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Australian Energy Market Commission

## CONSULTATION PAPER

# NATIONAL ELECTRICITY AMENDMENT (SETTLEMENT UNDER LOW OPERATIONAL DEMAND) RULE 2021

### PROPONENT

Infigen

22 APRIL 2021

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# RULE

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## ABOUT THE AEMC

The AEMC reports to the Energy Ministers Meeting (formerly the Council of Australian Governments Energy Council). We have two functions. We make and amend the national electricity, gas and energy retail rules and conduct independent reviews for the Energy Ministers Meeting.

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# 1 INTRODUCTION

## 1.1 Overview of Infigen's rule change request

On 15 February 2021, Infigen Energy (Infigen) submitted a rule change request to the Australian Energy Market Commission (AEMC or Commission) to change the formulas that the Australian Energy Market Operator (AEMO) uses to calculate how non-energy costs are allocated to market customers in the national electricity market (NEM). Non-energy costs in the NEM include payments for:

- market and non-market ancillary services
- compensation for directions, market suspension or administered pricing
- reserve contract payments.<sup>1</sup>

Infigen considers that, under the National Energy Rules (NER), AEMO's settlement system:

- cannot function if regional demand in a trading interval, or other cost recovery period, is zero
- faces the risk that under low operational demand<sup>2</sup> some market customers will be subject to over-procurement of non-energy costs.<sup>3</sup>

In its rule change request, Infigen notes that the NER and AEMO's settlement system were not designed for a power system with bi-directional resources.<sup>4</sup> As such, the rules did not foresee a scenario where there may be no customer energy demand from which to recover non-energy costs that are allocated to energy users.

## 1.2 Overview of related rule change from AEMO

On 8 February 2021, AEMO submitted a rule change request to the AEMC in relation to the formulas that are used to calculate how non-energy costs are allocated and the interaction between these formulas and the settlement of other markets within the NEM.<sup>5</sup>

AEMO has identified that its settlement systems, as currently configured, cannot function if regional demand in a trading interval, or other cost recovery period, falls below 1 MWh.<sup>6</sup> Further detail on AEMO's rule change request is provided in chapter 5.

Both AEMO and Infigen's rule change requests refer to rule 3.15 of the NER and there is some overlap in scope between the two rule changes. Infigen's rule change request addresses both the allocation of costs to market customers and the ability for the NEM to settle, while AEMO's request focuses solely on the ability of the NEM to settle.

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1 For detailed explanations of non-energy costs, see AEMC, *Integrating energy storage systems into the NEM*, 17 December 2020 p. 9 and AEMC, *Integrating energy storage systems into the NEM*, consultation paper, 20 August 2020, p. 65. See also AEMO, *NEM settlement in zero and negative demand conditions*, rule change request, p. 3.

2 Infigen has referenced operational demand within its rule change request rather than the technical term net regional demand, which is referred to within AEMO's rule change request. Both of these are measures of market customers demand but their values will vary as they are two separate measures.

3 Infigen, *Settlement under low operational demand*, rule change request, pp. 4-5.

4 Bi-directional resources are customers that both consume and produce energy to and from the NEM.

5 AEMO, *NEM settlement in zero and negative demand conditions*, rule change request, p. 4.

6 Ibid.

## 1.3 Implementation issues and link to AEMO rule change request

Infigen's rule change proposes that clause 3.15 of the NER is amended such that a lower limit of zero is set on market customer adjusted gross energy (AGE) value within the non-energy cost recovery formulas.<sup>7</sup> This 'flooring mechanism' would remove the possibility of market customers having negative AGE and help allocate costs more fairly between participants, with total costs recovered being limited to the total service cost.

However, AEMO has noted that it currently has limited time and resourcing to implement relevant changes to its systems before September 2021. This is because it will require time to test and certify any changes before this, while it is also already committed to implementing other significant rule change projects during spring 2021 and in early 2022. This includes five-minute settlement, wholesale demand response, reducing customer switching times and global settlements. These issues are explained further in section 4.3.1.

Because of this, AEMO has advised the Commission that it is unlikely to have the ability to implement the flooring mechanism in time. This will limit the avenues the Commission has to address the issues identified by Infigen.

Also of note is the *Integrating Energy Storage Systems into the NEM* (Integrating Storage) rule change, which, if made, will provide a solution for the calculation of non-energy costs that will solve the issues of low, zero or negative demand raised by both AEMO and Infigen. However, this will not be implemented until likely between September 2022 and September 2023 according to the current AEMO IT implementation roadmap.<sup>8</sup> Further information on this rule change can be found in chapter 5.

However, in its rule change request, Infigen provided a number of alternative solutions to the flooring mechanism in the event it could not be implemented. This includes the possibility of making a change to AEMO's proposed solution to have the threshold when the alternative settlement mechanism is triggered to be raised to 150 MWh. In Infigen's view, this would solve for both the issues raised by it and AEMO.

The Commission would like to explore the possibility of alternative solutions, including increasing the threshold value to 150 MWh. In the event stakeholders do not raise concerns with the higher threshold, and based on further analysis, there is potential to address the issues raised by Infigen in its rule change request through the AEMO rule change.

It is important to note here that the result of the *Integrating energy storage systems into the NEM* rule change, if made, is that any solution implemented in this rule change will only need to be in place for between 12 and 24 months. This should limit the impacts that may result from any changes to the threshold value.

If no substantial consensus can be reached through this consultation process, the AEMO rule change process will continue, as the Commission will not put settlement of the NEM at risk.

<sup>7</sup> Infigen, *Settlement under low operational demand*, rule change request, p. 12.

<sup>8</sup> AEMO, *Regulatory roadmap v4*, 18 March 2021. Timing of the Integrating Storage solutions is also subject to a decision by the Commission. A draft determination for Integrating Storage will be released on 29 April 2021, with the final due in August 2021.

The issues around a threshold value and the distribution of non-energy costs will continue to be consulted on within this rule change if no substantial consensus is reached.

The Commission recognises that the simultaneous rule change processes have the ability to cause confusion on what submissions should be presented for each of the requests. We request that comments and views on:

- NEM settlement be directed to AEMO's rule change request
- the distribution of non-energy cost recoveries be directed to this (Infigen's) rule change request.

The table below outlines the issues for consultation within this consultation paper and the crossover with AEMO's rule change consultation paper.

**Table 1.1: Crossover of issues between Infigen and AEMO's consultation papers**

<b>ISSUES FOR CONSULTATION</b>	<b>ISSUES RELEVANT FOR THIS RULE CHANGE</b>	<b>CROSSOVER WITH AEMO'S CONSULTATION PAPER</b>
Assessment framework	We seek feedback on the proposed assessment framework, including whether there are additional considerations that the Commission should consider in the framework.	The two papers have similar assessment frameworks.  Infigen's paper includes whether it provides efficient market signals, as it focuses on incentives market customers face during low operational demand.  AEMO's paper examines whether the proposed rule provides administrative certainty.
Risk of low operational demand	We seek feedback on the issues surrounding low operational demand, if they are currently being realised and if there are additional issues that need to be addressed.	The NEM settlement issued identified by Infigen is the key issue identified within AEMO's rule change request, and the Commission is consulting on this issue in the other paper.  The Commission is consulting on issues surrounding the distribution of non-energy costs within this paper.
Infigen's proposed solution	We seek feedback on whether the proposed solution is the most appropriate way to respond to issues raised, any additional issues that may arise, and if a commercial solution is a possible alternative option.	No crossover between the two papers.

ISSUES FOR CONSULTATION	ISSUES RELEVANT FOR THIS RULE CHANGE	CROSSOVER WITH AEMO'S CONSULTATION PAPER
Implementation constraints	We seek feedback on the viability of a determination given the implementation constraints AEMO currently has, noting that the <i>Integrating energy storage systems into the NEM</i> rule change is likely (if made) to provide a long-term solution.	The Commission has accepted the rule change will be run as an urgent process, and that it will not put the settlement of the NEM at risk. Therefore, implementation constraints are noted in the AEMO's rule change request but are not being consulted on.
Alternative solutions	We seek feedback on the alternative solutions that Infigen has proposed to the issues presented. Specifically, the option to raise the threshold at which AEMO's preferred solution would be triggered to 150 MWh (rather than 1 MWh).	One of Infigen's alternative solutions directly refers to AEMO's preferred solution where the threshold is raised to 150 MWh.
Expected costs, benefits and impacts	We seek feedback on the expected costs, impacts or benefits resulting from Infigen's proposed solutions.	Infigen expects its solution to be no more complex to implement than AEMO's with significant benefits for market customers with positive demand.

Source: Infigen, *Settlement under low operational demand*, rule change request, 15 February 2021; AEMO, *NEM settlement in zero, low and negative demand conditions*, rule change request, 8 February 2021; AEMC, *NEM Settlement in low, zero or negative demand conditions*, consultation paper, 22 April 2021.

We encourage stakeholders to engage in both consultation processes to ensure the Commission can reach an efficient outcome that takes into account the issues raised in both rule changes, while also ensuring the NEM is able to settle in the event of zero demand.

## 1.4 Expedited request

Both Infigen and AEMO have asked that their rule change requests be subject to the expedited rule making process on the basis that their requests are urgent rules as defined in the National Electricity Law (NEL). AEMO states that this is essential because there is a risk that regional demand in South Australia could fall below 1 MWh as early as spring 2021.<sup>9</sup> Infigen similarly considers its two issues are time-critical.<sup>10</sup>

<sup>9</sup> AEMO, *Minimum demand in South Australia*, fact sheet, 2021, p. 2.

<sup>10</sup> Infigen, *Settlement under low operational demand*, rule change request, p. 2.

Having considered both requests, the Commission has decided that AEMO's rule change request is to be expedited as it meets the test for an "urgent rule" in the NEL.

The Commission considers Infigen's rule change request as a standard rule change request under the NEL as the urgency of NEM settlement is covered under the scope of the AEMO rule change request.

This approach has the benefit of allowing a longer stakeholder consultation period on the issues and solutions around the distribution of non-energy costs, including Infigen's proposed changes to the threshold, without posing a risk of the NEM being unable to settle.

Given the time-critical nature of both the Infigen and AEMO rule change requests, the Commission intends to release draft and final determinations for the Infigen rule change request on a slightly faster timeframe (without impacting on the consultation periods). This will mean the final determination is in place prior to September 2021.

