2016–17 Wholesale Electricity Market Report to the Minister for Energy

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Economic Regulation Authority
WESTERN AUSTRALIA

Economic Regulation Authority

4th Floor Albert Facey House
469 Wellington Street, Perth

Mail to:
Perth BC, PO Box 8469
PERTH WA 6849

T: 08 6557 7900

F: 08 6557 7999

E: records@erawa.com.au

W: www.erawa.com.au

National Relay Service TTY: 13 36 77
(to assist people with hearing and voice impairment)

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Executive summary

Objectives for the wholesale electricity market are to provide secure and reliable electricity supplies, encourage competition and minimise the long-term cost of electricity to customers.

At present, the wholesale electricity market is partially meeting market objectives. However, this will not continue unless the wholesale electricity market adapts quickly to the changes taking place in the sector. These include the retirement of old coal plants and increasing amounts of renewable generation connecting to the grid. Timely reform is needed to avoid the supply interruptions and high prices experienced by customers in the Eastern States. This report explores the problems created by a rapidly evolving wholesale electricity market and makes recommendations for action.

Over the review period, the market delivered secure and reliable electricity supplies. Recent changes have removed excess generation from the market and the number and duration of supply interruptions are only slightly higher than last year.

Market objectives encouraging competition and reduced long-term electricity costs for customers were partly met. Competition exists in the contestable electricity retail market where six large retailers actively compete with Synergy. However, Synergy dominates the wholesale electricity market, controlling about 75 per cent of generation and setting electricity market prices three quarters of the time. There is limited competition and wholesale electricity prices are increasingly high and volatile. This is despite low spot prices for gas.

Synergy's dominance in the wholesale market coupled with a lack of price competition may be driving up wholesale electricity prices. Forward electricity contracts, to hedge against price volatility, are rarely traded. This suggests contract prices may be too high and the terms and conditions onerous for contracting parties. Increasing competition in the wholesale electricity market would place downward pressure on prices. Generation interim access arrangements are being introduced mid-2018 to allow a limited number of new generators to connect. However, new generators will have their output restricted to maintain system security. A barrier to entry will remain, as each subsequent generator faces growing output restrictions and revenue risk.

There are other problems contributing to the wholesale electricity market not meeting market objectives. The market clears at a single price in each 30 minute trading interval whereas other energy markets have trading intervals of five minutes or less. Individual markets for electricity and system support services operate independently. The existing unconstrained market design dispatches generators based on price and disregards any constraints on the network. The system operator has to manually intervene in the dispatch process to maintain the security and the reliability of the system, which may lead to errors and inefficiency in dispatch. Synergy bids into the electricity market as a portfolio, so it is not possible to determine the costs of individual power stations, or where electricity is supplied into the network.

The recent State Government commitment to move to constrained network access and reform wholesale market operations will address some of these problems. Constrained network access connects existing and new generators on the understanding that, at times, their output may be reduced to manage the reliability of the network. This will remove a current barrier to entry for new generation and improve competition in the wholesale electricity market.

The security and reliability of electricity supply is underpinned by ancillary services, such as load following, which help balance the supply and demand of electricity in real time. These

services are mostly supplied by Synergy. There is limited visibility of the quantity of ancillary services, and costs of those services are rising. For example, the cost of the load following service has doubled over the review period compared to the previous year when prices were relatively stable. Planned government reforms will combine the energy and ancillary markets and introduce consistency in how generators bid into the market. Generators competing to provide ancillary services will ensure service quantities and costs are efficient.

The ERA supports these reforms but further action is needed. Reforms to address increasing risks to the security and reliability of electricity supplies and to limit increases in wholesale electricity prices are needed if market objectives are to be met in the short to medium term. Five recommendations for action are as follows.

Tighten market power mitigation measures for Synergy to encourage competition.

Reducing Synergy's market power by splitting its business into separate units could encourage competition in the supply of wholesale electricity. This has been recommended by the ERA in the past and is supported by private sector industry participants. In the absence of industry restructuring, tightening some of the regulations that restrict Synergy's market power can also dampen wholesale cost increases and improve competition. Two actions are recommended.

i. The spread between the buy and sell prices of Standard Products should be reduced from 20 per cent to 10 per cent. Increasing pricing discipline on Standard Products will flow through to all wholesale electricity contracts and ultimately customers.

ii. Synergy should publish how it determines wholesale electricity contract prices to increase transparency, improve market confidence and encourage more trading.

Improving retailer access to competitively priced wholesale electricity is a necessary prerequisite to extending retail competition.

Expedite capacity market reform to reduce uncertainty so new private sector generation capacity can be installed.

The security and reliability of electricity supplies is dependent upon having sufficient generation capacity to meet customers' demands at all times. This is particularly important when demand peaks, for example in the late afternoon when people arrive home from work, or when there is a sudden shock to the network such as the failure of a major generator.

Current forecasts predict that new generation capacity will be needed by 2021. Building new plant is costly and takes several years. So capacity prices have to provide a signal well in advance of when investment in new generation capacity is required.

Transitional arrangements for capacity pricing are currently in place. An earlier proposal to introduce a capacity auction has been delayed to allow further consultation with industry over the coming year. These changes have created uncertainty about how future generation capacity will be procured. This could undermine the continued private sector funding of generation projects. If this leads to future undersupply of capacity, the reliability of electricity supplies will be compromised.

Achieve consistency across technical standards

The standards guiding the security and reliability of electricity supplies are spread across several different industry rules and codes. There is inconsistency in some of the security and reliability standards guiding system operation and network planning. For example, if

the main transmission line into the Eastern Goldfields fails, the technical rules require Western Power to ensure the network can continue to supply electricity to the towns of Kalgoorlie and Coolgardie but not surrounding districts. The system manager interprets the market rules as continuing to supply electricity to all users in the area, with no emphasis on only supplying local towns. This creates confusion over the responsibilities of the Australian Energy Market Operator (AEMO) and Western Power and risks the reliability of electricity supplies, particularly for some customers at the edge of the grid. The market rules and technical rules need to be consistent and clarify the responsibilities of AEMO and Western Power to manage reliability in all parts of the system.

Localised reliability problems in the network are met through contractual arrangements with generators to provide network control services. Alternatively, the system manager can constrain a local generator to supply more or less electricity into the network. These options have different costs and are not used consistently.

Conflicts of interest can exist between the bodies responsible for updating technical security and reliability standards. The administrative processes to address localised reliability requirements, such as procurement of network support services, need to be reviewed to ensure they are transparent, efficient and consistent with capacity procurement.

To avoid conflicts of interest and ensure consistency, establish a reliability advisory committee with responsibility for reviewing and making recommendations and determinations on power system reliability and security standards.

Change the market rules and technical rules to integrate increasing levels of intermittent generation and maintain reliable electricity supplies

To date, the reliability of the electricity system has been maintained while accommodating the connection of intermittent sources of generation such as solar and wind. The large rotating turbines in coal and gas plants, that naturally resist fluctuations in network frequency, help to maintain network stability. This network support will diminish as older coal plants shut down.

The amount of electricity generated by rooftop solar PV systems is equivalent to the output of the two largest coal-fired generators and is growing each year. This is in addition to output from network connected wind farms. The suitability of current security and reliability standards will be challenged as the level of intermittent generation continues to increase.

Rooftop solar systems are usually installed on the customer's side of the electricity meter and are invisible to the system manager, complicating how electricity demand is managed in real time. Electricity market costs increase as more costly gas-fired generators are used to manage peaks in network demand. The lack of accurate data on rooftop solar systems can also lead to overestimating the amount of generation capacity needed in the future. Excess capacity in the system is an unnecessary and inefficient cost to the market.

The continued maintenance of a secure and reliable electricity supply will be complicated by different types of generation technologies and changing consumer behaviour. Wholesale market legislation, rules and regulations need to be reviewed to integrate new technologies and maintain secure and reliable electricity supplies. Recommended actions are as follows:

i. Review the market rules and technical rules to ensure the reliability and security standards they contain are appropriate for new generation types entering the market. This review could extend to consideration of the security standards recommended in the Finkel report and how they could be applied to Western

Australia, e.g. the introduction of Energy Security Obligations to ensure new generators connecting to the network can provide a fast response to fluctuations in network frequency.

ii. Batteries are increasingly used as an electricity storage device at the household and network level but could provide other services such as localised capacity or ancillary service support. The potential value of these services needs to be identified to encourage investment in this technology. Legislative change is required before batteries can enter the electricity market.

iii. Establishing a register of new generation resources such as solar PV and batteries was another recommendation from the Finkel review that could be adopted in Western Australia. This will assist AEMO and Western Power manage and plan for increasing volumes of intermittent generation.

Without effective governance of technical standards, and with the increasing penetration of renewable generators, system security and reliability can be quickly undermined in a small and isolated electricity system like the wholesale electricity market.

Increase the pace of wholesale electricity market reform

Current projections suggest that substantive reforms under way, such as constrained network access, will not be fully operational until 2022. The problems preventing the wholesale electricity market from meeting market objectives are exacerbated by uncertainty over the scope and extended timeframe of market reform. For example, uncertainty over how future capacity will be procured is risking continued private sector investment in generation. Technical reliability and security standards have not changed with the generation mix and could impair system reliability and increase costs for customers in the future. Limited pricing discipline on Synergy has restricted competition in the wholesale electricity market and, unless addressed, will limit the effectiveness of future reforms to the retail market.

The high rate at which new technologies are emerging and entering the market means that change will be ongoing for many years. Electricity policy and market reforms need to happen in a timely manner to keep pace with changes in the wholesale electricity market. Market complexity is also increasing as different elements in the market, such as new technologies, prices and customer behaviour, influence each other. Therefore, reforms need to ensure that the market is designed in a manner that is both flexible and capable of adapting to change.

Previously, the Independent Market Operator took the lead on market development. Currently, no single body is taking or is obliged to take this lead. Market evolution needs to be driven by Government to ensure market reform receives the appropriate priority. The conflict of interest arising from the Government driving reform while being an active participant in the market, can be addressed through wider industry consultation. Additional wholesale market reforms need a clear focus on achieving the wholesale market objectives to improve competition in all markets, ensuring ongoing security and reliability of the electricity system and reducing the long-term costs of electricity for consumers.

1. Introduction

The ERA reports[1] to the Minister for Energy at least annually on the effectiveness of the Wholesale Electricity Market (WEM) in meeting the wholesale market objectives, which are:

- Promoting the economically efficient, safe and reliable production and supply of electricity and electricity related services.
- Encouraging competition among generators and retailers, including facilitating efficient entry of new competitors.
- Avoiding discrimination against particular energy options and technologies, including sustainable energy options and technologies such as those that make use of renewable resources or reduce overall greenhouse gas emissions.
- Minimising the long-term cost of electricity supplied to customers.
- Encouraging measures to manage the amount of electricity used and when it is used.

In March 2017, the ERA held a stakeholder workshop and on 25 July 2017, it released a discussion paper seeking public submissions on matters influencing the effectiveness of the WEM. Eleven submissions were received. Stakeholders' comments are included and addressed throughout this report and copies of the public submissions are available on the ERA's website.

This WEM report focusses on three key themes: downward pressure on wholesale electricity costs, addressing risks to reliability and security in the market, and developing a market design that is fit for purpose.

Section two considers how to achieve effective competition in the wholesale market to reduce cost pressures for consumers. Included is the state of competition in the market, the effectiveness of current market power mitigation mechanisms and full retail contestability.

Section three of the report addresses possible improvements to ensure the efficient operation of the wholesale market to further reduce cost pressures for consumers. Three core reforms are covered: the adoption of a security-constrained market design, co-optimisation of energy and ancillary services, and facility bidding for all market participants.

Section four of the report covers maintenance of system security and reliability, and considers generation resource adequacy, the governance of system security and reliability, and improvements to market operations and processes. This section explores different options for delivering reliability to the South West Interconnected System (SWIS) and discusses the retirement of Synergy's assets.

The final section examines market resilience to changes that may occur in the future, with a particular focus on the increasing penetration of distributed energy resources in electricity markets. It provides an example of an approach suggested by the Australian Energy Market Commission (AEMC) to build market resilience to the increasing penetration of solar PV and battery storage in the National Electricity Market.[2]

The final section concludes with consideration of the timing of market reforms, and the need to address the current absence of an organisation responsible for market development.

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[1] Refer to clause 2.16 of the Wholesale Electricity Market Rules (13 October 2017).

[2] These effects may include, for example, voltage stability issues, and a reduction in grid inertia and frequency response.

2. Competition in the electricity market

There is significant interaction between the wholesale and retail electricity markets. Market customers and electricity generators buy and sell wholesale supplies of electricity in the day-ahead Short Term Energy Market (STEM) and intra-day balancing market, and through bilateral contracting. The WEM should promote the economic efficiency of all markets through enabling and encouraging competition amongst generators and retailers and by facilitating the entry of new competitors.

The ERA recently examined the state of competition in the WEM as part of the 2016 review of the Electricity Generation and Retail Corporation (EGRC) regulatory scheme, implemented with the merger of Verve Energy and Synergy.[3] The scheme provides wholesale arrangements as the main mechanism for inhibiting the exercise of market power by Synergy, and for eliminating barriers to entry, exit, or expansion in the retail market.

In the 2016 EGRC review, the ERA found that competition is developing in the contestable retail market, with Synergy losing market share to rivals, and the Herfindahl-Hirschman Index becoming un-concentrated.[4] Competition is mainly occurring between six main participants, which own generation assets and have some capacity to self-hedge. However, there has been no growth in the market share of small retail market participants, which have a combined market share of less than two per cent.

Small market participants without generation assets purchase most of their supply through the STEM and balancing markets. A review of pricing for the 2016 period indicated that for a four-month period between July 2016 and October 2016, there was a general increase in prices in both the balancing and STEM markets.

