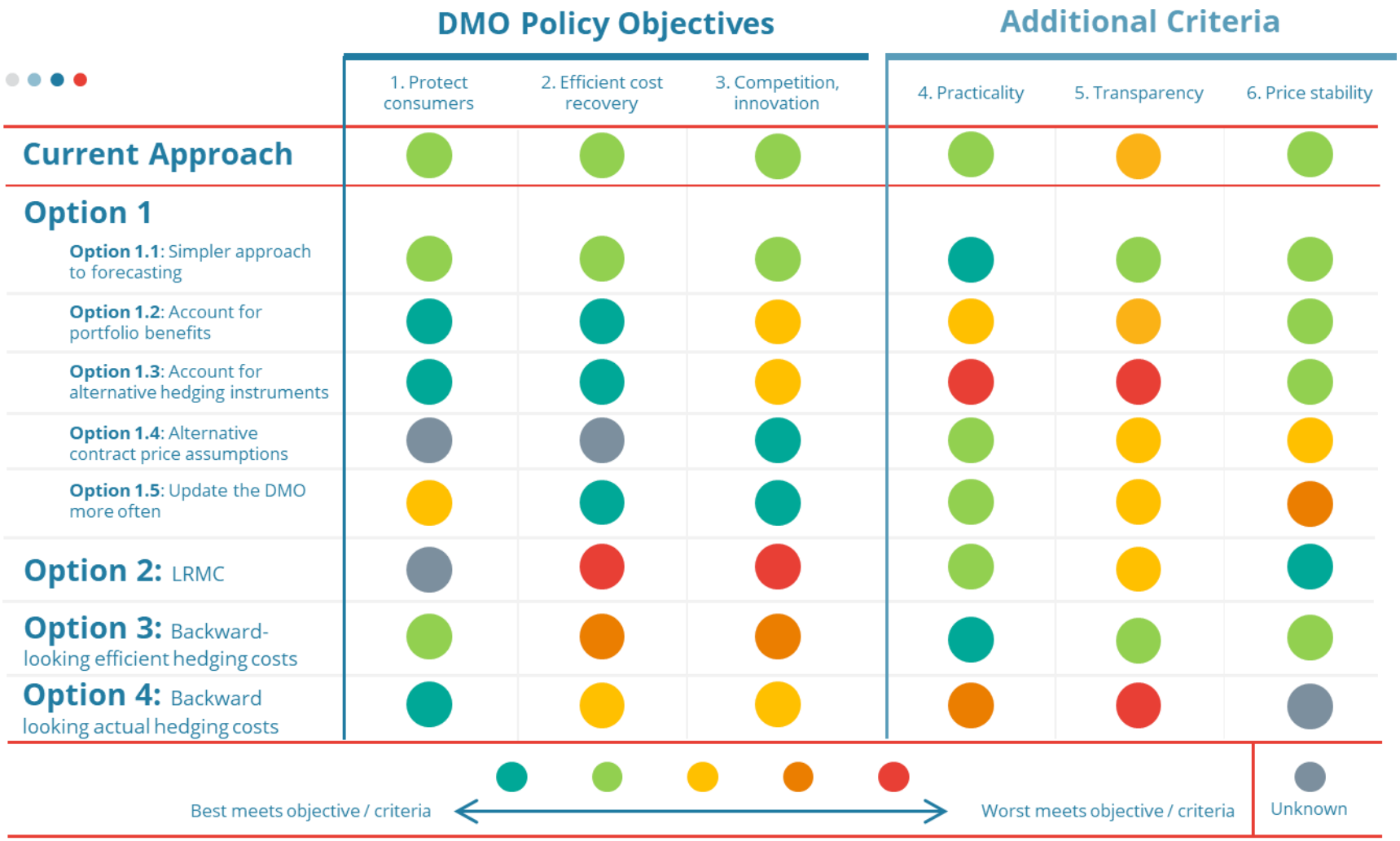
Our assessment is summarised below in **Figure 2** using a traffic light system. The traffic light system is on a scale from best meets the objective/criteria (represented by dark green) to worst meets the objective/criteria (represented by red). In some cases we are unable to make an assessment, because outcomes under the alternative option are unknown and the extent to which the alternative option will therefore meet a particular objective/criteria is also unknown. These issues are discussed in more detail in the sections that follow.

We note that the assessment in **Figure 2** and sections below are based on the implicit assumption that other elements of the DMO do not change as a result of adopting an alternative approach to the WEC. So for instance, we assess that Option 1.2 and Option 1.3 – which both seek to set a WEC that better reflects the costs of the most efficient retailer – are likely to perform better on the criteria of protecting customers and efficient cost recovery but are likely to perform worse in maintaining incentives for competition and innovation. When making this assessment, we are assuming that the lower WEC delivered by Option 1.2 and Option 1.3 is not mitigated by increases in other allowances in the DMO (perhaps to reflect greater risk to retailers or to provide more 'headroom' for competition).