The rule change requests are available on the AEMC's website.<sup>11</sup>

## 1.5 Structure of this paper and consultation dates

This consultation paper has been prepared to facilitate public consultation on the rule change request and to seek stakeholder submissions. It:

- sets out a summary of, and the background to, the rule change request (Chapter 2)
- outlines how the Commission is managing the links between this rule change and key related rule changes (Chapter 4)
- identifies a number of questions and issues to facilitate the consultation on this rule change request (Chapter 4).

Consistent with the timelines and requirements for a standard rule change the key dates for stakeholders in this process are as follows:

- commencement of this rule change process **22 April 2021**
- submissions on consultation paper due: **20 May 2021**
- draft determination published: **17 June 2021**
- submissions due on draft determination: **29 July 2021**
- final determination published: **26 August 2021.**

<sup>11</sup> See AEMC's website <https://www.aemc.gov.au/rule-changes/settlement-under-low-operational-demand> and <https://www.aemc.gov.au/rule-changes/nem-settlement-under-low-zero-and-negative-demand-conditions>.

## 2 BACKGROUND

The purpose of this chapter is to provide background relevant to the recovery of non-energy costs for the Infigen rule change request. This chapter describes current arrangements, specifically:

- the responsibilities of AEMO under the NEM
- current cost recovery formula
- directing market participants

### 2.1 Current arrangements

Chapter 3 of the NER sets out the procedures which govern the operation of the market relating to the wholesale trading of electricity and the provision of ancillary services.<sup>12</sup>

#### 2.1.1 AEMO's responsibilities

Chapter 3 gives AEMO the responsibility for the operation and administration of the wholesale electricity market, including the following (amongst others):

- operating and administering the spot markets for electricity and market ancillary services<sup>13</sup>
- settling transactions and trades<sup>14</sup>
- prudential monitoring to manage the financial risks, such as default risk.<sup>15</sup>

One of AEMO's settlement responsibilities is to recover payments from wholesale market customers<sup>16</sup> for non-energy costs.<sup>17</sup>

These responsibilities include:

- payments for market and non-market ancillary services
- compensation for directions, market suspension or administrating pricing
- reserve contract payments.<sup>18</sup>

As part of its settlements function, AEMO must derive value, fees and cost recovery calculations. To achieve this, AEMO relies on metering data from connection points. Under the NER, the registration categories and the connection point categories represent either 'generation' or 'load', the former generally flowing into the network and the latter taking flow from the network.

<sup>12</sup> See clause 3.1.1 of the NER.

<sup>13</sup> See clause 3.2.2 of the NER.

<sup>14</sup> See clause 3.2.6 of the NER.

<sup>15</sup> See rule 3.3 of the NER.

<sup>16</sup> Under Chapter 10 of the NER a 'market customer' is defined as "a Customer who has classified any of its loads a market load and who is also registered by AEMO as a market customer under Chapter 2 of NER". A Market Customer must purchase all electricity supplied at that connection point from the spot market and make payments to AEMO for electricity supplied at the connection point as determined for each trading interval, see Clause 2.3.4.

<sup>17</sup> AEMO, *NEM settlement in zero and negative demand conditions*, rule change request, p.4.

<sup>18</sup> Ibid.

Because, historically, market loads were almost always net consumers of energy, the NER generally allocates non-energy costs between market customers according to the proportion of *net* energy used by each customer.<sup>19</sup> However, the increasing penetration of rooftop solar has meant that these loads can now also be generators. This can have consequences that were not foreseen at the start of the NEM, particularly for the settlement of non-energy costs, which are usually calculated based on *net* energy flows. This is explored further in section 4.2.2.

### 2.1.2 Current cost recovery formula

The rule change request focuses in part on the potential impact of low operational demand on AEMO's recovery of non-energy costs from market customers.

Low demand impacts on the formulas AEMO uses to allocate non-energy costs under rule 3.15 of the NER. These formulas rely on numerators and denominators that include the AGE (see below). AGE is measured as the flow of electricity at a participant's connection point(s), in the relevant category for recovery either as load or generation.

The AGE for a trading interval is the net of energy produced and exported to the grid via the connection point and energy consumed at the connection point.<sup>20</sup> Non-energy costs that are currently recovered from market customers are generally allocated according to the following formula:

$$\text{Allocated cost to a Market Customer} = \text{Regional service cost} \times \frac{\text{Market Customer's AGE}}{\sum_{\text{region}} \text{AGE}}$$

The AGE for each market customer is defined under clauses 3.15.4 and 3.15.5 of the NER. Infigen describes a market customer's AGE as "the net consumption of that market customer for the relevant trading interval".<sup>21</sup> The denominator, being the sum of all AGE, is effectively the regional operational demand.

The "regional service cost" in the above formula is determined from global services costs<sup>22</sup> being allocated to a region on a pro-rata basis with operational demand.<sup>23</sup> Hence, when operational demand in a region is low, through the regional service cost parameter, the associated costs allocated to that region will be low, but non-zero.

Some services, such as directions and local lower Frequency Control Ancillary Services (FCAS) requirements, are recovered on a regional basis with costs recovered from the region's market customers. These costs occur particularly when a region is at the risk of, or is, islanded<sup>24</sup> from the NEM, requiring the resources to be recovered locally.

<sup>19</sup> See rule 3.15, NER.

<sup>20</sup> AEMO, *NEM settlement in zero and negative demand conditions*, rule change request, p. 5.

<sup>21</sup> Ibid, p. 4. Net consumption being the market customer's energy at each connection point which the market customer is financially responsible.

<sup>22</sup> For example, NEM-wide lower FCAS volumes.

<sup>23</sup> See clause 3.15.6A(g)(1)-(3) of the NER.

<sup>24</sup> Electrically separated from the rest of the grid (NEM). See chapter 10 of the NER for the technical definition.

### 2.1.3

#### Directing market participants

Under the NEL and the NER, AEMO has powers, in broad terms, to issue directions or instructions to market participants to ensure the power system is secure and safe. However, these provisions cannot be used to maintain market efficiency.<sup>25</sup>

Under the NEL and subject to other safeguards, AEMO has the power to direct market participants to do certain things where it is necessary:

- to maintain power system security
- for reasons of public safety.<sup>26</sup>

Such actions can include:

- switching off or re-routing a generator
- calling equipment into service or taking it out of service
- commencing operations or maintaining, increasing or reducing active or reactive power output
- shutting down or varying operations
- load shedding or restoring load (in accordance with the Rules and any procedures made in accordance with the Rules)
- other such things that are necessary to maintain the power system or for reasons of public safety.<sup>27</sup>

#### South Australian rooftop solar curtailment

On 28 September 2020, a number of new technical standards were introduced in South Australia. This followed advice from AEMO about the need to update operating procedures for low demand periods and to implement new capabilities to actively manage distributed solar photovoltaics (PV) when necessary.<sup>28</sup>

With this new set of technical standards, named 'Smarter Homes', all new solar systems installed in South Australia from 28 September 2020 were required to have the technical capability to be remotely disconnected and reconnected to help manage risks to the electricity system. Owners of new systems are also required to nominate an authorised agent who can act on instructions to manage rooftop solar output in a power system emergency.<sup>29</sup>

In March 2021, AEMO detected there was insufficient forecast scheduled demand<sup>30</sup> to maintain a secure operating state in South Australia. Therefore, AEMO directed South Australia's transmission owner and operator, ElectraNet, to take steps to maintain grid-demand above 400MW.<sup>31</sup> Previous research by AEMO noted that this demand is the minimum

25 See section 116 of the NEL and clause 4.8.9 of the NER.

26 Section 116 of the NEL (South Australia).

27 Section 116 of the NEL.

28 See AEMO, *South Australian Electricity Report*, November 2020, p. 75.

29 South Australian Government, *Regulatory changes for Smarter Homes: new requirements for smaller electricity generators*, September 2020.

30 Forecast scheduled demand differs from operational demand as operational demand includes local scheduled wind and solar generation of 30MW or more. Scheduled demand is a measure to meet scheduled generation and load.

31 AEMO, *Solar PV curtailment initiative by SA Government supports the NEM*, media release, 2021.

sufficient level to support minimum loading levels for synchronous generating units in the region, required for the secure provision of frequency control, inertia and system strength services when South Australia is islanded.<sup>32</sup>

During this approximately one hour period, 67MW of solar PV was curtailed through South Australia Power Networks (SAPN). This marked the first time that the new rules have been used since implementation.<sup>33</sup>

The following mechanisms were used during the curtailment:

- 17MW of commercial solar PV curtailed through System Control and Data Acquisition (SCADA) control systems
- >10MW of distributed solar PV curtailed through registered agents (Smarter Homes)
- 40MW of rooftop solar PV curtailed through enhanced voltage management at seven substations.<sup>34</sup>

It is important to note that AEMO cannot necessarily rely on these provisions to address the risks posed by both AEMO and Infigen in their rule change requests. That is, it cannot rely on this to be able to settle the NEM, as whilst low or zero demand is a risk to the efficient operation of the NEM, it is uncertain if it will also be a power systems safety and security risk.

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32 AEMO, *2020 Electricity Statement of Opportunities*, August 2020, p. 19.

33 Dan van Holst Pellekan MP, *SA-NSW Interconnector and Smart Solar "critical" to maintain energy security*, press release, accessed 1.43 pm, 23 March 2021.

34 AEMO, *Solar PV curtailment initiative by SA Government supports the NEM*, media release, 2021.

## 3 ASSESSMENT FRAMEWORK

This chapter sets out the Commission's proposed approach in assessing the proponent's rule change request:

- decision-making framework the Commission must apply to determine whether the rule change request contributes to the national electricity objective (NEO)
- proposed assessment framework
- the Commission's option to make a more preferable rule
- the Commission's option to make a differential rule.

### 3.1 Achieving the NEO/NERO

Under the NEL the Commission may only make a rule if it is satisfied that the rule will, or is likely to, contribute to the achievement of the national electricity objective (NEO).<sup>35</sup> This is the decision-making framework that the Commission must apply.

The NEO is:<sup>36</sup>

To promote efficient investment in, and efficient operation and use of, electricity services for the longer term interests 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.

### 3.2 Proposed assessment framework

To determine whether the proposed rule promotes the NEO, the Commission will assess the rule change request against an assessment framework.

The Commission is seeking stakeholder views on its proposed assessment framework, which includes the following criteria:

- **Effective and proportionate risk management:** does the proposed solution enable market participants and AEMO to manage risks?
- **Minimising uncertainty and market changes:** does the proposed solution minimise uncertainty for market participants and AEMO and promote confidence in the market?
- **Regulatory and administrative burden:** are the costs to market participants and market bodies of implementing the solution minimised and proportional to the benefits?
- **Providing efficient market signals:** does the solution provide market participants with efficient market signals to guide their decisions?