The wholesale supply market is highly concentrated, as measured by the Herfindahl-Hirschman Index. Synergy's wholesale supply market share decreased slightly in 2016 but Synergy remains the dominant supplier in the market, with a combined share of 74 per cent after accounting for Synergy's own generation and long-term contracts with other generators.[5] In the absence of any structural reform of the sector by the State Government, Synergy is expected to remain dominant in the wholesale supply market until at least the mid-2020s.

Gentailers smaller than Synergy (i.e. Alinta, Bluewaters, Wesfarmers Kleenheat, Perth Energy and ERM Power) use their own generation for hedging. Contracting is limited for retailers who do not own their own generation assets. Synergy can supply customised bilateral electricity contracts, which are tailored to meet the needs of suppliers. However,

[3] Refer to ERA, 2017. 2016 Review of EGRC Regulatory Scheme, Discussion Paper, https://www.erawa.com.au/electricity/wholesale-electricity-market/reviews/the-electricity-generation-and-retail-corporation-egrc-regulatory-scheme

[4] The Herfindahl-Hirschman Index is a measure of market concentration. It is determined by summing the squares of the individual participants' market shares. The higher the index, the higher the degree of market concentration. Markets with an index below 1,500 are considered to be un-concentrated. Markets with an index of between 1,500 and 2,500 are considered to be moderately concentrated. Markets with an index above 2,500 are considered to be highly concentrated. See US Department of Justice and Federal Trade Commission (2010) Horizontal Merger Guidelines, Federal Trade Commission, Washington, p.19 available from https://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf

[5] Synergy has the opportunity to exercise market power, as the portion of market demand not supplied by other firms in the market is relatively price insensitive.

Synergy can exercise discretion in setting prices for these contracts and accepting the transaction terms requested by market participants.

Customised contracts are negotiated privately and so the pricing of the products is not transparent to the market. As the products cannot be traded, market participants cannot easily enter into or exit from hedging positions offered by those contracts. These features of customised contracts can create a barrier to entry for new entrants to the market. While trading in customised contracts increased in 2016, only one small non-vertically integrated retailer submitted requests for quotes for customised products, none of which it executed.[6]

The standard product regime was developed to provide competitive and transparent price signals and as a hedging option for all market participants. Synergy can set its standard product prices wherever it likes but the EGRC regulatory scheme requires that the standard product sell price is no more than 20 per cent higher than the standard product buy price. Only one trade in standard products was entered into in 2016.

Market participants[7] indicate that the size and structure of Synergy is an impediment to a fully competitive market. Bluewaters and Kleenheat consider it a priority that the issue of market dominance is addressed before any more significant reform occurs. Bluewaters states that effective competition is likely to promote the objective of minimising the long-term cost of electricity supplied to customers.[8]

Kleenheat considers that neither the wholesale nor the retail market is effectively competitive due largely to the concentration of the wholesale market and the absence of full retail contestability. Kleenheat argues that Synergy's dominance and the lack of clarity regarding its future investments compounds the absence of full retail contestability to dissuade private sector investment in the WEM. Kleenheat states that it will continue to face challenges securing competitively priced wholesale electricity until Synergy's dominance is addressed.

Participants made suggestions for restructuring Synergy. ERM Power considers that, without the creation of new gentailers, as recommended in the first phase of the Electricity Market Review, the de-merger of Synergy's wholesale and retail businesses would lead to more transparency, better structural separation between the businesses and a better platform for competition.

Kleenheat and Perth Energy consider that structural reform of Synergy could occur through creating competing gentailers, with unbalanced portfolios that will encourage dynamic trading. Perth Energy suggests separating Synergy into one gentailer holding gas fired plant, gas Power Purchase Agreements and all contracts to supply contestable customers; and the other gentailer holds coal-fired assets, windfarms and wind Power Purchase Agreements plus supply to existing franchise customers. It considers that each gentailer would need to trade substantial quantities of energy between themselves and other market

[6] AEMC note that standalone retailers, such as new entrants that offer more innovative prices and products, rely more heavily on contracts than vertically-integrated retailers who have an internal, physical hedge. AEMC, 2017 AEMC Retail Energy Competition Review, FINAL, 25 July 2017, Sydney, page vii: http://www.aemc.gov.au/Markets-Reviews-Advice/2017-Retail-Energy-Competition-Review

[7] In particular, ERM Power, Kleenheat, Bluewaters and Perth Energy.

[8] See Bluewaters submission to the Discussion Paper for the 2016 WEM Report, p. 2, https://www.erawa.com.au/cproot/18217/2/2016%20WEM%20Report%20-%20PubSub%20-%20Bluewaters.PDF

participants, providing a base for effective wholesale trading, with the market operated by the ASX or another entity.

2.1. Synergy's dominance in the wholesale market

Western Australia's wholesale electricity market is characterised by the presence of a large and dominant vertically integrated participant, Synergy. This makes it hard for other suppliers to compete. Structural reform would be the most effective way to increase competition in wholesale energy supplies and drive efficiencies in wholesale pricing.[9]

Without structural change, the market power mitigation mechanisms in the WEM should be tightened to place downward pressure on wholesale costs, prevent price mark-ups and improve competition, thereby reducing costs for consumers. In particular, the ERA recommends adopting a narrower spread between the buy and sell price in the standard products regime and that Synergy publish its foundation transfer price and the method used for calculating this price.

On 17 November 2016, the Minister for Energy revised the cap on Synergy's thermal generation capacity downwards to 2,275 MW of nameplate design capacity.[10] On 5 May 2017, Synergy decided to remove generators from the market that have a combined capacity of 384 MW.[11] This should reduce Synergy's size and lead to a gradual reduction in its thermal generation market share over time, reducing Synergy's overall dominance.

The EGRC regulatory scheme imposes constraints on Synergy's wholesale pricing in the bilateral contract market. The *Electricity Corporations (Electricity Generation and Retail Corporation) Regulations 2013* include non-discrimination requirements in which Synergy is required to ensure that:[12]

- a wholesale supply of electricity is not offered to its retail business unit on terms and conditions that are, having regard to all relevant circumstances, more favourable than the terms on which it is offered to retail or generation competitors; and

[9] See Annual Wholesale Electricity Market Report to the Minister for Energy for the period July 2014 to June 2016 (page 22).
https://www.erawa.com.au/cproot/17086/2/Annual%20WEM%20report%20to%20the%20Minister%20for%20Energy%20for%20period%20to%20June%202016%20.pdf

[10] This excludes generating works that do not generate electricity using renewable energy sources, are no longer in service, that have a nameplate capacity of two megawatts or less and are connected to a distribution system, that provide capacity to an electricity system other than the South West Interconnected System, and battery storage devices. See: http://www.parliament.wa.gov.au/publications/tabledpapers.nsf/displaypaper/3914903a6b61c1cde6d034044825806e0027dedb/$file/4903.pdf

[11] The assets designated for retirement are Muja AB units 1 to 4 (240 MW), Mungarra gas turbine units 1, 2, and 3 (113 MW), West Kalgoorlie gas turbine units 2 and 3 (62 MW), and Kwinana gas turbine unit 1 (21 MW). See https://www.mediastatements.wa.gov.au/Pages/McGowan/2017/05/Synergy-to-reduce-electricity-generation-cap-by-2018.aspx

[12] See regulation 22, page 16 of the *Electricity corporations (Electricity Generation and Retail Corporation) Regulations 2013*: https://www.slp.wa.gov.au/pco/prod/filestore.nsf/FileURL/mrdoc_25864.pdf/$FILE/Electricity%20Corporations%20(Electricity%20Generation%20and%20Retail%20Corporation)%20Regulations%202013%20-%20%5B00-b0-04%5D.pdf?OpenElement

- the financial interests of its retail business unit are not considered in determining the terms and conditions on which a wholesale supply of electricity is offered to retail or generation competitors.

The spread between the buy and the sell price in the *Electricity (Standard Products) Wholesale Arrangements 2014*[13] is the main constraint on wholesale pricing in the bilateral contract market. The buy price anchors the sell price by ensuring that if Synergy puts its sell price up it must also put its buy price up to maintain the spread of 20 per cent. If the buy price is close to or above the expected price in the energy market, Synergy may be obligated to purchase energy from others.

In its submission to the discussion paper, Kleenheat states that the current design of the standard product regime is failing as it places the process of price determination in the hands of Synergy, which has an incentive to restrict access to wholesale supply by charging high prices. Kleenheat notes that the pricing of standard products has recently become more competitive but that there are many alternative superior frameworks to the current standard product regime, such as a Dutch auction or the Directed Contracts regime.[14] The Commission for Energy Regulation in Ireland developed directed contracts to increase independent retailers' access to appropriately priced wholesale electricity supply.

Kleenheat submits that the standard product arrangements have been ineffective in fostering competition, as they are not competitively priced due to a high buy-sell spread. The volume of energy offered is also very small at less than five per cent, as compared to approximately 10 per cent in Ireland.

Perth Energy notes that the Government has not reduced the buy-sell spread despite recommendations by the ERA and suggests the ERA represent the argument to government as a crucial means of mitigating market power.

Perth Energy suggests that the ERA should examine Synergy's transfer pricing arrangements to ensure the pricing structure does not confer any competitive advantage through inappropriate assignment of costs. It further recommends strengthening Synergy's ring-fencing requirements if structural separation does not eventuate. This would include ERA oversight of a cost allocation methodology between contestable and franchise customers, maintenance and publication of separate accounts for its ring-fenced businesses, full ring-fencing of contestable customer business from purchases and sales relating to franchise customers, registers of staff assigned to various business segments and (preferably) legal separation of the entities.

[13] Refer to Electricity (Standard Products) Wholesale Arrangements 2014, https://www.slp.wa.gov.au/gazette/gazette.nsf/searchgazette/E81FAE2E67051AB248257CDA0025714A/$file/gg073.pdf

[14] Direct Contracts are regulated Contracts for Difference imposed on generators with market power. These contracts place a requirement on generators to hedge specified volumes of wholesale electricity based on a predetermined pricing mechanism. The Energy Regulator determines volumes, with the aim of reducing the Herfindahl Hirschman Index to 1,150. Directed contract types are base load, mid-merit and peaking. The Energy Regulator runs a quarterly subscription process, determining the maximum Directed contract volumes for each retailer for the coming four quarters. Retailers then choose whether to subscribe to their maximum contract volume or a portion of the volume for the future quarters. The volume of Directed Contracts a retailer has in any quarter will be the aggregate of contract subscriptions over the past four Direct Contract auctions. Strike prices are determined using a regression equation for each type of contract, as a function of forward fuel and carbon prices.

The scheme sets out transfer pricing arrangements for the wholesale supply by Synergy's wholesale business unit to its retail business unit. It differentiates between wholesale supplies from the wholesale business unit to the retail business unit for:

- meeting foundation customer load (i.e. customers who do not have a new contestable customer arrangement).[15] The arrangements for a wholesale supply of electricity for foundation customers are set out in the foundation transfer price mechanism; and
- additional customer load (i.e. customers who do have a new contestable customer arrangement).[16] The arrangements for a wholesale supply of electricity for new load customers are set out in the additional transfer price mechanism.

In the 2016 EGRC review, the ERA noted that from 1 July 2017, Synergy has employed a new market based method for setting its transfer prices. Previously, the basis of price setting was existing contracts and budgets existing prior to the merger. Synergy now uses the same energy forward curve that underlies calculation of standard product prices to calculate its transfer prices. The non-discrimination requirements in the EGRC Regulations ensure that all of Synergy's contract prices, including customised products, are now constrained by the spread between the buy and sell price in the standard product regime.

The buy price anchors the sell price. If the spread between the buy and sell price is set at the maximum of 20 per cent and Synergy raises its sell price, it must also raise its buy price to maintain the maximum spread. If the buy price is close to or above the expected price in the energy market, Synergy may be required to purchase energy at the raised price.

In its 2016 EGRC Review, the ERA found that the sell price in the standard product regime may have been set too high. For instance, in 2015, five standard product buy transactions were entered into and only one sell transaction. This suggests that while the buy price was suitable for some sellers, the sell price was set too high for those wanting to purchase standard products. Retailers supported this conclusion.[17]

If the standard product maximum buy-sell spread is wide or Synergy's energy forward curve is inefficient, this will result in bilateral contract prices being set high. The supply arm of Synergy's business could earn excess returns. The economic rent would be generated while Synergy is dominant in the wholesale market, and retailers (including the retail business unit) have limited options other than to trade with Synergy. The economic rent

[15] An arrangement is not a new contestable customer arrangement if the arrangement became legally binding on Synergy after the merger, as a result of the contestable customer accepting, on or before 31 March 2014 (without amendment), an offer for the retail supply of electricity that was made by Synergy to the contestable customer before the merger time. Additionally, an arrangement is not a new contestable customer arrangement if the arrangement is for the supply of electricity to the contestable customer at a charge determined in accordance with the *Energy Operators (Electricity Generation and Retail Corporation) (Charges) By-laws 2006*.

[16] A new contestable customer arrangement is a new or amended agreement between Synergy and a contestable customer imposing a legal obligation on Synergy to supply electricity to the contestable customer on a retail basis, that became legally binding on Synergy after the merger.

[17] See Amanda Energy's submission to the 2015 EGRC review (page 2 https://www.erawa.com.au/cproot/14017/2/Amanda%20Energy%20-%20Public%20Submission%202015.pdf), and Kleenheat's submission to the 2016 EGRC review (page 2 https://www.erawa.com.au/cproot/18053/2/Kleenheat%20-%20public%20submission%20-%202016%20EGRC%20Discussion%20paper.pdf).

would persist even if the retail business unit incurs losses through contestable retail market competition. Accordingly, the ERA recommended:

- setting a narrower spread between the buy and sell price in the standard product arrangements to ensure that pricing discipline is placed on Synergy's wholesale supply offerings;
- adopting a 10 per cent maximum buy-sell spread, to be retained for a suitable period) to allow the effect of the change on the level of trade in standard and customised products to be assessed;[18] and
- exploring varied spreads for different products, with smaller spreads employed for more frequently traded products and wider spreads employed for illiquid products that have longer term uncertain forecasts.