On the whole, our assessment can be summarised as follows:

- The current approach does a good job of meeting the DMO objectives while also performing reasonably well on the other criteria of practicality, transparency and price stability.
- There are alternative options that could be expected to perform better than the current approach on one of more of the DMO objectives. However each of these perform worse on at least one of the DMO objectives and typically also perform worse on the criteria of practicality and transparency.
- Backward-looking approaches such as Option 3 and Option 4 perform poorly against the DMO objectives. However, the information on retailers' actual hedging positions that would be provided by Option 4 mean that this approach may be useful to undertake semi-regularly in order to inform methodological decisions and assumptions that would be needed to give effect to Option 1.2 or Option 1.3 (or both).

Figure 2: Summary of assessment of alternative options



Source: Frontier Economics

6.2 Current approach

The current approach refers to the approach to estimating WEC that is currently adopted by ACIL Allen on behalf of the AER.

Our assessment of the current approach against the DMO objectives and other criteria is as follows:

- **Protect consumers** – The current approach can be expected to reasonably meet the objective of protecting consumers. The approach has regard to the key drivers of the cost that retailers face in supplying electricity to small customers, being:
  - customer load and spot prices, and the correlation between the two
  - the need to hedge the risks associated with the settlement payments to AEMO resulting from future customer load and spot prices
  - the cost of hedging contracts.

  However, there is room for changes to the current approach to better meet the objective of protecting consumers. Built into the current approach are a number of methodological decisions that tend to result in the WEC being over-estimated relative to the WEC that the most efficient retailer could expect to achieve. The reasons for this include that:
  - the approach estimates the cost of supplying small customer load in each region on a stand-alone basis, which means that the portfolio benefits that are available to retailers from supplying a diversity of customers in a diversity of NEM regions are not accounted for;
  - the approach estimates the cost of hedging small customer load based only on a subset of the instruments available to retailers to manage their risks, which means that any greater risk management, or lower-cost risk management, provided by these instruments is not accounted for;
  - the approach assumes that retailers take a risk-averse approach when hedging their small customer load;
  - the approach sets the WEC at the 75% of all simulated WECs. Our understanding is that the effect of this is that the WEC that is used to determine the DMO is higher than the *expected* value of the WEC. While this approach may make sense to mitigate the risk that the WEC that is used to determine the DMO ends up being lower than the actual WEC (because of the uncertainty associated with actual outcomes), it nevertheless means that the WEC is higher than the *expected* WEC of the most efficient retailer.

  The other options that we discuss below are intended to address some of these reasons that the WEC under the current approach will tend to be over-estimated relative to the WEC that the most efficient retailer could expect to achieve.
- **Efficient cost recovery** – The current approach can be expected to reasonably meet the objective of providing efficient cost recovery. This is for the same reason as the current approach can be expected to reasonably meet the objective of protecting consumers: the current approach has regard to the key cost drivers that retailers face.

  However, for the same reasons as discussed above, there is room for changes to the current approach to better reflect the costs of the most efficient retailers. The other options that we discuss below are intended to address some of the reasons that the WEC under the current

approach will tend to be over-estimated relative to the WEC that the most efficient retailer could expect to achieve.

In addition, the current approach focuses on reflecting retailers' 'efficient' historical sunk costs. It does this by setting contract prices based on a book build period that extends for several years. This is different to reflecting retailers' efficient opportunity cost, which would generally reflect current market prices for contracts. Option 1.4 is intended to address this, basing the WEC on opportunity cost rather than historical sunk costs.

- **Competition, innovation** – To the extent that the current approach can be expected to result in WEC that is over estimated relative to the WEC that the most efficient retailer could expect to achieve, the current approach is likely to facilitate competition and innovation. By delivering a WEC and therefore DMO that is likely higher than the cost that the most efficient retailer could expect to achieve, the approach is unlikely to interfere with retailers' price strategies for market offers and is likely to provide incentives for customers to switch to market offers.

  The one caveat to this relates to the use of historical contract prices (under the book build approach) rather than current contract prices. To the extent that markets offers reflect current contract prices (being the opportunity cost to a retailer of increasing its hedge cover to support entry into the market or to support growth in its residential customers) the DMO can diverge from market offers. For instance, at times when contract prices are increasing over time, the DMO price will reflect lower historical contract prices, while retailers looking to enter the market or expand their retail position will face higher current contract prices. This may make it uneconomic for these retailers to compete with the DMO price.

- **Practicality** – The current approach reasonably meets the criteria of practicality. Although the approach involves detailed modelling and analysis and requires the use of an electricity market model, there are a number of organisations that have undertaken equivalent modelling and analysis on behalf of regulators and the AEMC in the past.