<sup>35</sup> Section 88 of the NEL.

<sup>36</sup> Section 7 of the NEL.

#### QUESTION 1: ASSESSMENT FRAMEWORK

1. Is the proposed assessment framework appropriate for considering Infigen's rule change request?
2. Are there any other relevant considerations that should be included in the assessment framework?

### 3.3 Making a more preferable rule

Under s. 91A of the NEL, the Commission may make a rule that is different (including materially different) to a proposed rule (a more preferable rule) if it is satisfied that, having regard to the issue or issues raised in the rule change request, the more preferable rule will or is likely to better contribute to the achievement of the NEO.

### 3.4 Making a differential rule

Under the Northern Territory legislation adopting the NEL, the Commission may make a differential rule if, having regard to any relevant MCE statement of policy principles, a different rule will, or is likely to, better contribute to the achievement of the NEO than a uniform rule. A differential rule is a rule that:

- varies in its term as between:
  - the national electricity system, and
  - one or more, or all, of the local electricity systems, or
- does not have effect with respect to one or more of those systems

but is not a jurisdictional derogation, participant derogation or rule that has effect with respect to an adoptive jurisdiction for the purpose of s. 91(8) of the NEL.

As the proposed rule related to parts of the NER that currently do not apply in the Northern Territory, the Commission has not assessed the proposed rule against additional elements required by the Northern Territory legislation.<sup>37</sup>

<sup>37</sup> From 1 July 2016, the NER, as amended from time to time, apply in the NT, subject to derogations set out in regulations made under the NT legislation adopting the NEL. Under those regulations, only certain parts of the NER have been adopted in the NT. (See the AEMC website for the NER that applies in the NT.) National Electricity (Northern Territory) (National Uniform Legislation) Act 2015.

## 4 DETAILS OF THE RULE CHANGE REQUEST AND ISSUES FOR CONSULTATION

Taking into consideration the assessment framework set out in chapter 3, a number of issues have been identified for consultation. Stakeholders are encouraged to comment on these issues as well as any other aspect of the rule change request or this paper, including the proposed assessment framework.

This chapter summarises the issues Infigen raises and the solutions it proposes in the rule change request and notes the issues for consultation. It also outlines Infigen's views on the expected costs, benefits and impacts of their proposed rule. Specifically it:

- explains the issue
- explains the risks that arise from the issue
- seeks stakeholder feedback on the proposed solution
- details previous consultation on the issue
- explains the implementation constraints that will inform the solution.

### 4.1 Distribution of non-energy costs in low operational demand

As noted previously, non-energy costs in the NEM are recovered by AEMO from market participants based on their registration category and the aggregate AGE from each participant over the trading interval.

The cost recovery formulas currently do not consider the possibility of bi-directional resources, which can allow for the potential over procurement of costs from market customers with a positive load and market customers with negative load receiving a negative settlement, i.e. a payment.<sup>38</sup>

#### 4.1.1 Why is it essential for this be addressed now?

The risk of aggregate AGE falling to low levels and even negative in a trading period has existed since distributed energy resources (DER) entered the NEM.<sup>39</sup> AEMO has previously suggested that the probability of low or negative demand was too remote and as such no rule change was requested.

However, in the last six months due to unprecedented rooftop solar uptake, AEMO has revised previous forecasts and recognises this risk is now non-remote with periods of low or negative demand being expected in South Australia in spring 2021.<sup>40</sup>

<sup>38</sup> Infigen, *Settlement under low operational demand*, rule change request, pp. 13-14.

<sup>39</sup> DER refers to often smaller generation units that are located on the consumer's side of the meter. See AEMC's website: [www.aemc.gov.au/energy-system/electricity/electricity-system/distributed-energy-resources](http://www.aemc.gov.au/energy-system/electricity/electricity-system/distributed-energy-resources)

<sup>40</sup> AEMO, *Minimum demand in South Australia*, fact sheet, 2021, p. 1.

## 4.2 Issues raised in the rule change request

According to Infigen in its rule change request, the increased likelihood of low operational demand poses risks to AEMO's ability to settle the market efficiently, and of materially over-charging some market customers (especially in South Australia) compared to the costs AEMO incurs in procuring non-energy services.

### 4.2.1 The risk of low operational demand

The rule change request outlines that increased rooftop solar in South Australia has led to a significant reduction in operational demand. The rule change notes that:<sup>41</sup>

- In the August 2020 *Electricity Statement of Opportunities (ESOO)*, AEMO has projected minimum demand under the high DER scenario (90 per cent Probability of Exceedance (PoE)) in South Australia of 300 MW in the financial year 2021 and approximately 20MW in the financial year 2022.
- In November 2020, AEMO published further analysis on operational demand indicating that zero or negative operational demand could be observed as early as September 2021 in South Australia.

Infigen states that: "AEMO has identified that the risk of zero or negative operational demand is already material".<sup>42</sup> Infigen further notes that:

while data is not publicly available, low or negative operational demand will involve some market customers having negative loads, to offset the remaining market customers with positive loads. This has significant impacts on the NEM's settlement systems.<sup>43</sup>

Infigen also notes that, when drafted, the NER did not consider the possibility of bi-directional resources, such as rooftop solar that can variously result in a net import from or a net export into the NEM in any particular trading interval.<sup>44</sup> The consequences of this heightened risk of low operational demand are outlined in section 4.2.4 below.

### 4.2.2 NEM settlement

Infigen notes that the cost allocation framework described in chapter 2 cannot function when a region's demand is zero, as this would result in a "divide by zero" error in the formula (the denominator "the sum of the regions AGE" parameter is zero).<sup>45</sup>

Infigen considers that under a best-case scenario, AEMO would be unable to allocate non-energy costs for that interval. The worst case would be that AEMO's automatic settlement system and some downstream processes may fail.<sup>46</sup> This is the issue raised by AEMO in its rule change request on NEM settlement in negative or zero operational demand.

41 Infigen, *Settlement under low operational demand*, rule change request, pp. 2-3.

42 Ibid p. 9.

43 Ibid, p. 3.

44 Ibid, p. 1.

45 Ibid, p. 4.

46 Ibid.

According to Infigen, settlement system failure would also impact AEMO's ability to manage prudential assessment processes, which rely on settlement data to determine the maximum credit limit of each market participant, as well as credit support and margin calls. AEMO's responsibilities are explained in section 2.1.1.

Further, in Infigen's view, if operational demand<sup>47</sup> were to fall below zero (to negative demand) the mathematical signs of the cost recovery formula would be reversed. This would result in loads being paid for the non-energy services that they consume and creating an incentive to increase demand. This is the opposite of the issues discussed in section 4.2.4 where there is an incentive to reduce demand. Infigen argues this would be inconsistent with the intent of the NER.

#### 4.2.3 **Distribution of cost recovery**

When operational demand reduces in a region, the remaining market customers with a net load pay a higher share of the cost recovery, despite native demand remaining constant.<sup>48</sup> The inequity concerns of this has been raised in the *Integrating energy storage systems into the NEM* rule change proposed by AEMO and is explained in section 5.1.

As operational demand approaches zero or negative values it is likely that direct connected industrial loads and some specialised retailers will continue to have positive AGE, which is being offset by negative load market customers, likely large residential retailers. Infigen provides an example of this settlement distortion in Figure 4.1 below.

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<sup>47</sup> In its rule change request, Infigen makes reference to operational demand rather than the technical term net regional demand. These concepts are similar as they are both used to measure the demand of market customers for electricity, though they will differ in their values through the way each is measured. Operational demand includes local scheduled demand, including solar and wind, which is 30 MW or more. Regional demand refers to the sum of all market participants' AGE's in the relevant NEM region. AEMO also relies on Scheduled demand, this measure does not include wind and solar greater than 30 MW. Scheduled demand is a measure to meet scheduled generation and load.

<sup>48</sup> See AEMO's website for definition of native demand: [aemo.com.au/-/media/files/stakeholder\\_consultation/consultations/nem-consultations/2019/dispatch/demand-terms-in-emms-data-model.pdf?la=en&hash=87701F90591C4DD3065AA00056AA71E8](https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2019/dispatch/demand-terms-in-emms-data-model.pdf?la=en&hash=87701F90591C4DD3065AA00056AA71E8).

Figure 4.1: Infigen's simplified example of cost recovery with three local loads/participants



Source: Infigen, *Settlement under low operational demand*, rule change request, p. 5

In scenarios 3 and 4 in the example above the costs recovered from market participants can be equal to or exceed the total non-energy costs to be recovered. This over procurement occurs as individual market customer operational demand reaches and exceeds region operational demand.

Net non-energy costs across all market participants will be equal to the total non-energy market costs in all scenarios due to the transfer of wealth from net consuming market customers to net exporting market customers.

Infigen puts forward that this risk of over procurement is a real possible outcome in South Australia, explained in appendix C.

#### 4.2.4 Understanding the risks

In its rule change proposal, Infigen has pointed to the broader potential for damage posed by market customers being forced to pay non-energy costs above the total non-energy costs within the trading period. It points to the potential for cascading impacts, including:

- disruption to South Australian industry
- risk of cascading defaults and disruption of the administration of the NEM
- system security and reliability risks
- disruption of settlements.

#### Disruption to South Australian industry

Customers in South Australia risk being exposed to material costs if local non-energy costs must be recovered during a low demand period. Infigen proposes that this would involve

significant and spurious costs imposed only on a subset of customers, most likely having the greatest impact on large industrial users.<sup>49</sup>

### **Risk of cascading defaults and disruption of the administration of the NEM**

If the costs are non-recoverable, this has the potential to create a situation where retailers default on their settlement obligations to AEMO. The result of this would force remaining customers onto the Retailer of Last Resort (RoLR). Infigen has highlighted that, in addition to the disruption this would create for customers, this situation would be a significant disruption to the market, as well as, having implications for contracting.<sup>50</sup> These would be distractions for AEMO in the critical lead up period to summer.

These would have serious consequences for the retail competition in South Australia.<sup>51</sup>

### **System security and reliability risks**

Large non-energy costs needing to be recovered from customers over a period of low operational demand will incentivise behaviours that could impact the security and reliability of the NEM. Infigen stipulates that the applied costs are likely to be in excess of the Value of Customer Reliability (VCR).<sup>52</sup> This would imply market customers with a positive load, that is customers that are net consumers (positive AGE), will have an incentive to reduce consumption, ie. load shed. These loads are most usually classified as non-scheduled and hence the reduction in demand will not be communicated to AEMO in advance of the reduction and has the potential to drop off suddenly.