As part of the new approach to setting contract prices in the market, Synergy proposed that the retail business unit and the wholesale business unit jointly determine transfer prices, based on their views of a forecast market price for electricity. Despite non-discrimination requirements in the regulations, the retail business unit has input into all Synergy's contract pricing, including the pricing of customised products for its retail competitors. The involvement of the retail business unit and its ability to influence the wholesale contract prices may confound the ring fencing requirements and any assessment of whether consideration of the retail business unit's financial interests occurs when setting prices for other participants.

Additionally, with the current arrangements, market participants may not be aware of the replacement transfer pricing method and its relationship to the market in which they trade. There is also no requirement for Synergy to inform the ERA of any changes to the way that transfer prices (and hence, bilateral contract prices) are calculated to allow for regulatory scrutiny of these changes and their effect on the market. The ERA therefore recommended that Synergy publish its foundation transfer price and the method it uses for calculating this price.

Finally, the ERA noted that only one standard product transaction occurred in the review period. It considered that the terms and conditions of contracting and/or the specification of the standard products may not match market expectations. In view of this, it recommended that Synergy relax its credit requirements for entering into standard product transactions so that they are proportionate to Synergy's exposure to the risk of counterparty default under the standard product regime. It considered that Synergy should also review and amend its product specifications, and amend the standard product force majeure clauses to make them symmetric and less conservative.

Competition generally produces the most efficient outcomes. Synergy dominates the wholesale market, allowing for the possibility that the market may be less competitive than it might be if no single generator had an advantage. Structural reform would be the best way to deal with the lack of competition in wholesale energy supplies and drive efficiencies in wholesale pricing. Without structural change, a focus on tightening the rules that mitigate market power is required to ensure competitive market outcomes.

[18] See section 2.4.1 for discussion on the adoption of a 10 per cent buy-sell spread.

2.2. Pricing discipline in wholesale energy markets

The Wholesale Electricity Market Rules (market rules) require suppliers to provide energy at their reasonable expectation of Short Run Marginal Cost (SRMC). This and the ex-post monitoring and investigation of bidding behaviour seek to mitigate the misuse of market power in the WEM. This is necessary because of the lack of effective competition in the wholesale energy market. However, the definition and interpretation of some of the terms in the market rules[19] are not clear. The ERA is preparing a market bidding guideline to describe how it undertakes investigations into generators' bidding behaviour. It will discuss the draft guideline with industry in late 2017 or early 2018, prior to publication.

The market rules place pricing discipline on market participants. In the balancing market, 'a Market Participant must not, for any Trading Interval, offer prices in its Balancing Submission in excess of the Market Participant's reasonable expectation of the SRMC of generating the relevant electricity by the Balancing Facility, when such behaviour relates to market power'.[20] Similar requirements exist for the STEM and Load Following Ancillary Service markets. [21]

Prices in the energy markets are also constrained by energy price limits or market caps, which include the maximum STEM price (currently $351/MWh), the alternative maximum STEM price,[22] and the minimum STEM price (-$1,000/MWh).[23] No market participant has ever presented evidence to an energy price limits review to show that the energy price limits were preventing it from recovering its short-run marginal costs.

The SRMC rules place an expectation on generators that their market bids should only seek to cover their variable costs of providing energy into the market per Trading Interval, and thus prevent excessive pricing of energy (i.e. economic withholding). SRMC based bidding allows the system operator to dispatch the lowest-cost available generation resources. Therefore, generation resources that have a SRMC below the clearing price earn net energy revenues, supporting investment in an economically efficient mix of generation.[24]

The capacity mechanism complements the energy market by allowing generators to recoup part or all of their fixed costs.[25] Generators receiving capacity credits in the capacity market must offer all of their available capacity into the STEM and balancing market, preventing the physical withholding of capacity.

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[19] Refer to the Wholesale Electricity Market Rules (13 October 2017), https://www.erawa.com.au/cproot/18373/2/Wholesale%20Electricity%20Market%20Rules%2013%20October%202017.pdf

[20] See market rule 7A.2.17. https://www.erawa.com.au/cproot/18049/2/Wholesale%20Electricity%20Market%20Rules%201%20July%202017.pdf

[21] See market rule 6.6.3 and 7B.2.15.

[22] The maximum price depends on whether gas or liquid fuelled generation is required to meet the electricity demand. The Alternative Maximum STEM Price is applied when liquid-fuelled generation is required. The Alternative Maximum STEM Price changes from month to month based on the price of liquid fuel.

[23] See market rule 6.20.

[24] Public Utilities Office, 2016. Market Power Mitigation Mechanisms for the Wholesale Electricity Market. Electricity Market Review, page iii. http://www.treasury.wa.gov.au/uploadedFiles/Site-content/Public_Utilities_Office/Industry_reform/Market-Power-Mitigation-Mechanisms-for-the-Wholesale-Electricity-Market-and-Brattle-Group-Report.pdf

[25] Not all generators can recoup all of their fixed costs through the capacity market, as their capacity may not be available during peak periods, when they are most needed.

However, the SRMC rules lack clarity. For example, the terms 'reasonable expectation', 'short-run marginal cost', 'relates to' and 'market power', are not defined in the market rules, which creates uncertainty in interpreting these terms.

In its 2016 EGRC review, the ERA concluded that, in a rapidly moving market, the extended timescale for monitoring, investigating and enforcing penalties for the misuse of market power may impede the effectiveness of pricing at SRMC. A significant lag may occur between inefficient pricing behaviour and the identification of that behaviour. Unduly high prices may persist in the market for an extended period.

There was mixed feedback from market participants on bid price formation. Perth Energy considered that the ERA should more clearly define how SRMC should be determined. In particular, it considered that an agreed method for determining the level of start-up costs, and accounting for the actual running profile of the plant, should be included in the SRMC calculation per interval. In contrast, Alinta Energy advocated removal of the current detailed definition of SRMC and broadening the scope of specific mitigation controls, as it is not possible to estimate appropriate SRMC-based bids at all times or in all conditions.[26]

Alinta Energy considered that market power abuse is a second order concern compared to the risk of a government entity not operating in a commercial manner, and that the current SRMC rules signal a lack of confidence in the broader market arrangements. Alinta Energy advocated a more permissive approach to bidding behaviour before price formation to support more dynamic and genuine competition in the market.

The requirement for suppliers to provide energy at their reasonable expectation of SRMC, and the use of ex-post behavioural mitigation to govern bidding behaviour in the WEM, are intended to counter the lack of effective competition in the wholesale energy market.

2.3. Full retail contestability

From the experience in National Electricity Market (NEM) jurisdictions and the Western Australian retail gas market, the introduction of full retail contestability may be ineffective in placing downward pressure on retail prices unless a competitive wholesale electricity market exists. Consequently, full retail contestability should be introduced in Western Australia once the lack of competition in the wholesale market is addressed. This can be achieved either through structural change to Synergy or through the tightening of market power mitigation mechanisms to achieve competitive outcomes. Competitive pressure between generators, and in particular, the availability of hedge contracts, is central to promoting competition in the retail market and reducing cost pressures for consumers.

Once wholesale competition improves, the implementation of full retail contestability would most likely lead to significant benefits including efficient price signals and lower prices for consumers, driven by the ability to choose a retailer.

As employed in NEM jurisdictions, independent regulation of retail prices will be required to restrict price rises for residential customers while competition builds between retailers. The State Government's plan to cease provision of the tariff adjustment payment subsidy after 2017–18 is a step towards implementing full retail contestability.

Competition in the wholesale energy market can be driven by a competitive retail market in which many retailers are seeking wholesale supplies. In turn, a competitive retail market is

[26] Alinta notes for example, that for mid-merit and peaking capacity, the appropriate SRMC bid can vary widely depending on expectations concerning how long a given start-up to shut down cycle will run.

dependent on retailers being able to access competitive wholesale energy supplies. The effectiveness of competition in one market both depends on and drives the effectiveness of competition in the other market.

The development of competition in a market is an evolving, dynamic and iterative process that does not necessarily occur smoothly. Changes in market conditions occur as the cost of inputs and technologies change, demand levels vary, innovation occurs, firms enter and exit the market and customer preferences change.[27]

The following sections provide a summary of the development of full retail contestability in the NEM and the Western Australian retail gas market, and then consider the implications for the implementation of retail competition in the WEM.

2.3.1. The National Electricity Market

Recent inquiries have highlighted electricity price increases on the east coast of Australia,[28] leading to concern about whether deregulated retail markets are actually delivering efficient prices for customers, regardless of the appearance of competitive behaviour. On 27 March 2017, the Federal Treasurer directed the Australian Competition and Consumer Commission (ACCC) to hold an inquiry into the retail supply of electricity and the competitiveness of retail electricity markets in the NEM.

In September 2017, in its preliminary report,[29] the ACCC found that the main cause of higher customer bills between 2007–08 and 2015–16 was the significant increase in network costs for all states other than South Australia. Network costs represented 48 per cent of an average residential bill in 2015–16.[30] The ACCC also highlighted how highly concentrated wholesale markets affected retail prices. It found that in the period since July 2016, higher wholesale prices drove retail price increases, with an estimated increase to the average bill in 2016–17 of $167.

The ACCC noted the unnecessarily complex and confusing behaviour of electricity retailers, which, in some cases, appeared to be designed to circumvent regulation.[31] While there is a significant degree of price dispersion, with hundreds of dollars difference between the highest and lowest retail offers in most NEM regions, the offers are difficult to understand and compare. Discounting is problematic because most retailers offer discounts off the total bill or electricity usage only, but the discounts are not taken from a comparable reference point across retailers. Retailers also use inconsistent terminology to describe the same terms.

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[27] Australian Energy Market Commission, 2017 AEMC Retail Energy Competition Review, Final Report, 25 July 2017, Sydney. http://www.aemc.gov.au/Markets-Reviews-Advice/2017-Retail-Energy-Competition-Review

[28] These included AEMC, Energy Consumers Australia and the Grattan Institute. Similar issues were raised in submissions to the Finkel Review. Australian Competition and Consumer Commission (31 May 2017) ACCC Inquiry into retail electricity supply and pricing: Issues paper, page 3: https://www.accc.gov.au/system/files/Retail%20Electricity%20Inquiry%20-%20Issues%20Paper%20-%20final%20for%20consultation%20hub%20-....pdf

[29] Australian Competition and Consumer Commission (22 September 2017) Retail electricity pricing inquiry: Preliminary report https://www.accc.gov.au/regulated-infrastructure/energy/electricity-supply-prices-inquiry/preliminary-report

[30] In South Australia, generation costs represented the highest increase.

[31] The ACCC found that consumers and small businesses are faced with a multitude of complex offers that cannot be compared easily, and there is little awareness of the tools available to help consumers make informed choices or seek assistance if they are struggling to pay bills.

Finally, the ACCC found that, while most retail markets across the NEM have more than 19 retailers, the 'big three' vertically integrated gentailers; AGL, Origin, and EnergyAustralia, hold large retail market shares in most regions. They control more than 60 per cent of generation capacity in NSW, South Australia, and Victoria, making it difficult for smaller non-vertically integrated retailers to compete.

In its 2017 Retail Competition Review, the AEMC considered that the different jurisdictions in the NEM are at different stages of evolution and have different characteristics that influence whether, how and at what pace competition develops (see Appendix 3).[32] It found that effective competition is yet to emerge in the smallest NEM jurisdictions, the Australian Capital Territory and Tasmania. Whilst full retail contestability has been implemented in these markets, price regulation remains in place, with both markets dominated by one main retailer. The most frequently mentioned impediments to entry included retail price regulation, policy and regulatory risk, the limited size of the market and the dominance of the incumbent retailer.

In contrast, AEMC considered that competition is effective in the larger Victorian, New South Wales, South Australian and South East Queensland retail markets, in which full retail contestability and price deregulation have both been implemented. Victoria has the lowest concentration in the NEM, with a Herfindahl-Hirschman Index of 1,596, and the highest market share of second tier retailers.[33] Whilst retailers consider entry into the Victorian market easiest compared with other jurisdictions, they identify policy and regulatory risk due to an increasing divergence between the Victorian regulatory arrangements and the rest of the NEM as a barrier to entry and expansion.

The main barriers to entry and expansion in the New South Wales, South Australia and South East Queensland markets identified by retailers are wholesale market conditions, including spot price volatility, limited access to hedging products and high wholesale prices. The factors increasing wholesale costs are also contributing to the decline in the availability of wholesale hedging contracts.

According to AEMC, the increases in wholesale energy market costs, and hence retail energy prices, are driven by factors that are unrelated to the state of competition within the retail energy sector, arising instead from:

- a lack of investment due to the uncertainty created by a lack of integration between current energy and emissions reduction policy mechanisms;
- the retirement of Hazelwood Power Station in March 2017, which supplied capacity of 1,600 MW. This came on top of the retirement of the Northern Power Station in May 2016, which supplied 546 MW of capacity; and
- increases in gas prices, partially due to high demand for gas for export markets and the moratoria on gas exploration and development.

The Large-scale Renewable Energy Target has resulted in an increasing penetration of renewable energy generators in the wholesale market. Renewable energy generators do not have the same incentives as other generators for entering into firm-capacity hedge contracts to finance their investment, as they can derive revenue from renewable generation certificates. New renewable generation adds to the physical capacity in the system, but results in no corresponding increase in the supply of firm-capacity hedge contracts. In turn,

[32] AEMC, 2017 AEMC Retail Energy Competition Review, FINAL, 25 July 2017, Sydney http://www.aemc.gov.au/getattachment/006ad951-7c42-4058-9724-51fe114cabb6/Final-Report.aspx

[33] Markets with an index of between 1,500 and 2,500 are considered to be moderately concentrated.

the new renewable generation contributes to the retirement of older plants that were supplying firm-capacity hedge contracts.

With a diminished supply of firm-capacity contracts, the cost of contracts increases. Following the retirements of the Northern and Hazelwood Power Stations, there were large increases in forward contract prices across the NEM due to the expectation that they would be replaced with black coal and mid-merit gas generation, which are more expensive. Average quarterly baseload forward contract prices for contracts purchased at the start of October 2016, to fix the wholesale price for 2017–18, increased by $40 to $50/MWh by the start of May 2017, following the retirements.