- **Transparency** – The current approach does not perform well on the criteria of transparency. While a lot of information and data is released to support the calculation of the WEC, reliance on electricity market modelling for key inputs into the calculation of WEC is a commonly cited barrier to transparency.

- **Price stability** – The current approach can be expected to reasonably meet the criteria of price stability. In particular, the use of contract prices that reflect a long-term average contract price, reflecting a gradual book build approach, is likely to result in greater price stability than an approach that marks-to-market contract prices.

The current approach can be expected to reasonably meet the objectives of protecting customers, providing efficient cost recovery and providing incentives for competition and innovation both today and into the future as market conditions change.

The reason is that the current approach is very much a forward-looking approach, and would be expected to reasonably capture changes in market circumstances during the electricity market transition. Indeed, one of the key features of the current approach is the effort to account for expected future changes to prices and load through the price and load forecasting methodologies. For instance, the market modelling undertaken to forecast spot prices should be able to account for the effect that increasing amounts of utility-scale PV and rooftop PV will have on prices during the middle of the day, and these impact on prices will then flow through to the estimated WEC (due to their impact on settlement payments and difference payments). Similarly, the solar PV forecasting that is incorporated into the load forecast should be able to account for the effect that increasing amounts of rooftop PV will have on residential customer load.

It is more difficult to know how the current approach will deal with more fundamental changes to market design in the longer-term, such as those that might emerge from the NEM 2025 work. The current approach is clearly best suited to use in an energy only market in which retailers have access to financial hedging products. The approach could likely be adjusted to account for changes such as the introduction of a capacity market, as long as the existing arrangements for settlement in the spot market and access to financial hedging products remained. In the event that changes to the electricity market cause the markets for financial hedging products to collapse it is harder to see how the current approach would continue to work.

6.3 Option 1.1: simpler approach to price and load forecasting

Option 1.1 retains the basic features of the current approach but takes a simpler approach to forecasting future patterns of spot prices and load. This simpler approach would principally rely on recent historical data on patterns of spot prices and load, rather than using market modelling and econometric modelling to forecast the effect that market trends will have on spot prices and load.

In assessing Option 1.1 we focus on how a shift to a simpler forecasting approach affects our assessment – that is, it focuses on how our assessment of Option 1.1 differs from our assessment of the current approach.

Our view is that a simpler approach to forecasting future patterns of spot prices and load can be an effective approach, particularly in the short-term. ASX Energy prices can provide a good basis for forecasting the *average* level of prices for the next year. This means that the remaining question is how to forecast *interval-by-interval* prices and load for next year. Modelling can be used to forecast the pattern of interval-level prices and load but, in our view, modelling of this kind is likely to draw heavily on recent historical data in any case. The alternative to modelling is simply to assume that future patterns of interval-level prices and load will be the same as recent historical patterns, and avoid the modelling entirely. The differences between these two approaches depends on the extent to which modelling can reliably improve upon historical data when forecasting in the short-term. Our view is that the differences are generally likely to be relatively small on average. For this reason, we consider that a simpler approach to price and load forecasting generally could be expected to perform almost as well as the current approach against the DMO policy objectives, but is significantly more practical and more transparent.

However, we would note that at times in which substantial future changes to the structure of the market are expected – for instance, the closure of a major power station – there is stronger reason to expect that the current approach would better capture the effects of these changes – and therefore perform relatively better against the DMO policy objectives – than Option 1.1.

6.4 Option 1.2: account for the portfolio benefits from a mix of customers

Option 1.2 retains the basic features of the current approach but seeks to account for the portfolio benefits that retailers can gain from supplying a mix of different customers in different NEM regions.

In assessing Option 1.2 we focus on how a shift to accounting for portfolio benefits affects our assessment – that is, it focuses on how our assessment of Option 1.2 differs from our assessment of the current approach.

Our assessment of Option 1.2 against the DMO objectives and other criteria is as follows:

- **Protect consumers** – Option 1.2 can be expected to improve performance against the objective of protecting customers. The reason for this is that Option 1.2 will ensure that the DMO reflects the benefits that retailers can achieve by hedging against a diverse mix of customer types in a diverse mix of NEM regions. These portfolio benefits will have the effect of lowering the total cost to a retailer of hedging, relative to a strategy of individually hedging against each separate customer type in each separate region. A proportion of the savings achieved through these portfolio benefits could reasonably be attributed to small customer load in each region, resulting in a lower estimate of the WEC and DMO, and greater protection for consumers.
- **Efficient cost recovery** – To the extent that there are portfolio benefits that retailers can achieve by hedging against a diverse mix of customer types in a diverse mix of NEM regions, it would be expected that efficient retailers would seek to achieve these portfolio benefits (and that competition would drive retailers to achieve these portfolio benefits). By accounting for the portfolio benefits, therefore, Option 1.2 would result in a WEC and DMO that better reflect the efficient costs of supplying small customers in each region.
- **Competition, innovation** – There may be practical reasons that not all retailers are able to follow a strategy of supplying a diverse mix of customers types in a diverse mix of NEM regions. Smaller retailers, for instance, or new entrant retailers, may not have the resources necessary to follow this strategy. By setting a WEC and a DMO that assumes retailers can achieve the portfolio benefits of supplying a diverse mix of customer types in a diverse mix of NEM regions, Option 1.2 may result in a WEC and a DMO that some smaller retailers, or new entrant retailers, may be unable to achieve for practical reasons. Ultimately, this could result in exit of these retailers, or deter new entry. If all that changes under Option 1.2 is that the WEC is lower to reflect available portfolio benefits, then there may also be reduced incentives for customers to switch to market offers.
- **Practicality** – Seeking to account for portfolio benefits under Option 1.2 does create additional practical difficulties. The chief practical difficulties are the following:
    - There is no readily available measure of what will be the total mix of customers for an efficient retailer. Absent a data request to all retailers, the best approach is likely to be to make assumptions based on total system load – although many large industrial customers are not supplied by retailers, so their load should be excluded from total system load. This would require the exercise of judgement and is likely to be a point of significant contention.
    - Accounting for portfolio benefits would require some method for allocating total hedging costs to the small customers able to access the DMO. Or to put this another way, accounting for portfolio benefits would require some method for allocating the available portfolio benefits to small customers. Approaches to cost allocation are rarely clear-cut, and this would require the exercise of judgement and is likely to be a point of significant contention.
- **Transparency** – For similar reasons, Option 1.2 does create additional issues with reduced transparency. Because Option 1.2 would require data on total load that is not readily available, and because the data that would be used and the approach to cost allocation would both require the exercise of judgement, stakeholders are likely to consider that this approach results in less transparency. To the extent that the approach under Option 1.2 involves a data request to all retailers, this data would be considered confidential by retailers and so would further increase the issues with reduced transparency.

- **Price stability** – In principle, Option 1.2 should not materially change price stability outcomes relative to the current approach (even if accounting for portfolio benefits does result in a reduction in the WEC). Any changes in portfolio benefits from one year to the next are unlikely to be a significant driver of WEC estimates and, therefore, unlikely to result in a significant change in volatility of the WEC or the DMO.

Option 1.2 would be expected to perform as well as the current approach in being able to account for changing market conditions. In fact, if one of the changes that we see in the NEM is that retailers increasingly seek to diversify in order to manage the increasing risk associated with high levels of renewable generation, then accounting for portfolio benefits – as in Option 1.2 – becomes increasing relevant to assessing retailers' efficient costs.

6.5 Option 1.3: account for alternative hedging instruments

Option 1.3 retains the basic features of the current approach but seeks to account for the hedging benefits that financial or physical instruments other than standard quarterly swaps and caps can provide to retailers.

In assessing Option 1.3 we focus on how a shift to accounting for alternative hedging instruments affects our assessment – that is, it focuses on how our assessment of Option 1.3 differs from our assessment of the current approach.

Our assessment of Option 1.3 against the DMO objectives and other criteria is as follows:

- **Protect consumers** – Option 1.3 can be expected to improve performance against the objective of protecting customers. The reason for this is that Option 1.3 will ensure that the DMO reflects a broader range of risk management instruments – accounting for these in the estimate of the WEC will result in a lower WEC (if there is some additional benefit from these additional instruments) or the same WEC (if there is no additional benefit from these additional instruments).
- **Efficient cost recovery** – To the extent that there are benefits that retailers can achieve by using a broader range of risk management instruments, it would be expected that efficient retailers would seek to achieve these benefits (and that competition would drive retailers to achieve these benefits). By accounting for the benefits that this broader range of risk management instruments provides, therefore, Option 1.3 would result in a WEC and DMO that better reflects the efficient costs of supplying small customers in each region.
- **Competition, innovation** – There may be practical reasons that not all retailers are able to make use of all the available risk management instruments. Smaller retailers, for instance, or new entrant retailers, may not have the resources necessary to enter into PPAs or physical ownership. By setting a WEC and a DMO that assumes retailers can make use of a broader range of risk management instruments, Option 1.3 may result in a WEC and a DMO that some smaller retailers, or new entrant retailers, may be unable to achieve for practical reasons. Ultimately, this could result in exit of these retailers, or deter new entry. If all that changes under Option 1.3 is that the WEC is lower to reflect available benefits from a broader range of risk management instruments, then there may also be reduced incentives for customers to switch to market offers.
- **Practicality** – Seeking to account for a broader range of risk management instruments under Option 1.3 does create additional practical difficulties. The chief practical difficulty is that there is no readily available and public information on the terms or prices of these other instruments. For instance, some types of financial derivatives that can be traded over-the-

counter are not currently traded on the ASX. Load-following swaps are one example – these products provide better management of retailer's volume risk, but do so at a price premium. Similarly, PPAs or physical ownership of generation provides risk management. However, there is no readily available public information on the terms or prices of these types of risk management. As a result, implementing this approach would likely require assumptions to be made about these other instruments or, more likely, require data provided by retailers.