Under these conditions the operational demand will further decrease, creating more incentives for market customers to reduce load, leading to a 'death spiral' of load shedding.<sup>53</sup>

High 'lower contingency' frequency control ancillary services (FCAS) costs act as a trigger for the scenario described above. Given this, AEMO may face a resourcing issue in being able to manage a sudden drop off in demand. Infigen argues the potential consequences of this situation would be AEMO issuing directions, curtailing rooftop solar or, under an extreme scenario, losing the ability to operate the NEM in a secure state.<sup>54</sup>

Batteries under normal circumstances have an incentive to charge in low demand periods. However, in the case above, batteries would be disincentivised to be acting as loads. The opposite would be the case and batteries would want to discharge so as not to incur any costs, further adding to the low operational demand. Assuming the stressed system would

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49 Infigen, *Settlement under low operational demand*, rule change request, p. 8.

50 Infigen has stated that this could include implications for the Retailer Reliability Obligation (RRO).

51 Ibid.

52 VCRs indicate the value different types of customers place on having reliable electricity supply under different conditions, measured in dollars per kilowatt hour, see: [www.aemc.gov.au/rule-changes/establishing-values-of-customer-reliability](http://www.aemc.gov.au/rule-changes/establishing-values-of-customer-reliability) for more detail.  
Infigen, *Settlement under low operational demand*, rule change request, p. 8.

53 Ibid.

54 As stated above in section 2.1.3, AEMO can only issue directions for system security reasons. This reasoning cannot be relied upon to solve the issues that occur under low operational demand, as low operational demand could occur without system security issues. Losing the ability to operate the NEM in a secure state is a system security reason, however, Infigen suggests that under an extreme scenario these directions could not be enough to keep the NEM in a secure state.

have triggered local reserve procurement or intervention costs, this discharging could deprive AEMO of valuable resources in future periods.

### Disruption of settlements

Infigen has stated, if operational demand reaches zero or a value below 1 MWh, AEMO's current non-energy cost recovery systems will fail. This has flow on effects into the broad NEM settlement which will result in the NEM being unable to settle. This would be a breach of AEMO's responsibilities under the NER, however, this is expected to be resolved under AEMO's rule change proposal.<sup>55</sup>

#### QUESTION 2: RISKS POSED BY LOW OPERATIONAL DEMAND

1. Does the issue of low operational demand give rise to any barriers to entry, inequities in cost or competitive disruptions, outside the issues identified already?
2. Are there any additional issues around inefficient bidding or market incentives posed by low operational demand?
3. Are any of the consequences identified by Infigen or the AEMC already being realised as the risk of low operational demand becomes more imminent? In particular, has this increased the costs on market participants or discouraged new market participants?

## 4.3 Proposed solution

Infigen identifies that the problem over the near-term is some market customers having negative AGE values, pushing regional operational demand to low or negative. Infigen suggests that clause 3.15 of the NER be amended such that a lower limit of zero is set on market customer AGE value within the non-energy cost recovery formulas.<sup>56</sup>

This 'flooring mechanism' would remove the possibility of market customers having negative AGEs and help allocate costs more fairly between participants, with total costs recovered being limited to the total service cost.

According to Infigen, the flooring mechanism would have the following impacts on the non-energy cost recovery process:

- A market customer cannot have a negative AGE for a trading interval which prevents that customer receiving a payment for their negative net flows. However, it also prevents these customers from paying any cost recovery.<sup>57</sup> This has the added benefit of limiting the total cost recoverable to the total service cost.
- The total regional operational demand can no longer fall below 0 MWh. This is because all market customers would have their minimum AGE set to zero, the sum of these values (which is the denominator used in the cost recovery formula) can no longer be a number

<sup>55</sup> AEMO, *NEM Settlement under low, zero and negative demand conditions*, rule change request, p. 9.

<sup>56</sup> Infigen, *Settlement under low operational demand*, rule change request, p. 12.

<sup>57</sup> Ibid.

less than zero.<sup>58</sup> This solution still has the potential for being unable to solve if all market customers in a region had a load that is net negative or zero for a trading interval.

Infigen notes that this scenario is very unlikely for at least the next 12-24 months.<sup>59</sup>

The proposed solution can be seen in the allocated cost formula below:

$$\text{Allocated cost} = \text{Service cost} \times \frac{\max(0, \text{Market Customer's AGE})}{\sum \max(0, \text{AGE})}$$

This formula and its implications for other formulas in rule 3.15 of the NER is identified in Appendix E. Infigen expresses that the issues described above are particularly relevant to South Australia, however as settlement is a NEM wide process it would solve these issues if they were to arise in any other state. It is expected that any proposed solution before the longer term solution from *Integrating energy storage systems into the NEM* (if the rule is made) would only be triggered in the South Australian region.

Infigen has noted that it has considered allocating costs based on the absolute value of a market customer's load, to allow for cost recovery from market customers even when their AGE is negative. However, this consideration is addressed in the *Integrating energy storage systems into the NEM* rule change by addressing gross energy flows and not net flows. Further information on this is provided in section 5.1.

Infigen considers that this solution insulates market customers in the short-term, while more fundamental reforms are undertaken by the AEMC, through the *Integrating energy storage systems into the NEM* process.<sup>60</sup> Infigen has expressed that the issues described above in section 4.2 are un-hedgeable costs and therefore its risk cannot be mitigated absent a rule change<sup>61</sup>

### QUESTION 3: PROPOSED SOLUTION

1. Is Infigen's proposed solution the most appropriate way to respond to the issue that it has identified in its rule change proposal?
2. Are there any cross-border impacts or other issues that have not been identified that require consideration?
3. Are stakeholders aware of a commercial solution to the problem raised?

<sup>58</sup> Infigen, *Settlementn under low operational demand*, rule change request, p. 12.

<sup>59</sup> Ibid.

<sup>60</sup> Ibid.

<sup>61</sup> Ibid. p. 14.

### 4.3.1 Implementation constraints

AEMO will need to implement the relevant changes under the *NEM settlement under low, negative and negative demand conditions*<sup>62</sup> before any changes that are deemed appropriate from Infigen's rule change proposal.<sup>63</sup> See AEMO's forward implementation schedule below.

As outlined in chapter 1, AEMO has noted that it currently has limited time and resourcing to implement relevant changes to its systems before September 2021. This is because it will require time to test and certify any changes before this, while it is also already committed to implementing other rule change projects during spring 2021.

Additionally, in discussions between AEMC and AEMO staff, AEMO has also indicated that it is currently dealing with resourcing constraints that affect its ability to make the required system changes as a result of its current implementation schedule.

#### **AEMO's spring 2021 rule change implementation schedule**

AEMO's Regulatory Roadmap notes that currently during spring 2021 it will be implementing the following rule changes:

- Five-minute settlement
- Wholesale demand response mechanism
- Reducing customer switching times.<sup>64</sup>

The Commission recognises that this will likely mean that AEMO has limited capacity to implement additional rule changes before summer 2021-22. AEMO has made it clear that it is reluctant to implement any additional rule change proposals during the summer months, as it is the period of the highest risk for the NEM.

Given the spring 2021 implementation schedule, AEMO has advised the Commission that it will have limited avenues to address any rule change from Infigen prior to at least mid-2022. It is important to note that there are a number of committed, proposed and in-progress projects that are scheduled to require system implementation requirements past spring 2021.<sup>65</sup>

Further to the above, the *Integrating energy storage systems into the NEM* rule change, set for final determination in August 2021, will, if made, provide a long-term solution to the issues raised by AEMO and Infigen. The indicative system implementation of *Integrating energy storage systems into the NEM* is by September 2023.<sup>66</sup> This rule change is explained further in section 5.1.

Due to these constraints, the Commission recognises that AEMO would not be able to implement the proposed solution as submitted by Infigen. This will limit the options the Commission may consider to address the issues identified by Infigen prior to at least mid-2022.

62 See AEMC's website: <https://www.aemc.gov.au/our-work/changing-energy-rules/rule-changes>.

63 Subject to the threshold consensus mentioned above.

64 AEMO, *Regulatory roadmap v4*, 18 March 2021.

65 Ibid.

66 Ibid.

Infigen notes a number of alternative solutions that it has considered if there are time constraints in the implementation of its preferred solution. These alternative solutions are listed below.

#### QUESTION 4: IMPLEMENTATION CONSTRAINTS

1. Given the time required to build, test and implement a settlement rule change, is an additional rule likely to be beneficial before *Integrating energy storage systems into the NEM* rule takes effect?

## 4.4 Alternative solutions

Infigen outlined a number of alternative solutions to the issues surrounding NEM settlement and distribution of costs in low operational demand.<sup>67</sup> Further potential solutions were also posed by AEMO in its rule change request as well as stakeholder feedback to AEMO's issues paper. These are discussed further below.

### 4.4.1 Infigen's proposed alternatives

Infigen has proposed a number of alternative solutions to its preferred flooring mechanism:

- Modifying AEMO's proposed solution within their rule change request to have the threshold when the alternative settlement mechanism is triggered to be raised to (say) 150 MWh per trading interval. Infigen considers this solution workable but does note that it would have the impact of more frequent disruption to settlement, and is only preferable if Infigen's solution was unable to be implemented. This is discussed further below.
- Infigen has suggested that the threshold value could be informed by AEMO modelling the largest expected net market customer load in South Australia during low operational demand. The threshold would then be set to trigger if net demand approaches a multiple of this net market customer load.
- Applying a settlement cap for non-energy cost recovery, such that a market customer could not be charged more than the total costs to be recovered, effectively removing the possibility of over procurement described earlier. Infigen considers that no 'spurious' payments could be made to negative load market customers. Infigen notes that this would likely be complex to administer but limits the worst outcomes for market customers.
- Changing the NER to allow AEMO to redistribute excess recovered costs by returning excess cost recoveries, ie. negative payments, to affected market customers. Infigen states that this solution would be challenging to implement, manage and operate. It also does not address the issue of the cost recovery being unable to solve at zero demand.

<sup>67</sup> Infigen, *Settlement under low operational demand*, rule change request, p. 13.

- Moving the cost recovery from a single trading interval across multiple periods, such as a week, month or year, at all times. Infigen describes this as a very material change and requires more consideration.

#### **A 150 MWh threshold**

One of Infigen's alternatives to the solution presented in AEMO's rule change request is to have the threshold for substitution raised from 1 MWh to 150 MWh.<sup>68</sup> Infigen considers that this is a workable solution that would limit potential downside impacts of inequitable cost recovery and over procurement of non-energy costs.