As noted by AEMC, a lack of hedge contracts or sustained high prices for hedge contracts, in particular, can have a detrimental impact on retail competition. Some retailers may exit the market because they are unable to remain competitive or they do not want to bear the risk of not being fully hedged. Alternatively, some retailers may seek to manage the risk of sustained higher prices by vertically integrating, which will create higher levels of market concentration over time, resulting in less effective competition, higher retail prices and less choice for consumers.

2.3.2. The Western Australian retail gas market

Practical full retail contestability for small use customers in the Western Australian retail gas market became possible from 31 May 2004, with the implementation of the retail gas market scheme.[34] This provided a mechanism for customer transfer between retailers. A gas market moratorium prevents Synergy from fully accessing the gas market, with Synergy only able to supply gas to customers who consume 0.18 TJ or more of gas per year.

In June 2016, there were four gas retailers licensed to supply small use customers in the south west of the State: Alinta Energy, Kleenheat, Perth Energy and Synergy. To date, Alinta Energy and Kleenheat have dominated the small use customer market. In 2015–16, Alinta Energy had the largest share of small use residential gas customers (87.5 per cent) and business customers (84.3 per cent) by customer number. Kleenheat has progressively increased its share over time to 12.5 per cent of residential and 15.7 per cent of business customers in 2015–16.

In 2017, AGL and Origin obtained small customer retailer licenses. AGL and Origin already retail gas on the east coast of Australia and came to the market with the experience and technology systems in place necessary to compete effectively. The prospect of more competition in the retail gas market has reportedly led to offers by competitors in the retail markets to provide long-term discounts on gas bills (in the order of 20 to 30 per cent) and incentives such as no lock-in contracts and no exit fees. There has been a marked increase in the monthly churn rate since the start of 2017.

Perth Energy, in its submission to the discussion paper, considers that the principal catalyst for change in mass-market gas supply was the development of a dynamic market at the wholesale level, with numerous providers supplying competing offers to retailers. Once retailers were able to secure firm gas at competitive prices they could make offers to end use customers knowing that they were backed by secure supply at known prices. Perth Energy considers that this contrasts with the electricity market, in which the bulk of electricity is generated for self-use or locked into long-term contracts.

[34] Customers who consume less than 1 TJ.

2.3.3. Retail competition in the WEM

Full retail competition is not in place in the WEM. Synergy is the only retailer in the WEM able to supply non-contestable customers, i.e. residences and small businesses consuming less than 50MWh. Non-contestable customers pay electricity prices regulated by the Western Australian Government under electricity by-laws.

The contestable retail market comprises customers consuming more than 50 MWh per year, including small to medium sized businesses and large businesses, which can choose their electricity retailer. Customers that consume between 50 and 160 MWh per year can choose to pay a capped rate offered by Synergy (i.e. contestable tariffs or non-contestable tariffs), or they can choose a retailer (including Synergy) to supply their electricity at a negotiated rate (i.e. a contract rate).

Table 1 presents the main characteristics of the small customer market in the WEM in 2016. The number of small customers in the WEM is comparable to the South Australian market.

Table 1. Characteristics of the small customer retail market in the WEM in 2016

Characteristic	Residential Customers	Business Customers
Number of small customers[35]	982,615	99,239
Number of retailers	1	6
Synergy's market share of small customers	100 per cent	97 per cent
Number of contestable customers	292	9,413

The contestable retail market in the WEM (including small and large customers) has a Herfindahl Hirschman Index just below 1500.[36] Despite this, outcomes in the WEM are similar to those experienced following the introduction of Full Retail Contestability in the Eastern States. For example, average wholesale market prices and the variability of wholesale market prices in the WEM increased in the second half of 2016. Stakeholders also report limited options for hedging.[37]

Market participants support the introduction of full retail contestability to address limited competition in the WEM. In response to the discussion paper for the 2016 WEM Report, Alinta Energy, Perth Energy and AEMO suggest that movement towards full retail contestability should be an immediate consideration. Perth Energy consider that with no structural reform in the WEM, existing participants would continue to hold their market shares, new entrants would be restricted and any move to full retail contestability would be ineffective.

Kleenheat suggests that access to customers will provide a competitive means through which the investment requirements of the market can be monetised. It notes that 98 per

[35] See page 39 of ERA's 2016 Annual Performance Report.

[36] Indicating that it is un-concentrated.

[37] Perth Energy supported these findings noting that the balancing market is highly volatile and risk management tools such as hedges are not obtainable. Consequently, participants are forced to be gentailers and closely balance their sales with generation capacity to manage their risk to an acceptable level. Kleenheat suggested that expanding the standard product arrangements to increase the number of product options and the volume of products offered, and ensure competitively priced products through a Dutch auction, would reduce barriers to effective competition.

cent of customers in the SWIS are unable to choose their electricity retailer and suggests a reduction of the contestability threshold to 20 MWh per year to increase the number of small business customers able to choose their electricity retailers. For Kleenheat, a first step toward reducing barriers to effective competition was to maintain the gas moratorium and regulate Synergy's market offers until at least four independent retailers operate in the market.[38]

ERM Power submits that, if structural reform is not forthcoming, the retail market should be separated into residential and non-residential segments. In addition, full retail contestability of the non-residential sector could occur relatively quickly, with transition from tariffs to contestability and, in particular, the removal of business tariffs eligible for a Community Service Obligation payment.[39] The residential segment could remain on regulated prices until the introduction of full retail contestability.

Alinta Energy recommends a three-phase introduction of full retail contestability involving firstly, reducing contestability to 30 MWh and immediately making unmetered supplies fully contestable. Secondly, it recommends introducing full retail contestability, subject to the development of independent price regulation and payment of subsidies via the network operator, rather than directly to Synergy.[40] Finally, Alinta Energy recommends review of effective competition after the introduction of full retail contestability, with a view to removing price regulation and the Gas Market Moratorium when competition in the electricity market is effective.

ERM Power considers that the community would not support further reform unless it understands that vulnerable members of the community will be protected and that the reform process affords them price stability and supply certainty. Alinta Energy recommends a comprehensive review of the concessions framework and the regulatory processes for managing bad debt and disconnections. AEMO offers a similar perspective, adding that an increased roll-out of smart meters should be included in the reform package.

There is significant support for increasing competition in the electricity retail market. Full retail contestability should remain a goal for the Government. However, retailer access to competitive wholesale electricity supplies is a necessary prerequisite to effective competition in the electricity retail market.

[38] With an aggregate independent retailer market share of at least 50 per cent, the third largest retailer market share is at least 10 per cent, and the rolling 12 month average churn rate is greater than 15 per cent.

[39] The transition in Tasmania, which took 12 months, was given as an example.

[40] Alinta notes that this is consistent with the NEM, in which there is agreement that general government subsidies should be provided via network costs rather than at the retailer level.

3. Efficient market operations and processes

The design of the short-term energy and ancillary services markets has to account for the challenges in the system and facilitate the change of the system to low-carbon generation. Operational challenges include network congestion[41], short-term adequacy of supply[42], load forecast errors, ramp requirements and controllability of distributed generation and over-generation.[43] The variability of operational load, due to increased penetration of renewable sources, warrants a more flexible operation of the system.

To ensure that the system functions efficiently and securely in the face of these challenges, the system operator has to collect and analyse information available in the hours and minutes before dispatch of electricity. The design of the market should allow updated price information to be made available to market participants in the hours before dispatch to incentivise the participation of distributed generation and demand-side resources.

The WEM is currently operating under a low-resolution design. That is, the underlying physical properties of the system, such as network constraints and load variations, are either not captured or collected with low frequency. The market operator operates the market with low resolution data.[44] For instance, the energy market clears at a single price at relatively long trading intervals of 30 minutes.[45] Energy and ancillary services markets are optimised independently. Capacity and energy market designs in the WEM disregard the network constraints in the system. Synergy, the largest and dominant supplier in the SWIS, is bidding as a portfolio.

In its review of market operations and processes, which began in March 2014, the Public Utilities Office identified areas of inefficiency in electricity market operations.[46] Reforms were needed to efficiently enhance the security of the system and harmonise market operations with other related reforms. Among a range of identified improvements, three core reforms were proposed:

- the adoption of a security-constrained market design;
- co-optimisation of energy and ancillary services; and
- facility bidding for all market participants.

These reforms were anticipated to mitigate inefficiencies and cross-subsidies.[47] The Public Utilities Office estimated that the benefits of the reforms could exceed $100 million and

[41] With the penetration of solar and wind electricity generation resources, network constraints increase. This is due to the peaky output of these resources and a possible mismatch between the existing network and the location of newly installed renewable plants.

[42] Irrespective of the availability of variable generation sources, demand and supply for electricity has to be balanced at all times. Capacity is needed to be available at short notice and ramp up capability to create this balance when it is needed.

[43] Over-generation can happen during hours when the consumption is low and the output from solar and wind resources is high. System operator has to create a balance between supply and demand taking into account fuel costs, start-up costs, ramp rates, minimum output of plants, and system constraints.

[44] For a brief explanation of the market operation resolution, refer to Appendix 4.

[45] In high-resolution markets, such as the NEM, market prices clear at 5-minute trading intervals.

[46] The EMR Steering Committee was the the committee charged with undertaking the EMR at the Department of Finance, Public Utilities Office.

[47] Cross-subsidy refers to charging higher prices to a group of market participants to subsidise prices for another group. Section 3.3 discusses the issue of cross-subsidisation in this context.

would enhance the competitiveness, dynamism, and automation of the energy and ancillary service markets and processes.[48]

3.1. Security-constrained market design

The ERA supports moving to security-constrained generator dispatch in the SWIS. Constrained network access is expected to result in an increase in the frequency of constrained dispatch events. The adoption of the new access model reinforces the need for a security-constrained market design. The ERA recommends adopting a security-constrained dispatch engine to ensure any network constraints are included when determining which generators to dispatch. This will remove the need for manual intervention and ensure economic dispatch, which in turn will minimise long-term costs to consumers.

In electricity markets, constraints on the flow of electricity from supply sources to users are imposed to maintain power system security. For example, the system operator imposes constraints to prevent overload of network equipment or to ensure the availability of sufficient reserve capacity. When the supply of electricity is restricted due to network limitations or other imposed constraints, the network is said to be suffering from congestion. The efficient dispatch of generators can be affected by network congestion.

The current design of generation dispatch in the WEM disregards system constraints. The WEM dispatch model assumes an unrestricted flow of electricity. The dispatch of generators is based on cost merit order only.[49] Currently, System Management manually intervenes and dispatches generators 'out-of-merit' to ensure that the flow of electricity is sufficient to meet demand on congested areas of the network.[50]

The current design of the dispatch model has contributed to inefficiencies. Forecast dispatch plans ignore the effects of network congestion and are unreliable. A lack of transparent and timely information about the network discourages active competition in the balancing market. There are also deficiencies in the compensation mechanism for out-of-merit dispatch.[51] Generators that must generate electricity out-of-merit (i.e. 'constrained on' generators[52]) for extended periods of time are under-compensated.[53] Constrained payments for out-of-merit dispatch are not sufficiently transparent. This has led to a lack of

[48] Refer to Position Paper: Design Recommendation for Wholesale Energy and Ancillary Service Market Reforms, Public Utilities Office, 14 March 2016, p.1. http://www.treasury.wa.gov.au/uploadedFiles/Sitecontent/Public_Utilities_Office/Industry_reform/Position-paper-Energy-Market-Operations-and-Processes.pdf

[49] The cost merit order enables the lowest net cost electricity to be dispatched first to minimise overall electricity system costs.

[50] Out-of-merit dispatch is to dispatch electricity from higher cost generators and less energy from lower cost generators.

[51] Refer to 2014 Wholesale Electricity Market Report to the Minister for Energy, pp. 27–28. http://www.erawa.com.au/cproot/13865/2/2014%20Report%20for%20the%20Minister%20for%20Energy%20(Including%20Appendix%201).PDF

[52] Appendix 4 provides a simple example of electricity dispatch under network constraints, constrained on payments and locational prices.

[53] Refer to Public Utilities Office, 2016. Position Paper: Design Recommendations for Wholesale Energy and Ancillary Service Market Reforms, p.56, http://www.treasury.wa.gov.au/uploadedFiles/Site-content/Public_Utilities_Office/Industry_reform/Position-paper-Energy-Market-Operations-and-Processes.pdf

appropriate price signals to encourage investments in capacity where they are needed most.

Currently, access to the network in the SWIS is unconstrained. The existing unconstrained dispatch model was designed based on an unconstrained network access model. Under an unconstrained network access model, the network is augmented to provide full access for generators to dispatch electricity. The substantial cost of network augmentation, born by new generators, led to the introduction of customised network access contracts[54] between System Management and project developers. Under such contracts, the output of generators is curtailed based on power flow restrictions on particular transmission lines. These contracts have been criticised due to a lack of transparency and interference with the efficient dispatch of generators.

Increases in the frequency of network congestion can render the unconstrained market design unworkable.[55] The Minister for Energy has indicated his intention to introduce legislation for an improved network access regime into the Western Australian Parliament in mid-2018.[56]

In its submission to the 2016 WEM Report Discussion Paper, Western Power supports the move to fully constrained network access, security constrained generator dispatch, and a security constrained dispatch engine.

3.2. Co-optimisation of energy and ancillary services

The ERA supports the co-optimisation of the ancillary services and energy markets to drive economic efficiency in the SWIS. The prerequisite for this reform is the implementation of facility bidding in the market, as discussed in section 3.3. To ensure reliability and security of the system under a co-optimised market design, AEMO and Western Power will need to coordinate generation and network activities, as discussed in sections 4.3.1 and 4.3.3.

System operators must be able to balance the electricity system in case of unplanned generator outages, variation in generation volumes, or deviations from electricity demand forecasts. To create this balance, the system operator contracts for ancillary services such as spinning reserve, load rejection service and load following. With increases in the penetration of variable renewable energy sources in the SWIS, demand for load following ancillary services is expected to increase.