- **Transparency** – For similar reasons, Option 1.3 does create additional issues with reduced transparency. Because Option 1.3 would require data on the terms and prices of other instruments that is not readily available, and because estimates for some instruments would require the exercise of judgement, stakeholders are likely to consider that this approach results in less transparency. To the extent that the approach under Option 1.3 involves a data request to all retailers, this data would be considered confidential by retailers and so would further increase the issues with reduced transparency.
- **Price stability** – In principle, Option 1.3 should not materially change price stability outcomes relative to the current approach (even if accounting for the benefits available from a broader range of risk management instruments does result in a reduction in the WEC). Any changes in the benefits available from a broader range of risk management instruments from one year to the next are unlikely to be a significant driver of WEC estimates and, therefore, unlikely to result in a significant change in volatility of the WEC or the DMO.

Option 1.3 would be expected to perform as well as the current approach in being able to account for changing market conditions. In fact, if one of the changes that we see in the NEM is that retailers increasingly shift away from standard swaps and caps traded on ASX Energy for risk management – perhaps because changing patterns of load and prices make these products increasingly ill-suited to the emerging risks that retailers face – then accounting for alternative instruments – as in Option 1.3 – becomes increasing relevant to assessing retailers' efficient costs.

6.6 Option 1.4: alternative contract price assumptions

Option 1.4 retains the basic features of the current approach but changes the period of time over which contract prices are calculated, such as by using a mark-to-market approach.

In assessing Option 1.4 we focus on how a change to using a mark-to-market approach to calculating contract prices affects our assessment – that is, it focuses on how our assessment of Option 1.4 differs from our assessment of the current approach.

Our assessment of Option 1.4 against the DMO objectives and other criteria is as follows:

- **Protect consumers** – It is unclear how Option 1.4 would perform against the objective of protecting consumers relative to the other available options. Ultimately, outcomes for the WEC and the DMO will depend on movements over time in the prices of ASX Energy contracts. Where the prices of these contracts have tended to fall over time, adopting a mark-to-market approach will result in a lower WEC and a lower DMO. In years in which prices of these contracts have tended to increase over time, adopting a mark-to-market approach will result in a higher WEC and a higher DMO. Conversely, in years in which prices of these contracts have tended to decrease over time, adopting a mark-to-market approach will result in a lower WEC and a lower DMO.
- **Efficient cost recovery** – The extent to which Option 1.4 would perform against the objective of efficient cost recovery really depends on what is intended by efficient costs. To the extent

that the objective is about reflecting the historical sunk costs that retailers incur in building a hedging position over time, basing contract prices on long-term averages (as in the current approach) will better reflect efficient costs than a mark-to-market approach. However, to the extent that the objective is about reflecting opportunity costs (and treating sunk costs as irrelevant), basing contract prices on a mark-to-market approach will better reflect efficient costs than a long-term average approach.

- **Competition, innovation** – In principle, it would be expected that prices in competitive markets would be based on opportunity cost. For this reason, determining the WEC and the DMO based on opportunity costs (rather than historical sunk costs) should result in greater alignment between DMO prices and prices of market offers. This in turn, should lead to more efficient decisions by customers about switching between the DMO and market offers.
- **Practicality** – The practicality of Option 1.4 is no different to the practicality of the current approach. The only difference between the current approach and Option 1.4 is that a different set of contract prices are used when calculating the difference payments and contract premiums that are used in determining the WEC.
- **Transparency** – The transparency of Option 1.4 is no different to the transparency of the current approach. The only difference between the current approach and Option 1.4 is that a different set of contract prices are used when calculating difference payments and contract premiums that are used in determining the WEC. Option 1.4 does not require any data that is not required under the current approach and does not require any additional exercise of judgement.
- **Price stability** – Option 1.4 is likely, although not certain, to result in less price stability than an approach that averages contract prices over the long term (such as the current approach). The reason is that contract prices that are marked-to-market each year are likely to be primarily determined by the unique circumstances at the time of the price determinations. However, contract prices that are averaged over the long-term mean that prices from one year to the next will still account for a period of common market circumstances.

There is reason to think that Option 1.4 may perform better than the current approach in being able to account for changing market conditions. Both the current approach and Option 1.4 are very much forward-looking approaches, and would be expected to reasonably capture changes in market circumstances during the electricity market transition. Indeed, one of the key features of the current approach (which would also persist under Option 1.4) is the effort to account for expected future changes to prices and load through the price and load forecasting methodologies.