Using Infigen's previous example<sup>69</sup> of 3 local loads/participants, as operational demand falls, scenarios 1 and 2 would remain unchanged with market customers paying a pro-rata share of the non-energy costs. In scenarios 3 and 4 when operational demand was to fall below the suggested threshold of 150 MWh, loads A, B and C would all pay a share of the \$3 million to be recovered. This would be based on a pro-rata share of their average AGE over the past 4 billing periods.

The solution does not ensure that there will be zero over procurement or equitable cost recovery. If load C was to be -20 MW the operational demand would be 180 MW and would not trigger the threshold. This would result in a cost recovery of \$1.66 million from loads A and B, with load C receiving \$333,333. While this is still an unintended outcome, it does limit the outcomes that could occur with a threshold of 1 MWh as seen in scenario 4.

A different threshold solution is only an interim solution as the long-term issue of non-energy cost recovery is solved through the *Integrating energy storage systems into the NEM* rule change as explained in section 5.1, and is expected to be in place for 12-24 months.

In discussions with AEMO, the Commission understands that implementing a threshold that is different to 1 MWh would not cause any material delays in implementation for AEMO. It is important to note that this value would still need to be decided upon with sufficient time to code, test and implement. However, it is expected that the proposed timeframe of this rule change request would allow for this.

#### **4.4.2**

#### **Threshold consensus and implementation**

The Commission may consider a different threshold value within AEMO's rule change request if there is a substantial consensus on a threshold value within this consultation paper. If no substantial consensus can be reached through this consultation process, the Commission will address the two rule change proposals separately, with the issues around a threshold value and the distribution of non-energy costs consulted on within this rule change.

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<sup>68</sup> Infigen, *Settlement under low operational demand*, rule change request, p. 13.

<sup>69</sup> See example in section 4.2.3.

### 4.4.3 AEMO proposed alternatives

AEMO has previously consulted on the issue of zero and negative regional demand in its issues paper from November 2020.<sup>70</sup> Infigen provided feedback to this process, which was in line with its current rule change request. In this issues paper, AEMO provided a table of options for dealing with the issue of low, zero or negative operational demand.

**Table 4.1: AEMO options for substituted AGE**

OPTION	REFERENCE AGE VALUE FOR SUBSTITUTION
1 (AEMO's preferred option)	Market customer's AGE with its average AGE for all relevant connection points in the region over the previous calendar year; and Aggregate regional demand (represented by AGE) with the sum of the substituted market customer average AGE's in the region over the previous calendar year.
2	Use a rolling 365-day period average energy consumption which is calculated dynamically every time a factor is required
3	Use the last interval which has a total regional consumption larger than 1 MWh
4	Divide the non-energy cost to be recovered by the number of active market customers and recover equally from all

Source: AEMO, *NEM settlement under zero and negative regional demand conditions*, issues paper, 26 November 2020.

AEMO's preferred solution is the same one that it has proposed in its rule change request. Stakeholder feedback on AEMO's options refer to Appendix D.

#### QUESTION 5: ALTERNATIVE SOLUTIONS

1. Is a threshold of 150 MWh, as mentioned above and explained in section 4.4, a workable solution? If not, is there a threshold that is a workable solution?
2. Do any of the proposed solutions provide a better outcome for non-energy cost recovery in low operational demand?
3. Are there any alternative solutions not explored previously that offer a more robust solution to non-energy cost recovery in low operational demand?
4. Are there any non-system or commercial solutions that would address the issues described?

<sup>70</sup> AEMO, *NEM settlement under zero and negative regional demand conditions*, issues paper, 26 November 2020.

## 4.5 Expected costs, benefits and impacts of the proposal

Infigen has stated that AEMO had previously estimated that implementing changes to their settlement system would cost less than \$100,000.<sup>71</sup> Additionally, Infigen is expecting that its proposed changes are no more complex to implement than those proposed by AEMO. It is important to note that the AEMC is aware that AEMO has already begun the coding necessary to implement its rule change.

Infigen's proposal has implications for market customers with positive loads, as the current rules place some market customers at risk of material (and potentially unrecoverable) costs, as seen in section 4.2.3.

Infigen expresses concern for large industrial loads that are unlikely to be able to completely offset demand with embedded generation, with the possibility of these loads facing single hour costs equivalent to annual wholesale energy costs.

This risk is not limited to the viability of the business but also that of their retailer as these costs are unhedgeable. Infigen argues that its proposed rule change would ensure customers only pay a fair share of the system costs without the possibility of over procurement.<sup>72</sup>

Under the NER negative consuming market customers may receive a negative settlement or payment under the non-energy cost recovery process. This payment does not reflect any provided response or enablement for a defined service. As such, Infigen argues market customers would not expect this payment and its removal would not distort the market.<sup>73</sup>

Under Infigen's proposal market customers with zero or negative consumption are not exposed to non-energy costs.<sup>74</sup>

Low operational demand creates new potential challenges for the operation of the NEM including, as noted by Infigen, lower availability of reserves, less synchronous resources, inertia and system strength, and fewer options for managing system security.

The risks to AEMO are explained above in section 4.2.4. Infigen's proposed solution is purported to remove these disincentives and deliver AEMO a more predictable system.<sup>75</sup>

Infigen has put forward that its rule change request contributes to the national electricity objective (NEO) by being in the long term interests of consumers and generators, as well as, improving the reliability and security of supply.<sup>76</sup>

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71 Infigen, *Settlement under low operational demand*, rule change request, p. 14.

72 Ibid.

73 Ibid.

74 Ibid.

75 Infigen, *Settlement under low operational demand*, rule change request, p. 14.

76 Ibid, pp. 14-15.

**QUESTION 6: EXPECTED COSTS, BENEFITS AND IMPACTS**

1. Do stakeholders consider there to be any other costs, benefits or impacts resulting from Infigen's proposed solutions?

## 5 RELATED PROJECTS

There are four other rule changes that are particularly relevant to this rule change request. These are:

- **Five-minute settlement** — was published as a final determination on 28 November 2017. The result of this determination was to align the settlement intervals with the dispatch intervals. Previously settlement was every 30 minutes where dispatch is in five-minute intervals.<sup>77</sup> The introduction of five-minute settlement will increase the risk of low or negative operational demand occurring in a trading period as aggregate AGE will be calculated for each five minute-interval rather than being averaged over thirty minutes. Five-minute settlement is due to commence in October 2021
- **Global settlements and market reconciliation** — was published as a final determination on 6 December 2018. The result of this determination was to move the demand side settlement of the wholesale electricity market to a 'global settlement' framework.<sup>78</sup> Under a 'global settlement' framework each retailer is billed for their loss-adjusted metered electricity, consumed by their customers within the region. The unaccounted for energy within that region is then allocated to market customers on a pro-rated basis from their 'accounted-for' energy.<sup>79</sup> With the introduction of this rule change AEMO will be able to facilitate the provision of separate metering data-streams, needed for the Integrating energy storage rule change described below.<sup>80</sup>
- **Integrating energy storage systems into the NEM (Integrating storage)** — was received by the AEMC on 23 August 2019 and the AEMC is set to publish a draft determination on 29 April 2021.<sup>81</sup> This rule change seeks to recognise and define storage systems in the NEM while also providing a better framework to allow for their participation and business models. Due to its broad scope, it promises to provide a long-term solution to the issues posed by falling operational demand.<sup>82</sup> Further detail is provided below.
- **NEM settlement in low, zero or negative demand** — was received by the AEMC on 8 February 2021 and initiated in parallel with this Infigen rule change request.<sup>83</sup> AEMO's proposal addresses the settlement issues that Infigen has observed as operational demand approaches zero.<sup>84</sup> Further detail is provided below.

### 5.1 Integrating energy storage systems into the NEM

The Commission considers that the *Integrating energy storage systems into the NEM* rule change, if made, may provide a permanent solution to the issues that Infigen raises in its

77 AEMC, *Five-minute settlement*, final determination, 28 November 2017.

78 AEMC, *Global settlement and market reconciliation*, final determination, p. i.

79 AEMC, *Global Settlement and Market Reconciliation*, information sheet, 6 December 2018.

80 AEMO, *NEM settlement in zero and negative demand conditions*, rule change request, pp. 7.

81 See AEMC's website: <https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem>.

82 AEMO, *Integrating energy storage systems into the NEM*, rule change request, p. 1.

83 See AEMC's website: <https://www.aemc.gov.au/rule-changes/nem-settlement-under-low-zero-and-negative-demand-conditions>.

84 AEMO, *NEM settlement in zero, low and negative demand conditions*, rule change request.

rule change request. As such, it considers this rule change, if made, need only provide a temporary solution to be in place for up to two years.

In the Integrating Storage rule change proposal, AEMO acknowledged that the existing NEM framework, processes and systems for non-energy cost recovery have been calculated on net metering data. As participants have adopted less traditional energy technologies and greater grid-scale connections with bi-directional flow<sup>85</sup> the use of net metering data can create perverse outcomes, noting that:

- it reduced the amounts recovered by AEMO from those registered participants
- it could lead to those registered participants receiving payments, rather than having amounts recovered from them, where they had sent out<sup>86</sup> more energy than they consumed.<sup>87</sup>

In responding to AEMO's rule change request, the Commission is developing solutions to address the registration and participation of grid-scale batteries, aggregations of smaller batteries and new business models with a mix of technologies behind the connection point (hybrid facilities).

### 5.1.1

#### **How *Integrating energy storage systems into the NEM* addresses settlement issues in the long-term**

The *Integrating energy storage systems into the NEM* rule change has the potential to provide a long-term solution to non-energy settlement issues by allocating costs based on gross energy flows, rather than net energy flows. The Commission is currently consulting on three different options for the recovery of non-energy costs:

1. Maintain current arrangements, where non-energy costs are recovered based on the market participant's registered category and from:
  - a. grid-scale batteries based on separately measured consumed and sent out energy
  - b. other participants based on net-metered energy data.
2. Amend current arrangements to recover non-energy costs in the same way from grid-scale batteries, hybrid facilities and market small generation aggregators (where consumed and sent out energy is measured separately).
3. Recovery of non-energy costs would be based on a participant's consumed and sent out energy in an interval irrespective of what participant category they are registered in. Consumed and sent out energy would be measured separately for all market participants (i.e. no net energy data). Consumed and sent out energy would be measured at the connection point.<sup>88</sup>

It is also worth observing that to correctly apportion costs, all of these proposed solutions will also require the implementation of the *Global settlements and market reconciliation rule*

<sup>85</sup> AEMO, *Integrating energy storage systems in the NEM*, rule change request, p. 1.