There is a trade-off between dispatch for energy supply and dispatch for ancillary services.[57] In principle, the system operator has to identify the least-cost dispatch solution from energy and ancillary service sources concurrently. The current WEM dispatch model optimises energy dispatch independently from ancillary services, and therefore ignores the trade-offs between the supply of electricity from energy and ancillary service sources.

Optimisation of energy and ancillary services dispatch will minimise the overall cost of providing electricity and ancillary services. Previous research conducted by the Public

[54] These customised contracts are referred to as runback schemes.

[55] For example, in the North Country region, regular out-of-merit dispatch was necessary since market start and before the commissioning of the Mid West Energy Project.

[56] Refer to the announcement on http://www.treasury.wa.gov.au/Public-Utilities-Office/Industry-reform/Electricity-Sector-Reform-Initiatives/

[57] For example, system operator can advise to supply a certain amount of electricity via different proportions of energy and ancillary service sources.

Utilities Office determined that co-optimised energy and ancillary services will not require additional costs beyond the cost of implementing the proposed security-constrained dispatch model.[58]

In their submissions to the 2016 WEM Report discussion paper, AEMO, Alinta Energy, Bluewaters Power, Perth Energy and Western Power support co-optimised dispatch of energy and ancillary services.

3.3. Facility bidding for all market participants

Directing Synergy to bid into the market by facility will deliver greater cost transparency, as individual facilities bid into the market at their short-run marginal cost. This will mitigate stakeholder and investor concerns about the transparency and efficiency of ancillary services provided by Synergy and reduce the potential for Synergy to exercise market power. Integrating energy and ancillary markets in combination with facility bidding will increase opportunities for competition, reduce forecast inaccuracies and enable more efficient wholesale price signals. This promotes more economically efficient electricity investment, production and supply and minimises long-term costs to consumers.

The portfolio bidding approach exercised by Synergy is incompatible with a security-constrained and co-optimised market design. To optimise the dispatch of electricity subject to system constraints, the dispatch model requires information about where on the network energy is generated and consumed. Synergy, as a portfolio bidder, does not disclose information in its market bids on the injection of electricity by specific plants into the system. With limited information about the contribution of Synergy's facilities, System Management relies on manual and ad hoc information to manage the flow of electricity in the network and the security of the system.

Portfolio bidding reduces transparency and equity between market participants. There is potential for portfolio bidding to adversely affect outcomes in the balancing market. The ERA can conduct an ex-post analysis of offer prices in the balancing market to investigate the potential exercise of market power. Portfolio bidding reduces the transparency of offers and makes ex-post scrutiny of offered prices more difficult. This issue is exacerbated by Synergy being the dominant price setter in the balancing market, particularly during peak trading intervals (i.e. Synergy sets the price in 84 per cent of peak trading intervals).[59]

Synergy's portfolio bidding also makes it impossible to identify the contribution of Synergy's facilities to balancing and load following services. As Synergy is the dominant supplier of load following services, this prevents an assessment of the efficiency of the load following service. In managing the frequency of the load, System Management controls the dispatch of Synergy's facilities that provide load following services, whereas all generators and retailers in the market pay for the cost of these functions performed by System Management. This is an exclusive service to Synergy for providing the load following function, with the costs recovered from market participants. This exclusive service also creates perceptions of conflict of interest and inequitable treatment.

[58] Refer to Public Utilities Office, 2016. Position Paper: Design Recommendations for Wholesale Energy and Ancillary Service Market Reforms, p. 15. http://www.treasury.wa.gov.au/uploadedFiles/Site-content/Public_Utilities_Office/Industry_reform/Position-paper-Energy-Market-Operations-and-Processes.pdf

[59] Based on an analysis of the balancing market clearing prices from March 2016 to July 2017, for trading intervals from 6:00 AM to 11:30 PM.

4. Maintaining security and reliability

This section focusses on some of the emerging issues in the effective operation of the WEM, with implications for the security and reliability of the SWIS. Current challenges in meeting system adequacy and governance of system security and reliability are discussed. Consideration is also given to experience in the NEM and recent recommendations made in the Finkel Review regarding improvements to market operations and processes to enhance security and reliability.

4.1. Resource adequacy

The WEM has no interconnections to other electricity systems. In designing the wholesale market, it was necessary to include a requirement for the WEM to have sufficient capacity to satisfy demand at all times and deal with supply emergencies. The system is relatively small with a limited number of generation resources. With the entry and exit of block loads, the system faces sudden and lumpy changes in demand. A reserve capacity mechanism (RCM) was included in the design to provide incentives for continued investment in existing and new capacity.

The RCM comprises three fundamental components. Firstly, AEMO determines the level of capacity required to meet the reliability objective of the WEM. The market rules refer to the required capacity as the reserve capacity target. This is AEMO's estimate of the total amount of generation or demand-side management required in the SWIS to satisfy a standard level of reliability. This standard level of reliability is set in the market rules and is referred to as the planning criterion.[60] Market customers are responsible for payments for procurement of capacity, based on their aggregate contribution to total system load during peak periods (from 1 December to 31 March).[61] Retailers largely pass this cost of capacity to electricity consumers in the form of higher electricity tariffs.[62]

Secondly, a price discovery mechanism determines the price of capacity. A capacity demand curve is developed based on the reserve capacity target and the expected level of compensation for a new entrant into the market.

Thirdly, a capacity product is defined based on the contribution of capacity resources to the reserve margin, taking into account the availability and performance characteristics of particular resources.[63]

Uncertainties in electricity demand growth and resulting forecast errors have driven the over-procurement of excess capacity in the WEM.[64] In the 2016–17 capacity year,[65] the

[60] The planning criterion ensures that there is sufficient capacity to meet peak demand based on a one-in-ten year peak event, plus a reserve margin to cover outages and ancillary services required to maintain system security. Refer to clauses 4.5.10(b) and 4.5.9 of the market rules.

[61] AEMO allocates individual reserve capacity requirements to every market customer. The individual reserve capacity requirement is a MW of quantity of capacity and represents the aggregated contribution of a market customer's loads to total system load during the previous hot season (1 December to 31 March) to the current capacity year.

[62] Subsidy payments to Synergy pass a portion of the capacity cost to tax payers.

[63] The last review of the RCM by the EMR Steering Committee found that the excess capacity was a major contributor to the high generation costs in the South West Interconnected System.[63]

[64] Refer to Public Utilities Office, 2014. Discussion Paper, Electricity Market Review, section 3.2 for a discussion of inefficiencies in procurement of capacity in the WEM.

[65] A capacity year is a period of 12 months commencing on 1 October.

WEM had approximately 23 per cent excess of capacity over the reserve capacity target.[66] The Public Utilities Office estimated the cost of this excess capacity at around $116 million.[67] The notional cost of capacity in 2015–16 was $684 million.[68] This is substantial when compared to the notional cost of energy, which is approximately $1.1 billion.[69]

In its last review of the RCM, the Public Utilities Office found that the excess capacity was a major contributor to the high generation costs in the SWIS.[70] This review also examined whether the capacity mechanism was delivering the right type of capacity.[71] Since market start, open cycle gas turbine peaking plant and demand-side resources have entered the market. The volume and type of excess capacity added in successive years indicated that the RCM was failing to procure capacity efficiently. The resulting recommendations for reform and implemented changes are outlined below.

4.1.1. Changes in the Reserve Capacity Mechanism

Uncertainty about the future of the RCM can deter investments in generation assets or raise the cost of capital for market generators. It may also incentivise short-lived, high-cost interim investments while businesses wait for the uncertainty to subside. Considering the recent exit of demand-side management resources and the expected retirement of 380 MW of Synergy's capacity, new capacity procurement is required by the 2021–22 period. The ERA notes that reforms to the RCM should be expedited so that sufficient capacity with efficient cost can be installed before it is required in the early 2020s.

The Public Utilities Office proposed changes to the RCM to reduce the cost of excess capacity for electricity consumers and provide incentives for the capacity market to move towards the provision of a level of capacity that matched the reserve capacity requirements of the system. A transition period was implemented that allows for the reduction of excess capacity and provides time to design a capacity auction mechanism.

For the transition period, the administered reserve capacity price adjustment formula[72] would be sharpened to make it more responsive to demand for capacity. In addition, the demand (i.e. pricing) curve used to calculate the administered reserve capacity price would be steepened to better reflect the economic value of excess capacity in the market.[73]

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[66] Refer to Figure 18, Appendix 2.

[67] Refer to Public Utilities Office, 2015. Position Paper on Reforms to the Reserve Capacity Mechanism, 3 December 2015, p.1.

[68] The notional cost of capacity is calculated based on the product of the reserve capacity price and the total amount of accredited capacity for the capacity year 2016–17.

[69] The notional cost of energy is calculated based on the product of (on grid) electricity consumption and balancing price.

[70] Refer to Discussion Paper, Electricity Market Review, Department of Finance, Public Utilities Office, 25 July 2014, p.15.

[71] Refer to Discussion Paper, Electricity Market Review, Department of Finance, Public Utilities Office, 25 July 2014, p.21.

[72] Refer to clause 4.29.1 of the market rules. https://www.erawa.com.au/cproot/18373/2/Wholesale%20Electricity%20Market%20Rules%2013%20October%202017.pdf

[73] The proposed transitional demand curve was implemented on 1 October 2017. The slope of the demand curve progressively steepens over the period from the capacity year beginning 1 October 2017 to the capacity year starting 1 October 2023.[73] The projected reduction in capacity payments due to excess capacity would range from $274 million in the 2017–18 capacity year to $910 million in the 2023–24 capacity year.[73]

Drawing on experience in other jurisdictions, the Public Utilities Office proposed that a three-year ahead auction for procuring capacity be adopted.[74] The first auction process would occur at the earlier of a pre-set level of excess capacity (five to six per cent) or a fixed date of 2021. Considering the size and concentration of the WEM, a set of auction parameters was proposed to ensure that the auction is effective in providing a competitive capacity price. The supply of capacity has changed since the design of the transitional demand curves. About 493 MW of demand-side resources exited the market and excess capacity fell from 23 per cent in the 2016–17 capacity year to 14.1 per cent in the 2017–18 capacity year.[75] On May 2017, the Western Australian government announced plans to retire 437 MW of Synergy's non-renewable generation nameplate capacity (equivalent to 387 MW of capacity credits). It is expected that the excess capacity in the SWIS will decrease to four per cent in the 2018–19 capacity year.

Previous reforms proposed by the Public Utilities Office recognised that auction design, monitoring measures, and control mechanisms have to be developed to address the particular circumstances in the WEM. Given the small size and the high concentration in the generation market, there is concern about the exercise of market power and volatility of prices in the auction.[76] The dominance of Synergy in the wholesale market presents challenges for the implementation of a capacity auction. The small size of the WEM, slow demand growth and the entry and exit of block loads can lead to volatility of prices in the auction. High price volatility increases investment risk to capacity investors.

Recently, the Minister for Energy announced that the Government will not implement a capacity auction before 2021. The Public Utilities Office announced that it will advise on a new capacity pricing model based on an investigation of alternative pricing arrangements including auctions. The Public Utilities Office stated that it will develop this advice in consultation with industry.[77]

Perth Energy, ERM Power, Bluewaters, and Merredin Energy note the uncertainty over the timing and implementation of the proposed auction mechanism. They consider that the Minister has to resolve the uncertainty to restore confidence in the private sector and ensure continued capacity investments in the WEM. Bluewaters recommends that the Minister mitigate any uncertainty by providing timely energy policy guidance, as any delay in providing certainty will be detrimental to the WEM in meeting the wholesale market objectives. It will be difficult for market participants to secure finance until there is clarification about the timing and design of the RCM.

Investment conditions in the NEM and the WEM have suffered from an extended period of national carbon policy uncertainty.[78] Capacity over-investment induced by the RCM may

[74] Refer to Public Utilities Office, 2016. Reforms to the Reserve Capacity Mechanism, Electricity Market Review. http://www.treasury.wa.gov.au/uploadedFiles/Site-content/Public_Utilities_Office/Industry_reform/Reforms-to-the-Reserve-Capacity-Mechanism-Final-Report.pdf

[75] Many demand-side resources not meeting the harmonised availability requirements exited the market.

[76] Large capacity markets, such as PJM, also suffer from the potential exercise of market power in capacity auctions. In nearly all capacity auctions, the PJM market has failed the regulatory test of market power. Historically, market power mitigation restrictions have been triggered in this jurisdiction.

[77] Refer to http://www.treasury.wa.gov.au/Public-Utilities-Office/Industry-reform/Electricity-Sector-Reform-Initiatives/

[78] Finkel A, Moses K., Munro C., Effeney T., O'Kane M., (2017) Independent Review into the Future Energy Security of the National Electricity Market – Blueprint for the Future, Commonwealth of Australia, Canberra pp74-75

have helped insulate Western Australia from the worst of these conditions. The timing of reforms to the capacity mechanism, such as transferring pricing risk through auctions, should be sensitive to the industry's broader policy risk exposure, particularly to uncertainties in the future of greenhouse gas mitigation policies.

4.2. Governance of system security and reliability

At an operational level, system security and reliability governance in the SWIS needs revisiting. There is inconsistency between the technical rules[79] and the market rules that should be resolved. The administrative procurement processes for the constrained areas of the network need to be reviewed to ensure system-wide cost efficiency. AEMO's and Western Power's obligations under both sets of rules need clarification. Currently, no single organisation in the WEM has responsibility and oversight of both the market and network operations necessary to set clear reliability and security requirements. The Government should pursue the recommendation of the Public Utilities Office to establish a technical, local reliability advisory committee.

Definitions of roles, responsibilities and accountabilities are necessary for key electricity system stakeholders to maintain the security of the electricity supply system. Regulatory and institutional frameworks should provide for effective communication and co-ordination among regulatory entities that have shared or complementary responsibilities.