Where Option 1.4 may perform better than the current approach in responding to changing market conditions is in making use of more recent contract prices. Where trends in electricity market conditions affect electricity prices, it is to be expected that more recent contract prices will better reflect the effect of these trends than old contract prices. So for instance, if a trend towards greater adoption of solar PV is having the effect of lowering electricity prices during the day, then it would be expected that today's contract prices will better reflect this trend than prices that the same contract was trading at two years ago.

6.7 Option 1.5: update the DMO more often

Option 1.5 retains the basic features of the current approach but updates the WEC and the DMO more often.

In assessing Option 1.5 we focus on how updating the DMO more often affects our assessment – that is, it focuses on how our assessment of Option 1.5 differs from our assessment of the current approach.

While the approach under Option 1.5 is essentially the same as the current approach, updating the WEC and the DMO more often would, in our view, result in two key changes to the assessment:

More recent updates to the DMO would result in more price volatility for customers. This is both because prices would be changed more often in response to changes in market conditions, but also because costs tend to be higher in some parts of the year than others. For instance, electricity prices in Q1 tend to be higher than electricity prices in other quarters; updating the DMO quarterly, therefore would result in customers facing higher in Q1 and lower prices at other times of the year relative to updating the DMO annually. This greater price volatility for customers suggests that Option 1.5 would perform worse than the current approach in **protecting customers** and in providing **price stability**.

More recent updates to the DMO would also result in prices that more closely reflect retailers actual costs. This is because higher costs during certain parts of the year (for instance, Q1) would result in higher DMO tariffs and because more regular updates to the DMO mean that any divergence between costs forecasts for the WEC and outturn market conditions will be less prolonged. This stronger link between costs and tariffs suggests that Option 1.5 would perform better than the current approach in ensuring **efficient cost recovery** and providing incentives for **competition and innovation**.

6.8 Option 2: Determine WEC based on the cost of generation / LRMC

Option 2 would determine the WEC based on the LRMC of generation.

In assessing Option 2 we focus on how a shift to a generation cost-based estimate of WEC affects our assessment – that is, it focuses on how our assessment of Option 2 differs from our assessment of the current approach.

Our assessment of Option 2 against the DMO objectives and other criteria is as follows:

- **Protect consumers** – It is unclear how Option 2 would perform against the objective of protecting consumers relative to the other available options. The cost of generation can diverge substantially from spot prices and contract prices, which are the key driver of WEC estimates under the current approach and under Options 1.1 to 1.5. This means that at times the cost of generation can be significantly higher than estimates of WEC under the current approach and at times the cost of generation can be significantly lower than estimates of WEC under the current approach.
- **Efficient cost recovery** – One of the key rationales for adopting an approach based on the cost of generation is that some retailers will seek to hedge risk by physical ownership of generation or through PPAs. In other words, the cost of generation is an estimate of the historical sunk costs that retailers face when hedging risk through physical ownership or through PPAs. However, it is currently a far more common approach for retailers is to use financial derivatives to hedge risk, which means that approaches based on the cost of these financial derivatives (such as the current approach) are more likely to reflect a typical retailers efficient costs under current conditions.

- **Competition, innovation** – For similar reasons, Option 2 would not be expected to perform well against the objective of promoting competition and innovation. Periods of divergence between costs of generation and market-based energy costs will interfere with opportunities for innovation and with incentives for customers to switch to market offers.
- **Practicality** – Option 2 can be expected to reasonably meet the criteria of practicality. While the approach involves detailed modelling and analysis, and does require the use of an electricity market model, there are a number of organisations that have undertaken equivalent modelling and analysis on behalf of regulators.
- **Transparency** – Option 2 would not perform well on the criteria of transparency. In particular, reliance on electricity market modelling for key inputs into the calculation of the cost of generation is a commonly cited barrier to transparency.
- **Price stability** – Option 2 can be expected to perform strongly against the criteria of price stability. The key drivers of cost of generation – capital costs, cost of capital estimates and fuel costs – are likely to be more stable over time than spot prices and contract prices. For this reason, the WEC and the DMO can be expected to be more stable prices under Option 2 than the current approach or the other options.

Option 2 will only indirectly reflect changes to market dynamics such as an increase in negative prices driven greater investment in solar PV, or a change to market design. The reason is that the costs of new generation are principally driven by capital costs, operating costs and fuel costs. To the extent that efficient retailers rely on vertical integration or PPAs, and it is considered appropriate to determine a WEC based on these sunk costs (rather than on the basis of opportunity costs), this is a benefit of Option 2. If retailers' costs are not driven by changes to market dynamics of market design because they are largely vertically integrated or rely on PPAs then it is appropriate that the WEC also is not driven by changes to market dynamics or market design. As discussed, however, where retailers' costs are driven by spot and contract prices, Option 2 will lead to significant divergence between retailers' costs and revenues.