<sup>86</sup> A generation unit's sent out generation refers to the amount of electricity supplied to the transmission network or distribution network at its connection point. See 'sent out generation' Chapter 10 of the NER.

<sup>87</sup> AEMO, *Integrating energy storage systems in the NEM*, rule change request, p. 19.

<sup>88</sup> AEMC, *Integrating energy storage systems in the NEM*, options paper, p. 19.

change (*Global settlement*) to ensure that AEMO has gross data on energy flows. Implementation of the *Global Settlement* rule change is due to go-live on 1 May 2022 with *Integrating storage* being implemented by September 2023.<sup>89</sup>

The key dates surrounding Integrating Storage are as follows:

- *Integrating energy storage systems into the NEM* draft determination expected: **29 April 2021**
- *Integrating energy storage systems into the NEM* final determination expected: **5 August 2021**
- Five-minute settlement commencement: **October 2021**
- Global settlement and market reconciliation commencement: **May 2022**
- Integrating storage non-energy solution expected commencement: **September 2022 - September 2023**.<sup>90</sup>

### 5.1.2 Interim solutions

Given the implementation schedule above, Infigen has outlined the need for an interim solution that will address the NEM settlement and cost distribution issues defined above, until the fundamental reforms are implemented through *Integrating storage* rule change.<sup>91</sup> The Commission expects that the interim solution would be in place for no longer than 24 months.

## 5.2 AEMO's rule change request

AEMO's rule change request *NEM settlement in zero and negative demand conditions* proposes to amend rule 3.15 of the NER to allow for substitution of AGE value, when necessary, to allow for formulas that will work in AEMO's settlement systems.<sup>92</sup> The AEMC is currently undertaking a consultation process for AEMO's rule change proposal in parallel to this process, a copy of the rule change request and consultation paper can be found on the AEMC website.<sup>93</sup>

### 5.2.1 AEMO's related concerns

AEMO notes that, under the current rules, if operational demand falls below 1 MWh for a trading interval, the non-energy cost recovery formulas cannot be solved by its market settlement systems.<sup>94</sup> If this occurs during a trading interval in which non-energy costs are to be recovered from market customers, AEMO cannot recover these costs. If the recovery amount cannot be allocated, the calculation will fail and AEMO's automated settlement runs will stop working.

<sup>89</sup> AEMO, *Regulatory roadmap v4*, 18 March 2021.

<sup>90</sup> Ibid.

<sup>91</sup> Infigen, *Settlement in low operational demand*, rule change request, p. 12.

<sup>92</sup> AEMO, *Settlement under low, zero and negative demand*, rule change request, p. 9.

<sup>93</sup> See AEMC's website: <https://www.aemc.gov.au/rule-changes/nem-settlement-under-low-zero-and-negative-demand-conditions>.

<sup>94</sup> Ibid.

Because settlement is an integrated process, this will impact the settlement of all transactions, including energy and reallocation.<sup>95</sup>

### 5.2.2 AEMO's proposed solution

AEMO proposes an amendment to rule 3.15 of the NER to allow it to substitute AGE values to create numerators and denominators for non-energy cost recovery formulas when necessary so that these formulas will work in AEMO's settlement system.<sup>96</sup>

In these situations, AEMO will substitute the market customer's actual AGE value with an average of the AGE amounts in the last four billing periods for and will substitute aggregate AGE for a region with the sum of the substituted Market Customer average AGES in the region.<sup>97</sup> By substituting the values in place of AGES in these circumstances, the region's aggregate AGE cannot be a number less than 1 MW and the formula cannot fail to calculate. This also means that customers with net negative loads will not receive any compensation through AEMO's cost allocation formula.

AEMO notes it has also excluded Reliability and Emergency Reserve Trader (RERT)<sup>98</sup> costs and compensation for administered price cap or floor events from the proposed rule, to minimise the scope of work and the cost required to implement system changes. This is because these non-energy costs are highly unlikely to be incurred during periods of minimum demand.<sup>99</sup>

AEMO's proposed solution does address Infigen's concern about the inability of the NEM to settle if operational demand falls below 1 MWh, however, this is the only area in which AEMO's concerns align with Infigen. AEMO's solution does not take into account the issues around the distribution of costs in low operational demand, and the issues surrounding this as mentioned above in section 4.2.3.

### 5.2.3 AEMO's rule change key dates

The Commission has commenced an urgent rule change process for AEMO's rule change request by releasing a consultation paper. The key dates for this process are as follows:

- Consultation paper released: **22 April 2021**
- Requests not to make an expedited process due: **6 May 2021**
- Submissions on consultation paper due: **20 May 2021**
- Final determination published: **17 June 2021**
- expected commencement: **September 2021.**

<sup>95</sup> A reallocation, under the NER, is an agreement that is approved between AEMO and market participants, which enables a settlement transaction to be exchanged. This process involves AEMO making matching debits and credits to the position of the market participants. See Chapter 10 of the NER.

<sup>96</sup> AEMO, *NEM settlement under low, zero and negative demand conditions*, rule change request, p. 9.

<sup>97</sup> Ibid.

<sup>98</sup> The RERT is the NEM's strategic reserve and has formed part of the reliability framework since the start of the NEM in December 1998. It is a tool that allows AEMO to procure 'standby' emergency reserves; generation and demand-side capacity that is not otherwise being traded in the market.

<sup>99</sup> Ibid.

## 6 LODGING A SUBMISSION

Submissions on this consultation paper will be open for a period of four weeks and will close on **20 May 2021**. The Commission cannot guarantee that it will be able to consider submissions provided after this date.

Written submissions on the rule change request must be lodged online via the Commission's website, [www.aemc.gov.au](http://www.aemc.gov.au), using the "lodge a submission" function and selecting the project reference code **ERC0327**.

The submission must be on letterhead (if submitted on behalf of an organisation), signed and dated.

Where practicable, submissions should be prepared in accordance with the Commission's guidelines for making written submissions on rule change requests.<sup>100</sup> The Commission publishes all submissions on its website, subject to a claim of confidentiality. Please clearly mark any sections of your submission which you consider to contain confidential material.

If you have any questions about this project, please contact:

- Harrison Gibbs on (02) 8296 0626 or [harrison.gibbs@aemc.gov.au](mailto:harrison.gibbs@aemc.gov.au)
- Kate Wild on (02) 8296 0622 or [kate.wild@aemc.gov.au](mailto:kate.wild@aemc.gov.au)

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<sup>100</sup> This guideline is available on the Commission's website [www.aemc.gov.au](http://www.aemc.gov.au).

## ABBREVIATIONS

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AGE	Adjusted gross energy
AAGE Commission	Aggregate adjusted gross energy See AEMC
DER	Distributed energy resources
ESOO	Electricity Statement of Opportunities
FCAS	Frequency control ancillary service
MCE	Ministerial Council on Energy
MSGA	Market Small Generation Aggregator
MWh	Megawatt hour
NEL	National Electricity Law
NEO	National electricity objective
NER	National electricity rules
PoE	Probability of Exceedance
RERT	Reliability and Emergency Reserve Trader
RRO	Retailer reliability obligation
RoLR	Retailer of last resort
VCR	Value of customer reliability

## A CHANGING MARKET CONDITIONS

Operational demand<sup>101</sup> in South Australia has been declining as more generation is being installed at customer connection points, in particular rooftop solar.

Current modelling indicates it will likely be the first region with zero or negative operational demand.<sup>102</sup> Minimum demand levels have typically occurred on non-working days in spring that are mild but sunny resulting in low energy consumption and high rooftop solar output.

South Australia has had record low operational demand on 11 October 2020 of 300MW, with recent lows for operational demand of 358MW on 14 March 2021.<sup>103</sup>

South Australia had approximately 1,660MW of installed rooftop solar capacity at the end of 2020, based on the latest data from the Clean Energy Regulator.<sup>104</sup> This is an increase of 330MW of installed capacity 12 months earlier. Across this period AEMO's ESOO central and central downside high DER scenarios had forecast rooftop solar growth of 232MW and 259MW respectively.

AEMO, in its 2020 ESOO, had forecast minimum demand under the high DER scenario (90% POE) in South Australia of approximately 200MW in FY22.<sup>105</sup> The low operational demand South Australia recorded in October 2020 was in line with this 90% POE forecast and prompted AEMO to explore further sensitivities, seen below:

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101 For more information refer AEMO's demand definitions: [aemo.com.au/-/media/files/stakeholder\\_consultation/consultations/nem-consultations/2019/dispatch/demand-terms-in-emms-data-model.pdf?la=en&hash=87701F90591C4DD3065AA00056AA71E8](https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2019/dispatch/demand-terms-in-emms-data-model.pdf?la=en&hash=87701F90591C4DD3065AA00056AA71E8).

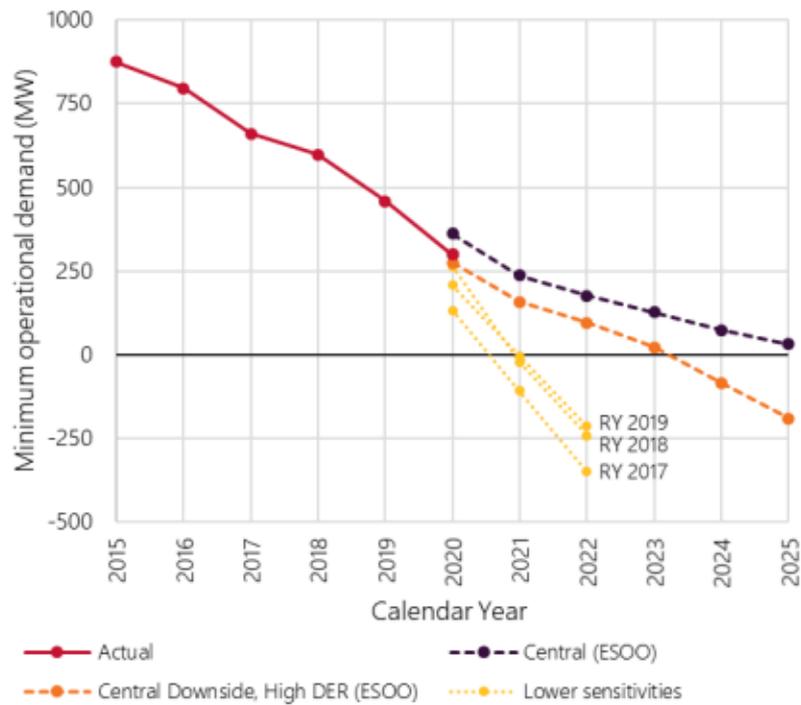
102 AEMO, *Minimum demand in South Australia*, fact sheet, 2021, p. 1.