Security of the electricity supply in the WEM is met through a set of standards in the market rules, Western Power's Technical Rules,[80] and the Network Quality and Reliability of Supply Code. Previously, the Independent Market Operator undertook reliability review functions.

It is common practice in other jurisdictions, such as the NEM, that independent regulatory entities undertake governance of the security and reliability of the electricity system. For instance, in the NEM the Reliability Panel reviews market parameters regarding system security and reliability and provides advice to AEMC. The Reliability Panel is part of AEMC, which is independent from government. There is no entity in the WEM, with oversight of both the market and network, responsible for setting coherent reliability and security requirements. [81]

Recently, the Finkel Review made 14 recommendations to strengthen the governance of the NEM. The first two of these recommended the Energy Council develop a strategic

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Australian Industry Group (2016) Joint Statement: Energy reform is urgent to avert systemic crises, Australian Industry Group, Sydney, https://www.aigroup.com.au/policy-and-research/mediacentre/releases/Joint-Statement-Energy-Reform-13Dec/

Select Committee into the Resilience of Electricity Infrastructure in a Warming World, (2017) Stability and Affordability: Forging a path to Australia's Renewable Energy Future, Australian Senate, Canberra, P30; also

Pierce J. (2012) The Australian National Electricity Market: Choosing a New Future, Conference Paper for the World Energy Forum, 13-16 May 2012, Australian Energy Markets Commission, Sydney, pp20, 24-25

[79] Technical rules consist of the standards, procedures and planning criteria governing the construction and operation of an electricity network. They also set out performance and technical specifications for user equipment connected to the network. Refer to https://www.erawa.com.au/electricity/electricity-access/western-power-network/technical-rules

[80] Refer to technical rules (1 December 2016), https://www.erawa.com.au/cproot/14411/2/edm%2040518689%20-%20technical%20rules%201st%20august%202016%20publish%20version%20-%20fri.pdf

[81] Public Utilities Office (2016) Position Paper on the Proposed Design of a Reliability Advisory Committee in Western Australia, Department of Finance, Perth, pp 5-6

energy plan incorporating outcomes from the Finkel Review and establish an Energy Security Board to implement the plan and oversee energy security and reliability.[82] The Energy Security Board was established by the Council of Australian Governments on 8 August 2017.

Stakeholder responses to establishing an Energy Security Board in Western Australia are mixed. Bluewaters suggests that the Minister should consider setting up a planning body to coordinate the entry of intermittent generation that is modelled on the Energy Security Board but modified (through a public consultation process) to suit the circumstances in the WEM.[83]

AEMO suggests that, as the WEM operates as a single jurisdiction, the Public Utilities Office has the role of the Energy Security Board.[84] The Australian Energy Council and Alinta do not believe that an Energy Security Board is required in the WEM. Both organisations suggest that greater planning and coordination is required between the different regulatory bodies in Western Australia.

In its submission to the 2016–17 WEM Report discussion paper, Western Power indicates that there are inconsistencies in reliability requirements between the market rules, the Network Quality and Reliability of Supply code, Western Power's Technical Rules and the Electricity Networks Access Code. Western Power suggests that the power system security and reliability obligations outlined in these instruments need to be amended to address emerging technologies and changing customer requirements. AEMO raises concerns about the lack of clarity in the technical rules, particularly with reference to the maintenance of system security and reliability in edge-of-grid locations and the roles and responsibilities of Western Power and AEMO.

Western Power considers that the formation of a state-based reliability committee should be pursued with the role of defining the minimum electricity supply reliability requirements for customers. This would underpin the integration of emerging technologies, including distributed generation and demand response, in edge-of-grid locations.

In its submission, AEMO advises that, in the NEM, it has responsibility for whole-of-system planning oversight and produces the National Transmission Network Development Plan. This provides an 'independent, strategic view of the efficient development of the NEM transmission grid over a 20-year planning horizon'.[85] However, this responsibility, and development plan, does not extend to Western Australia. In its submission, AEMO advises it is 'currently considering the requirements and potential scope for a Transmission Network Outlook in the SWIS to identify emerging issues and opportunities for investment at the best network locations with the most appropriate performance and capability'.[86]

Western Power has responsibility for electricity network planning as well as building, maintaining and operating the network. A network planning report[87] is published annually and identifies emerging capacity constraints on the network and Western Power's plans to address these constraints and meet customer needs. The annual planning report is supported by information contained in Western Power's internal Network Development

[82] Recommendation 5.1 and 5.2 from the Finkel report to be completed by mid-2018 for the strategic plan and immediately for agreement to establish the Energy Security Board.

[83] Bluewaters submission, p.4.

[84] AEMO submission, p.12.

[85] AEMO website – 2017 NTDV in development

[86] Reference AEMO submission, p.12

[87] Western Power Annual Planning Report 2017

Plans, which provide medium to long term (2 to 50 years) planning advice for load areas across the SWIS.

AEMO acknowledges that Western Power is not obliged to publish any forward-looking assessment of overall power system security and reliability. If this were available, it would support AEMO in its maintenance of power system security by:

- providing an independent view of future power system security and reliability risks for the SWIS;
- identifying areas of the SWIS that may require augmentation in order to preserve system security and reliability;
- monitoring the impact of emerging technologies on the security and reliability of the SWIS; and
- identifying requirements to amend or augment technical standards to support future connections.

The current design of technical rules and market rules may cause inefficiencies in network control services procurement. For instance, a failure at the Muja Bus Tie Transformer 2 in February 2014 led to the long-term out-of-merit dispatch of the Vinalco generation units, costing market customers $10.1 million. In retrospect, and assuming an economic case could have been made, it may have been preferable to have a pre-existing network control service contract in place, in anticipation of such an event.

The rules are not clear on which party is responsible for putting a network control service contract in place, e.g. Western Power or System Management. The security and reliability risks in the above example were caused by Western Power transmission equipment failures, but the cost of mitigation, as a result of out-of-merit dispatch by System Management, was borne by market participants.

AEMO raises concerns about its role in the change process for the market rules and technical rules. AEMO suggests it is in a position to identify opportunities for improvement in the market, although its role in supporting market development is not clear and currently subject to a proposed rule change.[88] AEMO notes that only Western Power and the Technical Rules Committee are allowed to propose amendments to the technical rules. Technical rules can impose obligations on AEMO, while AEMO cannot directly propose amendments to these rules.[89]

AEMO recommends that a greater range of stakeholders should have the opportunity to propose amendments to the technical rules. Reforms to the market also require changes to harmonise the technical rules and the market rules. AEMO suggests this may be achieved by requiring the Rule Change Panel to also approve amendments to the technical rules. AEMO highlights the important role of the proposed reliability advisory committee and asked whether and when the entity will be established.

The ERA considers that in the WEM, the Public Utilities Office has the responsibility for policy oversight and providing future strategic direction, and thus the formation of an Energy

[88] AEMO has submitted a rule change proposal to address this issue. Refer to rule change proposal; RC_2017_05 available at https://www.erawa.com.au/cproot/18200/2/RC_2017_05-Synergy-P1%20Submission.pdf

[89] In the NEM, technical rules are placed in the National Electricity Rules, where all stakeholders can propose changes to AEMC.

Security Board is not necessary. The functions of the Public Utilities Office, however, do not extend to direct engagement in the day-to-day operation of the WEM.

The Public Utilities Office considers reliability and security functions in the WEM within the context of what is needed and the capacity of existing bodies to meet that need, to ensure a balance between reliability and the cost of providing that service. [90]

Among its considerations was independence from conflicting functions and purposes, to enable the decision maker to objectively balance reliability and cost. While Western Power and AEMO have the necessary expertise, their objectives and performance measures may not allow the right balance to be struck between meeting reliability standards and the associated cost.[91] Accordingly, the Public Utilities Office recommends establishing a reliability advisory committee drawing expertise from existing market entities.

4.3. Improvements to market operations and processes

Other improvements to market operations and processes could ensure the security and reliability of the system in addition to the market efficiency reforms discussed in section 3. This section explores locational pricing and the retirement of Synergy's assets. Operational recommendations from the Finkel Review are discussed. These recommendations aim to facilitate the transition of the current electricity system to one with an increased penetration of renewable energy technologies.

4.3.1. Locational pricing

The design of the market has to balance administrative resource planning and market-based investment decisions, based on locational price signals. With changes to the electricity system over time, enhanced coordination between network and generation activities is needed. Administrative procurement of network support services can continue while network costs are regulated. However, this important mechanism could provide additional transparency to ensure informed market-based decisions.

The least-cost dispatch engine in the WEM disregards network congestion when determining a single wholesale electricity price for the SWIS (see section 3.1). To maintain the security of the system, System Management dispatches generators out-of-merit and AEMO compensates them through constrained-on and constrained-off payments. Consequently, marginal generation costs vary for different parts of the network.

A locational pricing design could be considered to reflect the scarcity of electricity in different parts of the network. Where network constraints are always binding for specific lines or radial networks, zonal pricing may be used to reflect the physical constraints of the network.[92] Failure to implement locational pricing can result in inefficiencies (Appendix 4 provides an example to illustrate how locational pricing can improve economic efficiency).

[90] Public Utilities Office (2016) Position Paper on the Proposed Design of a Reliability Advisory Committee in Western Australia, Department of Finance, Perth, pp 7

[91] For example, a network operator may pursue network reliability requirements and increase its regulated asset base at the expense of cost, whilst an operator might pursue continuity in operation at the expense of cost.

[92] A constraint 'binds' when network conditions restrict the supply of electricity from generators to consumers.

Western Power notes the system security issues caused by the integration of variable renewable generation in the system.[93] It recommends that in the future, and in some areas of the network, scheduled generation capacity may be insufficient and therefore, stronger location signals or incentives have to be provided for new generators.

However, previous reviews of market operations and processes by the Public Utilities Office concluded that locational pricing is complex and can lead to the introduction of additional risk for parties that trade between price locations. Its conclusion was for the operation of the market to continue with a single pricing mechanism for all types of capacity and for constrained-on payments to persist.[94]

Compared to a uniform pricing approach, locational pricing is complex. Without locational pricing, constrained payments can signal to market participants where capacity is needed most. However, currently constrained (on or off) payments are not published in the WEM. The constrained on and off prices can be published to provide additional locational information to market participants. This has the potential to drive investments in generation assets, demand-side resources, and network infrastructure on constrained areas of the network where they are most needed.[95]

Locational pricing could be considered for the areas of the transmission network where network constraints are frequently binding or are expected to bind in the future. A cost-benefit analysis can be conducted to assess the economic viability of locational pricing in these regions.

A locational energy price design has to be complemented with locational capacity procurement.[96] While it is possible to meet its reliability goal on a whole system level, parts of load on the SWIS may be underserved due to transmission constraints. Locational capacity procurement can drive investments to those areas of the network where they are most needed.[97] A locational capacity price can reflect local scarcity of capacity and cover fixed costs of electricity generation.[98] A locational energy price reflects scarcity of energy and covers variable costs of electricity generation. Together, locational capacity and energy prices can provide investors with a normal economic profit.

The current design of the RCM does not allow for locational management of system adequacy. In the WEM, locational management of reliability e.g. for edge-of-grid locations, is run separately. AEMO and Western Power can enter into bilateral contracts (i.e. for the procurement of dispatch support services[99] and network control services[100]) and procure support services for constrained areas of the network. AEMO and Western Power raised

[93] Refer to Western Power's submission to the 2016 WEM Report Discussion paper, p.7. https://www.erawa.com.au/cproot/18223/2/2016%20WEM%20Report%20-%20PubSub%20-Western%20Power.pdf

[95] Constrained-off payments will not be required under a security constrained market dispatch design.

[96] Locational energy and capacity pricing is a common design in the U.S. electricity markets such as the Pennsylvania New Jersey Maryland (PJM) or New York Independent System Operator Installed Capacity Markets.

[97] In all U.S. jurisdictions with capacity markets, capacity price can vary between zones. This is aligned with the locational pricing structure of their energy markets. Although Britain and Ireland operate uniform capacity markets, locational pricing in both markets is being considered.

[98] It is possible that a system wide capacity price to be close to zero (due to a high level of excess capacity), while a local price of capacity to be significantly high due to system constraints.

[99] Dispatch support services are services not covered by other ancillary service markets, e.g. services provided by generators capable of maintaining voltage levels in the power system.

[100] Network control services are services provided by generation and/or demand-side management that can be substituted for an upgrade to the transmission or distribution network.

issues about the coordination of such contracts under the technical rules. These issues are discussed in section 4.3.3.

4.3.2. Finkel Review operational recommendations

In the SWIS, low-inertia non-synchronous generation will progressively displace high-inertia synchronous generation. Given the isolated nature and small size of the system, this presents challenges for the flexibility of the power system in responding to operational disturbances. Review and amendment of reliability settings in the WEM are necessary to include system-wide inertia and system strength requirements. As recommended by the Finkel Review, generator connection standards should be improved. Enhanced collection of distributed generation data is important to facilitate the integration of variable and distributed energy sources.

The Finkel Review made several recommendations about increasing system security and ensuring an 'orderly transition to a reliable low emissions future'. Many of these recommendations are intended to improve power system security and reliability in response to increasing intermittency in the generation mix.

A recommendation from the Finkel Review was the adoption of a package of Energy Security Obligations[101] for generators and transmission network service providers. These obligations require new generators to have fast frequency response capability. The transmission network service provider is required to provide and maintain a sufficient level of inertia for each region. The Finkel Review recommended that all grid connection standards would be reviewed and updated every three years and that new generators 'must fully disclose any software or physical parameters that could affect security or reliability' before approval for connection to the network.

The Australian Energy Council, Alinta and AEMO all consider that this recommendation is applicable to Western Australia. Alinta considers that the WEM is 'in a privileged position to be able to learn from the recent NEM issues regarding managing increased levels of intermittent generation' and notes that '*now is the time to plan and prepare for the future to ensure the WEM does not experience the same security and price issues as the NEM*'.