6.9 Option 3: Determine WEC based on backward-looking efficient costs of a benchmark retailer

Option 3 involves determining the WEC based on a backward-looking estimate of the efficient costs of a benchmark retailer. These costs would be based on a similar hedging approach as the current approach, incorporating an efficient mix of swaps and caps to meet the regulated load.

In assessing Option 3 we focus on how a shift to a wholly backward-looking approach to estimating WEC affects our assessment – that is, it focuses on how our assessment of Option 3 differs from our assessment of the current approach.

Our assessment of Option 3 against the DMO objectives and other criteria is as follows:

- **Protect consumers** – Like the current approach, Option 3 can be expected to reasonably meet the objective of protecting consumers. The approach has regard to the key drivers of the cost that retailers face in supplying electricity to small customers, being:
  - customer load and spot prices, and the correlation between the two
  - the need to hedge the risks associated with the settlement payments to AEMO resulting from future customer load and spot prices
  - the cost of hedging contracts.

However, unlike the current approach, Option 3 is wholly backward-looking, meaning that the estimate of the WEC will reflect efficient costs in the previous year. From the perspective of customers that are prepared to switch to market offers, this may be relatively low risk: at times when costs are increasing, the WEC will lag this price increase and at times when costs are decreasing and the WEC will lag this price decrease customers will have the option to switch to lower priced market offers. For customers that are not prepared to switch to market offers, costs over the long term under Option 3 will be, on average, the same as costs over the long term under the current approach. However, to the extent that there are persistent trends affecting the electricity market (such as an increase in negative prices due to solar PV), Option 3 will be slower to reflect these trends than the current approach.

Just as there would be room for changes to the current approach to better meet the objective of protecting consumers, there would also be room for changes to Option 3. These would include accounting for portfolio benefits, accounting for a broader mix of risk management instruments and changing the period over which contract prices are determined.

- **Efficient cost recovery** – That Option 3 is wholly backward-looking raises similar issues in respect of the objective of efficient cost recovery that it raises in respect of the objective of protecting consumers. However, the issues for retailers are potentially more acute because changes in the number of customers that any retailer has on the DMO from one year to the next will mean that a WEC that is lagging retailers' actual costs can have lasting financial consequences for retailers. With no changes in the number of customers, retailers costs and revenues will be reasonably aligned over time; with changes in the number of customers this may not be the case.
- **Competition, innovation** – Again, that Option 3 is wholly backward-looking raises issues with meeting the objective of competition and innovation. Because Option 3 will result in an annual mismatch between the DMO and retailers' costs, it can drive inefficient incentives for innovation and competition.
- **Practicality and transparency** – The chief advantages of Option 3 are that it is simpler to implement and more transparent than forward-looking market-based approaches. Since Option 3 is wholly backward-looking, there is no need under Option 3 to forecast future spot prices and future load. This removes one of the key sources of complexity and one of the key sources of poorer transparency.
- **Price stability** – Like the current approach, Option 3 can be expected to reasonably meet the criteria of price stability. In particular, the use of contract prices that reflect a long-term average contract price, reflecting a gradual book build approach, is likely to result in greater price stability than an approach that marks-to-market contract prices. However, the fact that Option 3 is backward-looking does mean that changes in the DMO under Option 3 will lag changes in costs and in market prices, potentially creating confusion about changes in prices.

Because Option 3 is wholly backward-looking it will clearly take longer to respond to change in market dynamics and market design than will options that are forward-looking (such as the current approach, Option 1.1 to 1.5 and Option 2).

6.10 Option 4: Determine WEC based on backward looking actual costs of retailers

Option 4 is similar to Option 3 in that it is wholly backward-looking. Option 4 differs from Option 3 in that rather than the estimate of WEC being based on the efficient cost of a benchmark

retailer (using a similar hedging approach as the current approach), the estimate of WEC would be based on retailers' observed historical costs. Clearly, this would require detailed information to be provided by retailers.

In assessing Option 4 we focus on how a shift to a wholly backward-looking approach based on retailers' actual costs affects our assessment – that is, it focuses on how our assessment of Option 4 differs from our assessment of the current approach.

Our assessment of Option 4 against the DMO objectives and other criteria is as follows:

- **Protect consumers** –Option 4 can be expected to reasonably meet the objective of protecting consumers. Option 4 has regard to the key drivers of the cost that retailers face in supplying electricity to small customers, being:
  - customer load and spot prices, and the correlation between the two
  - the need to hedge the risks associated with the settlement payments to AEMO resulting from future customer load and spot prices
  - the cost of hedging contracts.

  Option 4 offers some advantage over the current approach in that accessing rich retailer data on their actual positions provides greater opportunity to better meet the objective of protecting consumers by accounting for portfolio benefits and different risk management instruments.