103 AEMO, South Australia - Operational demand and rooftop PV, 14 March 2021. See: [www.abc.net.au/news/2021-03-17/solar-panels-switched-off-in-sa-to-stabilise-grid/13256572](http://www.abc.net.au/news/2021-03-17/solar-panels-switched-off-in-sa-to-stabilise-grid/13256572).

104 CER, Postcode data for small-scale installations, January 2021. Available: [www.cleanenergyregulator.gov.au/RET/Forms-andresources/Postcode-data-for-small-scale-installations](http://www.cleanenergyregulator.gov.au/RET/Forms-andresources/Postcode-data-for-small-scale-installations).  
See also: Large-scale Renewable Energy Target supply data (only non-scheduled generation) –January 2021 and [www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/Large-scale-Renewable-Energy-Targetmarket-data/large-scale-renewable-energy-target-supply-data](http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/Large-scale-Renewable-Energy-Targetmarket-data/large-scale-renewable-energy-target-supply-data).

105 AEMO, *Electricity Statement of Opportunities 2020*, See [forecasting.aemo.com.au/Electricity/MinimumDemand/Operational](https://forecasting.aemo.com.au/Electricity/MinimumDemand/Operational).

**Figure A.1: Minimum demand in South Australia (linear rooftop solar growth)**

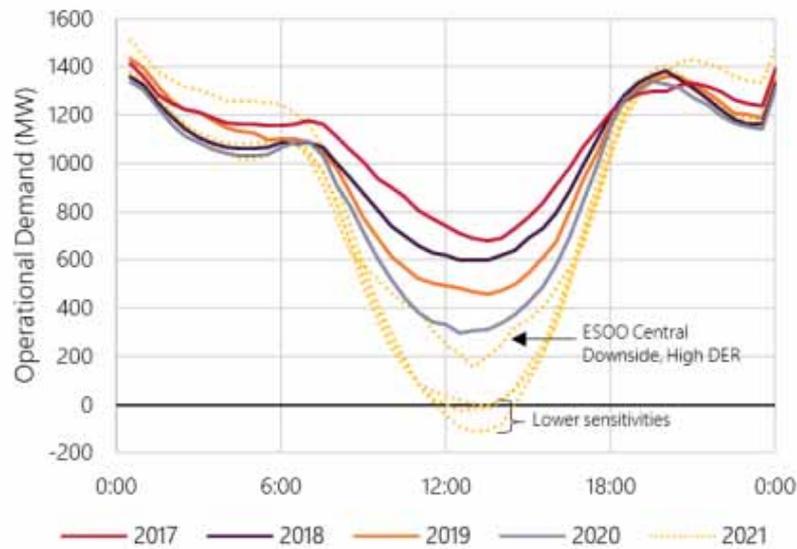


Source: AEMO, *Minimum demand in South Australia*, fact sheet, 2021, p. 3.

These sensitivities were based on the actual demand values for 2017, 2018 and 2019, adjusted for the current uptake of rooftop solar and increases in large loads. The resultant minimum operational demand scenarios indicated that South Australia can face a period of zero or negative operational demand as early as spring 2021,<sup>106</sup> the following figure shows the indicative minimum demand profile for the lowest demand day:

<sup>106</sup> AEMO, *Minimum demand in South Australia*, fact sheet, 2021, p. 2.

**Figure A.2:** Lowest demand day in South Australia (linear rooftop solar growth)



Source: AEMO, *Minimum demand in South Australia*, fact sheet, 2021.

Based on this analysis, AEMO notes that all three of its modelled reference years showed minimum demand levels falling below 1 MWh in 2021.<sup>107</sup> Furthermore, AEMO noted that if 2017 demand and rooftop solar generation patterns occurred in 2021, there would have been 10 trading intervals below zero.<sup>108</sup> As discussed above, the NER non-energy cost recovery formula relies on there being positive energy consumption in a region in every trading interval.

<sup>107</sup> AEMO, *Minimum demand in South Australia*, fact sheet, 2021, pp. 2-3.

<sup>108</sup> *Ibid*, p. 2.

## B PARTICIPANT RESPONSIBILITIES

AEMO charges registered participants fees to recover its budgeted revenue requirements. The NER state that the components of participant fees charged to each registered participant should be reflective of the extent to which the budgeted revenue requirements for AEMO involve that registered participant.<sup>109</sup>

As such, the fees differ between categories of registered participant. Additionally, the NER states that participant fees should not unreasonably discriminate against a category or categories of registered participants.<sup>110</sup> AEMO generally recovers the cost of these services and mechanisms from participants in proportion to the energy consumed or sent out in relevant trading intervals (currently 30 minutes). The costs of some services are recovered based on a causer pays principle. The objective of this principle is to create an incentive for market participants to minimise the overall requirements for that service.

Table B.1 below identifies all NEM non-energy cost recoveries and which registered partners AEMO recovers these costs from.

**Table B.1: Current NEM non-energy cost recovery**

	<b>COST RECOVERY FROM</b>	<b>NER REFERENCE</b>
<b>Market ancillary services:</b>		
FCAS – contingency raise	Market Generators, MSGAs	3.15.6A(f)(3)
FCAS – contingency lower	Market Customers	3.15.6A(g)(3)
FCAS – regulation	Market Generators, MSGAs and Market Customers on causer pays basis	3.15.6A(i)
<b>Non-market ancillary services:</b>		
Network support control ancillary services (NSCAS)	Market Customers	3.15.6A(c2)(1)
System restart ancillary services (SRAS)	Market Customers, Market Generators, MSGAs	3.15.6A(c2)(2)
<b>Interventions:</b>		
Direction – energy	Market Customers	3.15.8(b)
Direction – FCAS	Market Customers, Market Generators and MSGAs on a causer pays basis	3.15.8(f)
Direction – other	Market Customers, Market Generators, MSGAs	3.15.8(g)
Mandatory restrictions	Market Customers	3.12A.7(e)

<sup>109</sup> Clause 2.11.1 of the NER.

<sup>110</sup> Ibid.

	<b>COST RECOVERY FROM</b>	<b>NER REFERENCE</b>
Reliability and emergency reserve trader (RERT)	Market Customers	3.15.9(f)
Affected Participant Compensation	Scheduled Generator, Scheduled Network Service Provider, Market Customer	3.12.2
Market suspension	Scheduled Generators, Ancillary Service Providers	3.14.5A
<b>Other events:</b>		
Market shortfall and surplus	Market Generators, MSGAs	3.15.22, 3.15.23
Administered price cap or administered floor price compensation Payments	Market Customers	3.15.10(a)

Source: AEMO, *Integrating energy storage systems into the NEM*, rule change request, p. 14.

## C SOUTH AUSTRALIAN EXAMPLE

Infigen describes in its rule change request that the issue of over procurement and high costs is not a theoretical argument and the cost impacts to customers in South Australia are likely to be material under sufficiently low operational demand. In South Australia costs associated with Regional contingency lower FCAS services can be greater than \$100,000 across a single trading interval, and there have been 20 trading intervals where these costs have been greater than \$500,000.<sup>111</sup> If these high pricing events were to coincide with low operational demand, resulting in over procurement of costs as described above, Infigen believes the impact would be unacceptable for all stakeholders.<sup>112</sup>

Infigen notes the specific example below:<sup>113</sup>

On 9 of November 2019, between 6:00 and 7:00 am, there was an average of more than 100 MW of each fast (6 seconds) and slow (60 seconds) lower contingency service enabled in South Australia. For the 6:30 am trading and the 7:00 am trading interval these services were settled at \$13,000/MWh and the market price cap of \$14,700/MWh respectively, with total costs for these services over the hour period of \$3.4 million. These costs were distributed according to the current rules with all market participants paying a proportional share.

Had this high price event occurred with a period of low operational demand the costs associated with a 20MW industrial load would be up to \$68 million as regional demand approached 1 MWh, this cost is 20 times the total cost of the service. This cost is equivalent to an average annual cost of \$485/MWh.<sup>114</sup> Infigen expresses that this single hour of high local non-energy costs and low operational demand could be significantly higher than the load's entire annual cost, or equivalent to applying a cost of \$3,400,000/MWh to the load during the event, compared to the market price cap of \$14,700/MWh.

The example above represents a \$68 million transfer from the single 20MW load to net exporters in the region, an outcome that Infigen states would not have been intended by the current NER. Further to this, as operational demand decreases the market price cap under current settlement systems does not adequately protect customers or reflect consumer preferences, with market customers being exposed to unnecessary costs that they may be unable to absorb.

Infigen argues that this outcome is not consistent with good market design and creates an incentive to push demand negative, which may not be good for the market. These risks are identified in section 4.2.4.

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<sup>111</sup> Infigen, *Settlement under low operational demand*, rule change request, p. 6.

<sup>112</sup> Ibid.

<sup>113</sup> Ibid. p. 7.

<sup>114</sup> Assuming an 80% load factor.

## D RESPONSES TO AEMO'S ISSUES PAPER

AEMO's consultation period closed on 15 December 2020. In response to this process, AEMO received six submissions from the Australian Energy Council (AEC), AGL, ENGIE, Infigen, Origin and SA Water.<sup>115</sup>

No stakeholder disagreed with AEMO's assessment that the problem needed to be urgently addressed,<sup>116</sup> but there were divergent opinions between stakeholders on the best substituted value to use:

**Table D.1: AEMO responses to stakeholder feedback**

<b>STAKEHOLDER</b>	<b>PREFERRED SOLUTION</b>	<b>AEMO'S RESPONSE</b>
<b>AEC</b>	The AEC slightly preferred AEMO's second option over its first option because it relied on a rolling average, rather than a previous calendar year. It noted that this was because it relied on more current data and did not exclude market customers registered in the previous financial year.	N/A
<b>AGL</b>	AGL suggested either the previous month's AGE, to be more reflective of seasonal demand changes, or, a cost allocation methodology similar to what was previously used for the RERT, which AGL noted would trigger based on the intervals used and smeared based on the previous 7 days' average market customer demand.	AEMO notes that it considers that a shorter reference period to calculate the average customer energy amounts, which are substituted, reduces the risk of significantly under or over representing a Market Customer's demand due to customers churn.
<b>Engie</b>	Engie preferred substituting a market customer's AGE, with the average AGE for all connection points in the region over the previous year.	N/A
<b>Infigen</b>	Infigen noted its collateral issue,	AEMO acknowledged in its submission

<sup>115</sup> See AEMO, *NEM settlement under zero and negative regional demand conditions* <https://aemo.com.au/en/consultations/current-and-closed-consultations/nem-settlement-under-zero-and-negative-regional-demand-conditions>, accessed 2:53pm, 10 March 2021.