Alinta suggests that inertia should be procured through a market mechanism rather than by the network operator.[102] In its submission, AEMO advises that it has 'held some preliminary workshops with Western Power to discuss potential changes to generator connection requirements'. AEMO also warns that although system performance standards and generator connection standards for the WEM are covered in the technical rules, their coverage is limited, and system-wide inertia or system strength requirements are absent.[103]

Western Power suggests expansion of reforms to ancillary services markets to include obligations to promote power system security and prevent cascading power system problems. These obligations address system inertia, fault ride-through capability, and reactive power support.

[101] Recommendation 2.1 from the Finkel report

[102] Alinta submission, p10

[103] AEMO submission, p10

The Finkel Review recommends the development of a data collection framework for distributed energy resources to provide static and real time data for these resources.[104] The adoption of similar measures in the WEM can enhance the resolution of market operation.[105]

The Australian Energy Council, Alinta, AEMO and Bluewaters all support the adoption of this recommendation in Western Australia. Bluewaters notes that a significant proportion of intermittent generation is behind the meter and does not contribute to the network costs and fees to support market operations in the WEM. Bluewaters considers this to be an inefficient allocation of costs, which can distort investment signals in the WEM. It supports treating behind-the-meter generation as actual generation and allocating costs accordingly. Improved visibility of distributed generation is required for alternative cost allocation and will provide useful information to the system operator for maintaining the security of the power system'.[106]

Other Finkel report recommendations already exist in Western Australia, such as those relating to 'tighter governor settings' (2.3) for facilities providing frequency support[107] and 'system black restart plans' (2.4). AEMO sees future potential in Finkel recommendations about 'the market based provision of system security services' if a benefit is demonstrated (2.2) and the 'participation of distributed energy resources in the provision of power system security services' (2.5).

4.3.3. Retirement of Synergy's assets

Recent concerns about the provision of network control services and dispatch support services for the North Country and Eastern Goldfield regions highlight the need for a review of Western Power's and AEMO's roles in network and system planning and maintaining network and system reliability standards as noted in section 4.3.1. For instance, consistent with the practice in the NEM, AEMO could annually develop and publish a network development planning report to assess the future needs of the SWIS transmission grid. The report should identify network control services to manage power system security. At the same time, Western Power would be responsible for the procurement of network support services or network infrastructure. If the design of the market is to continue with uniform pricing of capacity and energy, the suggested roles for Western Power and AEMO would complement the non-locational RCM and energy market designs, and incentivise investment in different types of capacity at locations on the grid where network constraints are frequently binding.

In their submissions to the 2016–17 WEM Report discussion paper, AEMO, Western Power, and Noel Schubert raise concerns about the retirement of Synergy's plants and the resulting effect on the edge-of-grid regions of the SWIS. AEMO notes that the retirement of West Kalgoorlie power station could delay the restoration of power to some Eastern Goldfield regions for as long as a few days following a major disruption in supply. In the North Country Region, the retirement of the Mungarra power station, which provided energy and frequency control, will leave the region with a higher likelihood of blackouts. In the past, Mungarra has operated when one of the transmission lines to the region has been out of service. If both

[104] Recommendation 2.6 from the Finkel report

[105] For an explanation of market operation resolution, refer to Appendix 4.

[106] Bluewaters submission, p4

[107] In Western Australia, only Newgen Kwinana and Synergy's High Efficiency Gas Turbines have automated governor control (AGC) by System Management to provide load following ancillary services

transmission lines to the region were lost, restoration of power could not occur until at least one of the lines returned to operation.[108]

AEMO advises that Western Power is currently investigating options (including the procurement of network control services) to support the Eastern Goldfields and North Country regions. However, it notes that the technical rules are not clear about Western Power's responsibilities for the procurement of such services. AEMO suggests that the network planning criteria in the technical rules require clarification and that clear identification of the roles and responsibilities of AEMO and Western Power in the sub-regions of the SWIS is required. AEMO suggests that this could be progressed by the establishment of the Technical Rules Committee or a Reliability Advisory Committee.[109]

[108] Over the past three years, there has been two incidence of losing both 132kV transmission lines to the North Country region.

[109] The Electricity Networks Access Code 2004 (clauses 12.16 and 12.23) allows the ERA to establish the Technical Rules Committee from time to time to review, consider, and advise on matters about the technical rules.

5. Market resilience

Market Resilience is becoming increasingly important to energy market reform and design. The WEM is becoming more complex. New and increased interdependencies between system components are expected, leading to amplification of changes and unanticipated consequences, which can weaken the resilience of the market. Renewable energy policy and consumers pursuing lower energy bills have driven the integration of wind and solar generation, and energy efficiency[110] into a traditional energy and capacity market design.

Electricity consumers have invested heavily in substituting part of their energy needs with distributed generation. Collectively, there is approximately 750MW of small-scale distributed photovoltaic solar generation in postcodes overlapping with the SWIS.[111] This is comparable in scale to the combined capacity of Collie power station and Bluewaters units 1 and 2.

Together, increased intermittent generation, reduced capacity and a changing load profile have increased the need for ancillary services to manage system reliability and may have contributed to the high and volatile energy prices and increased ancillary service costs observed in the market. The electricity system is reaching a point where the load profile reduces significantly through the day, such that thermal load may have to turn down, and forecasting demand and capacity requirements has become increasingly difficult.

At the same time, the WEM has been the subject of major and ongoing reviews. The Independent Market Operator, which originally managed the WEM evolution process, first undertook periodic reviews leading to the development of three-yearly market rules Evolution Plans, with progressive changes in market mechanisms through the rule change process.[112] More recently, the Electricity Market Review examined the structures of the electricity generation, wholesale and retail sectors, and the incentives for industry participants to make efficient investments and minimise costs. The review led to reforms to the WEM institutional arrangements and proposed other improvements to the WEM and measures to encourage retail competition.

The following sections discuss the types of changes that are expected in the WEM in the future and their effect on system dynamics. Consideration is given to an approach that builds market resilience to an increasing penetration of distributed energy resources, the timing of market reforms and the absence of an organisation responsible for reform.

5.1. Technological changes in the market

Future demand for distributed energy resources such as rooftop solar photovoltaic (PV) systems and battery storage systems is expected to grow quickly. AEMO expects that approximately 1000 MW of additional rooftop PV capacity and 330 MW of battery capacity will be installed in the SWIS between 2017–18 and 2026–27.[113]

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[110] Household appliances such as fridges and dishwashers.

[111] ERA analysis of Clean Energy Regulator data available from http://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Postcode-data-for-small-scale-installations

[112] For example, see: https://www.erawa.com.au/cproot/15351/2/Market%20Rules%20Evolution%20Plan%20-%20November%202012.pdf

[113] See AEMO's 2017 Electricity Statement of Opportunities (pages 40-48) https://www.aemo.com.au/-/media/Files/Electricity/WEM/Planning_and_Forecasting/ESOO/2017/2017-Electricity-Statement-of-Opportunities-for-the-WEM.pdf

AEMO projects that electric vehicle uptake will occur more slowly, due to limited infrastructure, the narrow range of models available, and the cost relative to conventional petrol or diesel vehicles. Nevertheless, it is projecting growth to between 60 GWh and 480 GWh (with an expected value of 200 GWh) by 2026–27. Many electric vehicles are technically capable of providing the same service as battery storage.

The market rules do not make specific provisions for the inclusion of electricity battery storage in the market. More detailed consideration and clarity is required on:

- the value that storage technologies can provide (e.g. energy price arbitrage, capacity, ancillary services and network support) and how this can be optimised;
- whether networks can participate in the ownership and control of storage technologies; and
- whether storage should be registered as a separate service or as both a retailer or generator.

The Lantau Group has provided support to the 2016–17 Wholesale Electricity Market review. It considers that the key is to ensure that barriers to market entry are minimised and that stakeholders are provided with timely information supporting decisions about cost, value, opportunity and risk.[114]

In its submission, Perth Energy notes that the WEM is already subject to demand swings influenced by wind and solar PV output. It considers that the existing dispatch systems are struggling to accommodate the penetration of solar PV, and that the quantity of low inertia intermittent generation requires considerable additional manual intervention by System Management. This restricts the system's ability to respond to the types of load changes that are occurring and will worsen as the contribution from renewables increases.

Perth Energy notes that there is general agreement that fast-start gas turbines and batteries are suitable tools to accommodate load variation. However, an effective response from these technologies is dependent upon near real-time gate closure, which is itself dependent upon an improved dispatch system; improvements in AEMO's forecasting; restructuring the RCM to encourage investment in gas fired plant; and rule changes to allow for batteries to be incorporated into the WEM.

In light of changing technologies and conditions, AEMO highlights a number of recommendations from the Finkel Review that it considers are applicable to the WEM. For example, AEMO highlights the recommendation for AEMC or the Energy Security Board to undertake a comprehensive review of the National Electricity Rules by the end of 2020, in order to streamline them.

Additionally, AEMO notes the recommendation for the development of a data strategy for the NEM to provide an adequate 'evidence base' for development of the strategic plan and provide for tracking of performance indicators across the sector and in support of the market adapting to rapidly changing conditions. AEMO suggests that there is future potential for developing a data strategy for the WEM.

[114] The Lantau Group, 2017. Anticipating the changes ahead. https://www.erawa.com.au/electricity/wholesale-electricity-market/annual-report-to-the-minister

Consumers are also changing their behaviour in response to increasing retail prices. Many that can afford it are avoiding costs by investing in rooftop PV systems. Studies show that the major motivational factor for rooftop PV investment is to reduce bills.[115] Consumers who both produce and consume energy, take a more active approach in the energy market e.g. through selling energy produced by distributed energy resources, such as solar PV, back to the grid.

The two main ways that consumers who both produce and consume energy could engage more actively in managing retail prices are to:

- remain independent and trade amongst themselves;[116] or
- participate in the existing electricity market (particularly if they aggregate).

Taking the independent route creates further forecasting problems. Participation by consumers who both produce and consume energy in the wider electricity sector may affect wholesale electricity pricing through the flow of aggregated, low cost renewable electricity into market. This in turn may cause curtailment of cheap baseload plant during times of high renewable output, with implications for system reliability. Alternatively, these consumers may be encouraged to participate in a distributed energy market for provision of ancillary services. This is explored in more detail in section 5.1.2.

Consumers make decisions on whether to invest in energy efficiency, solar PV and storage based on retail electricity tariffs. The Uniform Tariff Policy, which ensures customers are charged the same tariff rates regardless of location, leads to customers in populated areas cross subsidising those in remote regions. This reduces incentives for remote customers to explore alternative lower-cost options available to supply electricity. In contrast, in load centres, the cost of the cross subsidy exacerbates the incentive to avoid tariff payments by increasing the attractiveness of solar panels and batteries.[117]

Furthermore, the time-of-day structure of tariffs, whether all-hours or peak/off-peak, disconnects electricity customers from the true value of electricity at any point in time, such that they may respond to the tariff price by reducing consumption at a time of day when the price is low. Smart metering, enabling the provision of relevant pricing signals to customers, would facilitate comprehensive tariff reform.

In the short term, the change in patterns of customer energy usage could improve system reliability. In the medium and long terms, the prolonged change in energy usage could defer the need for capacity and network expansion. It may also help the power system to prepare for the integration of renewables and other new technologies. However, the penetration of advanced metering technology in the WEM is limited and implementation carries considerable cost.

In its submission, AGL strongly supports the implementation of advanced meters as an enabling technology for the development and introduction of more innovative retail and

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[115] Refer to study conducted by Bondio, Shahnazari, McHugh, 2017. The technology of the middle class: understanding the fulfilment of adoption intentions in a rapid uptake residential solar photovoltaics market, Renewable and Sustainable Energy Reviews, Elsevier (in press).

[116] For example, the White Gum Valley energy sharing trial in Fremantle allows for peer-to-peer trading. It employs blockchain technology as a platform for consumers to participate in a new renewable energy market that involves the trade of unused solar energy generated and stored at the site between residents. See: https://westernpower.com.au/energy-solutions/projects-and-trials/white-gum-valley-energy-sharing-trial/

[117] The Lantau Group, 2017. Anticipating the changes ahead. https://www.erawa.com.au/electricity/wholesale-electricity-market/annual-report-to-the-minister

behind-the-meter products and services, including solar PV, energy storage, time of use tariffs and other innovative retail and network products. AGL considers that digital metering technology can provide significant benefits to consumers. The detailed information that they capture empowers customers, by allowing them to become better informed about their energy use than was previously possible, so that they are better equipped to decide on new products and services. AGL notes that retailers, distributors and third party entrants are currently competing on the development and provision of platforms and tools that give customers easy access to insightful and usable data.

5.1.1. System dynamics and consequences

The Lantau Group was engaged by the ERA to assess the changes that are either under way in the Western Australian electricity sector or that can be anticipated to affect the sector over the next few years, and then consider whether the current market design is able to ameliorate the risks associated with these changes.[118]

In competitive markets, competing suppliers and consumers are exposed to the risk of new market or technological developments. The key issue is whether the causes and pace of disruption create efficiencies or arise because of the exploitation of some regulatory, policy or market design decisions.

Changing something in one part of the electricity value chain runs the risk of triggering an effect in another part of the chain. Given the wide and growing range of energy options, it is becoming more difficult to mitigate consequences such as material cost-shifting, the risk of stranded costs borne by investors or taxpayers, and reductions in network reliability and security. The solution is continual checking for and responding to policies, regulations and aspects of the market design that are driving a material misalignment between benefits for the adopters of new technologies and the wider benefits to society.

Some changes in the electricity market may be self-correcting, triggering responses that limit the extent of any problem. Other problems, however, may lead to new problems or expand problems and further increase distortions or costs. To demonstrate this point, Lantau provides a simple example of how the addition of rooftop solar panels can lead to an interaction of consumer decisions with the subsequent rebalancing of tariffs for network cost recovery, to amplify the initial incentive to add rooftop solar.