  However, to the extent that Option 4 gives effect to something like rate of return regulation there is the risk that retailers will have less incentive to pursue efficient contracting strategies. This risk is relatively low, however, since DMO customers are only one, relatively small, part of retailers' overall position.
- **Efficient cost recovery** – To the extent that the objective of efficient cost recovery is directed at recovery of retailers' historical sunk costs, Option 4 provides a better information base on which to achieve this objective. Information on retailer's actual load and hedging positions can feed into the determination of the WEC, ensuring that the resulting WEC betters reflects retailers' actual costs.

  Even if the objective of efficient cost recovery is directed at recovery of retailers' opportunity cost, Option 4, by providing greater information on retailers' efficient contract positions can inform an assessment of retailers' efficient opportunity costs.

  Against this, however, is the fact that Option 4 is wholly backward-looking raises the same issues about the mismatch between costs and revenues that arise for Option 3.
- **Competition, innovation** – Option 4 provides greater information about the actual load and contracting behaviour of retailers. This greater information should, in principle, mitigate the risk inherent to other market-based approaches where the market-based approach results in a WEC reflecting load assumptions or contracting assumptions that retailers cannot achieve, and which, therefore, will impede the ability of retailers to innovate.

  Against this, however, and like Option 3, is the fact that Option 4 will result in an annual mismatch between the DMO and retailers' costs means that it can drive inefficient incentives for innovation and competition.
- **Practicality and transparency** – The chief disadvantages of Option 4 are that it is more difficult to implement and less transparent than standard market-based approaches. Since Option 4 is fundamentally based on information that is confidential to retailers this approach

creates greater complexity, in interpreting and using the differing data sets from retailers, and creates greater opacity, because much of the information on which the WEC is based will need to remain confidential to retailers.

- **Price stability** – How Option 4 performs against the criteria of price stability is unknown. To the extent that Option 4 leads to different decisions about inputs into the calculation of the WEC or, indeed, a different approach to calculating WEC, it is unclear whether these changes will result in more or less price instability that the current approach or other market-based approaches.

Because Option 4 is wholly backward-looking it will clearly take longer to respond to change in market dynamics and market design than will options that are forward-looking (such as the current approach, Option 1.1 to 1.5 and Option 2).

The greatest benefit of an approach like Option 4 is that information on the way that retailers actually develop their hedge positions, and the costs associated with this, could be used to inform a forward-looking approach. For instance, information on retailers' actual hedge positions could be used to inform methodological decisions and assumptions that would be needed to give effect to Option 1.2 or Option 1.3 (or both), helping to resolve the issues with practicality and transparency for these options.

7 Conclusion

Our strategic level assessment of a range of alternative options for estimating retailer WEC against the DMO's policy objectives and key additional criteria does not suggest a compelling case to deviate from the current approach absent further information.

Alternative approaches that we have considered all have both 'upsides' and 'downsides'. For the most part, options that might be expected to better meet some of the DMO policy objectives will perform worse against other DMO policy objectives, and typically will perform less well against criteria including practicality and transparency.

Key lessons include the following:

- A simper approach to setting the WEC (Option 1.1) may generally achieve similar performance against the DMO objectives, while being more practical and more transparent. However, this simpler approach would do less well in accounting for significant future changes to the market than the current approach.
- Approaches that seek to better reflect retailers actual contracting behaviour (Option 1.2, Option 1.3 and, on a backward-looking basis, Option 4) have the potential to better identify efficient costs and better protect customers. However, there are practical challenges because of the lack of publicly information about retailers actual contracting behaviour.
- Using a mark-to-market approach (Option 1.4) or updating the DMO more often (Option 1.5) would be expected to result in more efficient prices and better provide incentives for competition and innovation. However, these approaches have the potential to result in greater price volatility for customers.

The challenge, then, would appear to be assessing whether potential improvements in meeting certain policy objectives are worth worse performance in meeting others. To an extent, the potential improvements in meeting the policy objectives that can be delivered by alternative options is an empirical question. A quantitative study would be able to test some of these alternatives with real data to determine likely effects on the WEC, and how the alternative approaches deliver differently on the objectives in reality. This detailed quantitative study would help inform an understanding of whether or not the end changes to the WEC are material enough to merit any potential trade-offs. This detailed quantitative study would benefit from information from retailers on their actual load and actual hedging practices and costs.

Additionally, if it is determined that a shift in approach is warranted, the information from a detailed analysis of real retailer data could prove a valuable source of inputs and assumptions to help calibrate any alternative WEC estimation methodology used in place of the current approach. This exercise could be conducted as a one-off detailed study or as a regular (potentially every 5 or so years) check on how the chosen WEC estimation approach is performing. Though this can be time-consuming, it would likely provide the required data to more definitively answer stakeholder concerns about wholesale energy cost methodology that have now spanned multiple DMO reviews, especially about how well the forecasts mirror real-world hedging strategies and associated costs.

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