<sup>116</sup> AEMO, *NEM settlement under zero and negative demand conditions*, issues paper, November 2020, p. 9.

STAKE-HOLDER	PREFERRED SOLUTION	AEMO'S RESPONSE
	<p>brought about by falling regional demand, namely that as this continues to decline due to increasing solar exports, the remaining loads pay a higher share of system services. Infigen also noted that, because of negative loads at a given point, a market customer can be forced to pay more than 100 per cent of the total service costs, with the additional recovered costs being paid to those customers with net exporting loads.</p>	<p>that where a Market Customer has a net negative AGE for an entire cost recovery period, that Market Customer could receive a payment, effectively funded by those Market Customers who are consuming in the affected trading interval. This payment would be over and above the total non-energy cost amount that should be recovered. It noted that it is unlikely that this was ever intended.</p> <p>AEMO also acknowledges that with a threshold value of 1 MWh for substitution there is the potential for non-energy costs to be allocated based on very low levels of regional customer energy, which could lead to Market Customers without significant rooftop solar being required to bear a disproportionate share of non-energy costs. AEMO also acknowledged that a different threshold value could be used to achieve a more equitable and efficient outcome.</p> <p>Despite this AEMO believes that using an alternative value would be a departure from the scope of its rule change.</p> <p>As discussed in greater detail in Section 3.2, Infigen has now submitted a rule change request titled <i>NEM settlement under low operational demand</i>, which covers the issues raised in Infigen's submission, to AEMO's consultation process.</p>
<p><b>Origin</b></p>	<p>Substituting a market customer's AGE, with the average AGE for all connection points in the region over the previous year.</p> <p>Origin noted that manual</p>	<p>AEMO noted that there is no need for a manual adjustment, because, in substituting energy values, the market settlement system will calculate a Market Customer's average customer energy each time relying on the latest data.</p>

STAKE-HOLDER	PREFERRED SOLUTION	AEMO'S RESPONSE
	<p>adjustments could be made, to account for new customers that were not active in the previous calendar year.</p>	
<p><b>SA Water</b></p>	<ol style="list-style-type: none"> <li>1. SA Water preferred using the value from the last trading interval, where there was operational demand which was greater than 1 MWh.</li> <li>2. SA Water felt the best option was a simplified implementation of an option noted in the Integrated storage issues paper, which would allow that for each trading interval where there is zero or negative net system load, the net load for each connection point is partitioned into import and export streams based on the sign of the net ('N') data stream at that connection point. The sum of the system's imports and exports is then used as the denominator while the sum of the import and export for each participant is used to allocate costs for the trading interval.</li> </ol>	<ol style="list-style-type: none"> <li>1. In relation to SA Water's first solution AEMO noted that it believes this option is more complex and costly to implement than its preferred option. It also believed that in the absence of actual metering data this approach could require AEMO to use substituted metering data for affected trading intervals. This would potentially lead to under or over representation of a Market Customer's demand.</li> <li>2. In relation to SA Water's alternative solution, AEMO noted it will be unable to implement this system before September 2021 (the AEMC notes that AEMO may mean September 2022) because the sent out and consumed energy metering data will only be available once the Global Settlement rule comes into effect on 1 May 2022. AEMO notes that without this metering data, it will not be able to implement this alternative.</li> </ol>

Source: AEMO, *NEM settlement under zero and negative regional demand conditions*, submissions: AEC, AGL, ENGIE, Infigen, Origin, SA Water.

## E INFIGEN'S PROPOSED DRAFTING

Infigen has included the following proposed drafting of the rule change incorporating proposed amendments to chapter 3 of the NER.

### E.1 Proposed drafting

In their consultation, AEMO has identified a number of services that will require updates to the relevant clauses.

**Table E.1: Clauses requiring amendment**

<b>PAYMENT TYPE</b>	<b>COST RECOVERY BASED ON AGGREGATE REGIONAL DEMAND</b>	<b>NER CLAUSE</b>
<b>Market ancillary services</b>		
FCAS - contingency lower	Trading interval	3.15.6A(g)
FCAS - regulation	Trading interval	3.15.6A(i)(2)
<b>Non-market ancillary services</b>		
Network support control ancillary services (NSCAS)	Trading interval	3.15.6A(c8),(c9)
System restart ancillary services (SRAS)	Trading interval	3.15.6A(e)
<b>Interventions</b>		
Compensation for direction - energy, FCAS or other services	Trading interval(s) when direction in effect	3.15.8(b),(f),(g)
Reliability and Emergency Reserve Trader (RERT) payments Affected participant compensation for RERT	Split between: <ul style="list-style-type: none"> <li>RERT usage charges and compensation payments - trading intervals when RERT was used</li> <li>RERT availability/other charges - billing week when paid.</li> </ul>	3.15.9(e)
Compensation - market suspension - energy and FCAS	Trading interval(s) within a market suspension pricing period	3.15.8A(b),(f)
<b>Other events</b>		
Administered price cap or floor price compensation	Trading intervals in the eligibility period for compensation claims under clause 3.14.6	3.15.10(b)

Source: AEMO, *NEM settlement under low, zero and negative demand conditions*, rule change request, 8 February 2021.

### E.1.1 Lower Contingency service

Clause 3.15.6A(g) of the NER prescribes how cost recovery for the fast lower service, slow lower service and delayed lower service should be recovered from market customers. The trading amount (TA) to be recovered from a market customer is given by:

$$TA = RTCLSP \times \frac{TCE}{RATCE} \times -1$$

where:

TA (in \$)	=	the <i>trading amount</i> to be determined (which is a negative number);
RTCLSP (in \$)	=	the total of all amounts calculated by <i>AEMO</i> as appropriate to recover from the given <i>region</i> as calculated in this clause 3.15.6A(g) for the <i>fast lower service, slow lower service or delayed lower service</i> in respect of <i>dispatch intervals</i> which fall in the <i>trading interval</i> ;
TCE (in MWh)	=	the <i>customer energy</i> for the <i>Market Customer</i> in that <i>region</i> for the <i>trading interval</i> ; and
RATCE (in MWh)	=	the aggregate of the <i>customer energy</i> figures for all <i>Market Customers</i> in that <i>region</i> for the <i>trading interval</i> .

The total lower service costs to be recovered from the region (for a given trading interval) is RTCLSP, which is the sum of:

- the global market ancillary service requirement cost for that region, for all dispatch intervals in the relevant trading interval, as determined pursuant to clause 3.15.6A(g)(3); and
- all local market ancillary service requirement costs for that region, for all dispatch intervals in the relevant trading interval, as determined pursuant to clause 3.15.6A(g)(3).

Clause 3.15.6A(g)(3) is:

allocate for each relevant dispatch interval the sum of the costs of the global market ancillary service requirement and each local market ancillary service requirement calculated in clause 3.15.6A(g)(2) to each region as relevant to that requirement pro-rata to the aggregate of the customer energy figures for all market customers in each region during the trading interval

We interpret this clause as meaning that when the aggregate of the customer energy figures for all market customers (i.e., operational demand) is low (or zero), the pro-rata allocation of global lower services to South Australia will be similarly low. However, when local costs are incurred (e.g., when local lower services are procured in South Australia), these will be fully allocated to a specific region's customers.

The critical term is RATCE, which we interpret could express as  $RATCE = \sum TCE$ , such that the proportion of RTCLSP costs to be recovered from market customer  $t$  is:

$$\text{Share of costs} = \frac{TCE_i}{\sum TCE}$$

This is of the form identified in Section 2.2 of Infigen's proposal, and therefore risks distorting the cost recovery when any individual customer energy figure is comparable to the sum of customer energy figures for the region (i.e., operational demand).

### E.1.2

#### Proposed change

TCE (in MWh) = the customer energy for the market customer in that region for the trading interval or zero if the customer energy for the Market Customer in that region for the trading interval is zero; and

RATCE (in MWh) = the aggregate of the positive customer energy figures for all market customers in that region for the trading interval. The intent of this change would be to deliver a formula:

#### Section 3.15.8(b),(f),(g)

*AEMO* must, in accordance with the *intervention settlement timetable*, calculate a figure for each *Market Customer* in each *region* applying the following formula:

$$MCP = \frac{E}{\sum E} \times \frac{RB}{\sum RB} \times CRA$$

where

MCP is the amount payable or receivable by a *Market Customer* pursuant to this clause 3.15.8(b);

$E$  is the sum of the *Market Customer's adjusted gross energy* amounts at each *connection point* for which the *Market Customer* is *financially responsible* in a *region*, determined in accordance with clauses 3.15.4 and 3.15.5 in respect of the relevant *intervention price trading intervals* excluding any *loads* in respect of which the *Market Customer* submitted a *dispatch bid* for the relevant *intervention price trading interval* in that *region*; and

RB is the regional benefit determined by *AEMO* pursuant to clause 3.15.8(b1) at the time of issuing the *direction*.

CRA is the *compensation recovery amount*.

#### Note

This clause is classified as a civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

*AEMO* must, in accordance with the *intervention settlement timetable*, calculate a figure for each market customer in each region applying the following formula:

$$MCP = \frac{\max(E, 0)}{\sum \max(E, 0)} \times \frac{RB}{\sum RB} \times CRA$$

**Section 3.15.6A (c8)**

In each trading interval, in relation to each market customer for each region, an ancillary services transaction occurs, which results in a trading amount for the market customer determined in accordance with the following formula:

$$TA_{P,R} = \left( \sum (TNSCAS_{S,P} \times RBF_{S,P,R}) \right) \times \frac{\max(AGE_{P,R}, 0)}{\sum \max(AGE_{P,R}, 0)} \times -1$$

~~AAGE<sub>P,R</sub> (in MWh) = the aggregate AGE<sub>P,R</sub> figures for all market customers in respect of the relevant region and trading interval.~~

**Section 3.15.6A (c9)**

$$TA_P = TNSCAS_P \times \frac{\max(AGE_P, 0)}{\sum \max(AGE_P, 0)} \times -1$$

~~AAGE<sub>P</sub> (in MWh) = the aggregate AGE<sub>P</sub> figures for all market customers in respect of the relevant trading interval~~