If tariffs are not set appropriately, adding rooftop solar to the system results in reduced cost recovery for the utility, triggering the need to compensate for lost revenue. However, because the incentive to invest in solar is the end user's ability to avoid paying tariffs, it can increase the number of end users who see value in investing in this technology. With simple metering, it is not possible to shift cost recovery from usage at different times of day. Consequently, average costs increase. Non-solar customers bear the bulk of the cost shifting, with customers who can add solar panels increasingly doing so.

The increase in the behind-the-meter solar generation eventually becomes material, imposing costs on the system such as ancillary service costs and grid enhancement costs to accommodate solar power injections at locations that were not originally designed to accommodate them. Averaging these costs over a broad customer base can exacerbate the incentive for cost shifting. Mitigation of these effects can only be achieved through greater price discrimination, e.g. more selective charging of customers or by selective

[118] See The Lantau Group, 2017. Anticipating the changes ahead. https://www.erawa.com.au/electricity/wholesale-electricity-market/annual-report-to-the-minister

charging for types or times of usage. Metering may also assist by supporting more accurate and dynamic price signals.

The way that various changes influence one another is complex. Interactions can occur at several levels, with complex feedback loops. The complexity of interactions becomes more elaborate when behind-the-meter solar, battery storage, energy efficiency and grid-connected capacity are combined.

Lantau considers that the following market design principles encourage alignment, efficiency and equity:

- energy market reforms that sharpen signals, move signals closer to real-time, and provide granularity and responsive dynamics to pricing;
- enhancement of locational signals, including the move to a constrained access model, increased locational signalling of capacity requirements, and efforts to reduce a reliance on the state-wise averaging of prices;
- enhancement of ancillary service pricing and service definitions to ensure that new technologies with valuable response features can monetise this value and are more likely to be commercially viable when needed;
- enhancements to the RCM to ensure that it is sufficiently dynamic and responsive to market conditions so that it is technology neutral; and
- risk management options (such as contracts, the RCM or any other mechanism driving capacity pricing and tariff adjustments) that are sufficiently robust as to only support investment that is needed.

5.1.2. AEMC approach to building market resilience

In the NEM, like the WEM, solar PV constitutes a large proportion of the existing distributed energy resources. In the future, it is expected demand for multiple distributed energy resources such as solar PV, energy storage and electric vehicles will increase. This will be driven by the falling costs and increasing functionality of these technologies, more sophisticated information and control technologies (and fast, cheap computing platforms), and changing consumer attitudes to electricity supply and prices.

Historically, at low levels of penetration, distributed energy resources can be, and have been, accommodated in Australia's distribution networks with little or no coordination or assessment of their cumulative impacts. Networks have generally had the spare capacity and some ability to adapt to the technical impacts of these resources. However, distribution networks are likely to be increasingly affected as penetration levels increase.[119] Along with the benefits that the resources provide, they may produce a range of technical impacts, prompting some distributors to limit the installation of solar PV in parts of the network.

[119] There are multiple possible technical effects of distributed energy resources. For example, some distributed energy resources can lead to voltage stability issues, distributed energy resources can reduce inertia and frequency response by displacing synchronous plant, inverter connected distributed energy resources can increase harmonic distortion and distributed energy resources fueled by intermittent generation can result in unacceptable levels of flicker.

In 2017, AEMC undertook a project to explore whether the NEM arrangements are flexible and resilient enough to respond to changes in technology.[120] The purpose of the project was to examine how distributed energy resources might drive evolution to a more decentralised provision of electricity services at the distribution level. It considered the incentives or disincentives for business model evolution, required changes to the regulatory framework, operation of distribution systems, and required market design to enable this evolution to occur in a manner consistent with the National Electricity Objective.[121] To do this, AEMC explored:

- The technical opportunities and challenges presented by distributed energy resources;
- What, if any, new roles, price signals and market platforms are required to optimise the deployment and use of distributed energy resources;
- How the role of distribution network service providers may need to adapt to facilitate a transition to a more decentralised market for electricity services;
- Whether the existing electricity regulatory framework impedes or encourages innovation and adaptation by distribution network service providers to support the efficient uptake and use of distributed energy resources; and
- Whether changes to the existing distribution regulatory arrangements or design of the market are necessary to address any impediments to efficient business model evolution.

AEMC developed a set of principles to guide its analysis. These included facilitating effective consumer choice, promoting competition, promoting price signals that encourage efficient investment and operational decisions, enabling technological neutrality, a preference for simplicity and transparency, and regulating to enable the safe, secure and reliable supply of energy.

To optimise investment in distributed energy resources, and better coordinate with wholesale markets, AEMC proposed a distribution market model that can be thought of as a two way-platform, with consumers on the supply side and electricity market participants and networks on the demand side.

AEMC considered that consumers need a way to express their preferences and respond to price signals about how their distributed energy resources can be used. Distributed energy resources need to be visible and dispatchable. Correspondingly, the demand side needs a way to signal what they are willing to pay for distributed energy resources.

AEMC referred to the service that maximises the value of distributed energy resources as the ‘optimising service,’ as it allows consumers to trade off value streams to maximise the overall value of their distributed energy resource.[122] The service responds to network, retail,

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[120] This project was intended to be a forward thinking, strategic analysis used to inform its assessment of rule change requests and advice to government.

[121] The National Electricity Law sets out the National Electricity Objective ,which is to ‘promote the efficient investment in, and efficient operation and use of, electricity services for the long-term interest of consumers of electricity with respect to: (a) price, quality, safety, reliability and security of supply of electricity and (b) the reliability, safety and security of the national electricity system’.

[122] For example, one consumer might place a high value on having backup power, and so not provide network or wholesale services in order to have their battery fully charged. Another consumer might place higher value

wholesale, and other service prices, and co-ordinates this with AEMO's central dispatch where relevant. AEMC considered that retailers that operate within a competitive market in the NEM are better placed than regulated network service providers to deliver this service.[123]

The distribution system operator is the party responsible for distribution safety and system security. AEMC considered that the role of the distribution system operator should be optimised as issues become more localised. It asked Energy Networks Australia to explore what minimum level of control network service providers require over distributed energy resources, to enable higher levels of distributed energy resources for distribution level markets, without compromising their regulatory obligations.

Network capacity can be provided through either building networks or using a distributed energy resource to defer or avoid investment in the network. AEMC recommended that network service providers optimise the decision on whether and how to provide network capacity by committing to and publishing information about congestion and technical issues, at more localised levels on their network. This would provide consumers with meaningful and consistent information, so that they can make efficient investment and operation decisions across different distribution networks.

While such an approach could also be utilised in Western Australia, the particular features of the WEM would require due consideration in the development of a distribution market. For example, the retail market in the SWIS is not competitive for residences and small businesses, which are supplied only by Synergy. Full retail contestability would thus be a precursor to the use of retailers to provide the optimising service.

5.2. Market reform

Changing technologies and electricity market conditions are expected to advance quickly. The WEM may only have a short period before it experiences similar conditions to those occurring in the NEM.[124] Additional market reforms need to be undertaken now to ensure the reliability and security of the system, and that cost pressures are reduced for consumers.

Electricity markets are complex. They require continual refinement to ensure that they operate in a manner that supports the long-term interests of consumers. Previously, the ERA was concerned about the lack of progress in energy policy development. The previous government had begun to address this through the Electricity Market Review process. However, a change of government and the appointment of a new Minister delayed reforms to the electricity market. Clarity is beginning to emerge on the government's plans for the electricity industry.

Once the current reforms are finalised, it will be important to continue to develop policy to address issues in a timely manner, rather than having to go through periodic and lengthy

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on the payment it gets from its local network service provider for the use of its battery at times of network congestion. Distributed energy resources have a range of technical capabilities, including the provision of energy, voltage control, frequency regulation and reactive power.

[123] AEMC considered that a network business might be conflicted for three main reasons, affecting competition in the market. A network business may be able to cross subsidise a competitive service from its regulated activities, it may acquire commercially sensitive information in the course of performing its regulated activities (e.g. metering data or load profile data), and it may be able to restrict access to infrastructure or provide access on less favourable terms than to an affiliate.

[124] For example, see AEMO's reports on the technical challenges of the changing generation mix experienced in the South Australian market https://www.aemo.com.au/Media-Centre/AEMO-publishes-final-report-into-the-South-Australian-state-wide-power-outage

major reviews. Policy development needs to anticipate issues as they emerge and the market design needs to be refined as necessary.

At a time when the market is evolving at a rapid pace, the interdependency between governance and market frameworks is critical to a smooth transition to a market with an increased penetration of distributed energy resources. Operational and regulatory institutions will need to collaborate, monitor developments, and identify information gaps, paying particular attention to the possible unintended consequences of reforms and to the attributes of new technologies and their effect on system security and reliability.

Reforms to market design should ensure the market can be adaptive, such that it can maintain or recover function following uncertain or unforeseen disruptions to system performance levels, and flexible so that it can respond to changes quickly in a way that mirrors the dynamic nature of the system.

Further, as noted by Lantau in its report, the extraordinarily complex way the growing range of issues and options interrelate makes it more important to understand the fundamental drivers of value and the ways in which regulation, market design and policy either contribute to adaptive responses or the hastening of unintended responses. Therefore, it is important to focus on price signals and the extent to which they embed compromise or averaging or are otherwise higher or lower than they should be.

Advanced metering and full retail contestability could support different tariff structures. Tariff reform, advanced metering and retail contestability may thus be significant enablers underpinning any future market design.

5.3. Agency roles

In the past, the Independent Market Operator undertook the function of market development. However, with the transfer of market operations to AEMO on 30 November 2015, there is now a gap, with no agency or mechanism responsible for fulfilling this role. The State Government should ensure timely market reform in the WEM, with the aims of both achieving the wholesale electricity market objectives and promoting the long-term interests of Western Australian consumers.

The ERA is an independent statutory authority established by the Parliament of Western Australia. The role of the ERA is to ensure the effectiveness of the WEM through monitoring the market and clearly identifying problems or issues that need to be resolved, and recommending measures to the Minister to improve the effectiveness of the market in achieving the Wholesale Market Objectives.

The ERA is also responsible for compliance and enforcement functions in the market. The Monitoring Protocol Market Procedure[125] states how the ERA monitors participants' compliance with the market. For an overview of the main outcomes of the ERA's compliance and enforcement measures in 2016–17, see Appendix 2, sections nine through to thirteen.

The Rule Change Panel is independent of the ERA's Governing Body and is responsible for the market rules and the Gas Services Information rules. It considers proposed amendments to the rules and decides whether an amendment to the rules would better achieve the objectives of the gas and electricity markets. The Minister for Energy appoints

[125] Refer to: https://www.erawa.com.au/cproot/17925/2/FINAL%20Monitoring%20Protocol%20clean%20version.pdf

members to the Rule Change Panel, which operates in accordance with the *Energy Industry (Rule Change Panel) Regulations 2016*.

The Public Utilities Office and AEMO also have important roles in ensuring the effectiveness of the WEM. The Public Utilities Office focuses on the development of energy policy, including the policy response to issues or problems identified by the ERA. AEMO focuses primarily on the operation of the market in accordance with the market rules and the WEM market procedures.

In the WEM, there is no organisation similar to the AEMC, which undertakes market development in the NEM. The ERA supports the rule change process but a requirement to undertake market development may be conflicted by the requirement for the ERA to also assess the effectiveness of the market. The Public Utilities Office, which is responsible for policy reform, does not currently have the capacity to undertake significant market development. Industry also perceives a conflict of interest in the Public Utilities Office fulfilling this role, as it may not make reforms unless there is a political appetite or imperative to make reforms.

AEMO suggests that its central, independent role in market and system operation means it is uniquely placed to identify opportunities for improvement in market operation and administration. Consequently, in July, AEMO submitted a rule change proposal to clarify its role in market development and ensure that it is able to recover any costs associated with this role

In its submission, Alinta considers that it is difficult to undertake a 'fulsome assessment' of whether or not the oversight and coordination of planning and market development in the WEM is as efficient and effective as it could be. In particular, it has concerns regarding perceived or actual conflicts of interest now that the ERA is responsible, as the Independent Market Operator once was, for the compliance and monitoring, and rule change secretariat functions. Within the ERA, ring-fencing arrangements apply to the Rule Change Panel support team, and internal audits are conducted to ensure compliance with these arrangements.

Alinta is also concerned that the governance structure does not duplicate functions or costs for the industry, as AEMO, the Rule Change Panel and the Public Utilities Office are all involved in work leading to the development of the market.[126] Alinta recommends a review of the current institutional arrangements to ensure:

- that each agency's role is clear;
- there are no conflicts of interest and no duplication of functions or costs occurring; and
- that robust energy policy development is able to occur in a timely manner going forward.

Alinta supports the Finkel recommendation of 'statements of expectation' for the Australian Energy Regulator and the AEMC, and a 'statement of role' for AEMO, coupled with a

[126] Also see the submission by the Australian Energy Council, which cites a 'lack of clarity between the roles and responsibilities of the ERA, the Public Utilities Office, the Rule Change Panel and the Minister for Energy'. The council expresses concern that there may be duplication between the various bodies or that 'matters may not be addressed promptly and effectively. The Australian Energy Council considers that inconsistencies between agency roles may lead to increased risk to industry and increased costs to consumers.

comprehensive list of outcome based performance indicators.[127] Alinta suggests consideration be given to developing statements of expectation for the ERA and the Rule Change Panel, and a statement of role for AEMO in Western Australia, with analogous performance indicators.[128]

Stakeholder submissions also indicate a preference for more industry involvement in the reform process. For example, in its submission, ERM Power notes that market participants did not and do not favour an auction but the mechanism was approved by the EMR Steering Committee with no input from market participants. Similarly, Merridin Energy notes that the Electricity Market Review did not properly consider the commercial implications of the market reforms for the private sector and the impact on its funding. Merredin considers that any streamlining of the market rules, including the RCM and network access models, should include consultation with broader industry. The Minister has recently indicated the priority of wider industry consultation in the ongoing reform process.

[127] Recommendation 7.5 from the Finkel report, to be completed by mid-2018.

[128] Alinta submission, p.10.