AEMC

RULE

Australian Energy Market Commission

CONSULTATION PAPER

NATIONAL ELECTRICITY AMENDMENT (NEM SETTLEMENT IN LOW, ZERO OR NEGATIVE DEMAND CONDITIONS) RULE 2021

PROPONENT

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INQUIRIES

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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

On 8 February 2021, the Australian Energy Market Operator (AEMO) submitted a rule change request to the Australian Energy Market Commission (AEMC or Commission) in relation to the formulas that are used to calculate how certain non-energy costs[1] are allocated and the interaction between these formulas and the settlement of other markets within the national electricity market (NEM).[2]

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.[3]

The National Electricity Rules (NER) and the NEM settlement systems were not designed for a power system with two-way flows at a significant scale and did not envisage a scenario in which there may be no energy demand from which to recover non-energy costs.

Mathematically, if aggregate regional demand is less than 1 MWh, AEMO's settlement systems will not be able to calculate the relevant non-energy cost recoveries.[4] This would cause the entire automated settlement run to fail, as energy and reallocation transactions[5] are part of the same integrated process for settlement purposes. Not only would the NEM not be settled, but there would be no information available to determine prudential requirements.[6]

In submitting its rule change request, AEMO has requested that it be subject to the expedited rule making process on the basis that it is an urgent rule 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.[7]

The Commission considers that the rule change request should be treated as an urgent rule change under the NEL. The rationale for this position is discussed in detail in chapter 6.

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

This paper:

- provides a summary of, and background to, the rule change request
- identifies a number of questions and issues to facilitate consultation on this rule change request

1 AEMO's rule change request does not propose changes for the formulas relating to reserve contract and compensation for administered price cap or floor events.
See AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 9.

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

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

4 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 13.

5 A reallocation, under the NER, is a transaction under which two market participants and AEMO agree to AEMO making matching debits and credits to the position of the market participants. See the definition of 'reallocation' in Chapter 10 and clause 3.15.11 of the NER.

6 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 13.

7 AEMO, *Minimum demand in South Australia,* fact sheet, 2021, p. 2.

- outlines the process for making submissions to this consultation paper and objections to the expedited process.

1.1 Key dates

The Commission considers that this rule change request is a request for an urgent rule under the NEL, and therefore has decided to use the expedited rule change process, provided it does not receive any valid requests not to do so.[8] Under section 96 of the NEL, stakeholders may object to the Commission using the expedited process.

Consistent with the timelines and requirements for an expedited rule change process under the NEL, the key dates for stakeholders in this process are as follows:

- Commencement of this rule change process **22 April 2021**
- Objections to an expedited process to be received by **6 May 2021**
- Submissions to the consultation paper to be received by **20 May 2021**
- Final rule determination to be published under an expedited process by **17 June 2021.**

1.2 Consultation on related rule change from Infigen

On 22 April 2021, the Commission also released a consultation paper on a rule change request received from Infigen.

This request focuses on the potential of low operational demand conditions to distort cost allocation calculations. This occurs when regional net demand approaches zero. At this point, more market customers are likely to be net generators. The remaining market customers, with net loads, will need to pay a higher share of non-energy costs, despite native demand remaining constant.[9]

It notes that this may lead to a point where the remaining market customers with positive net loads are required to pay more than 100 percent of the total service charges, with the extra amount being paid to market customers who are net generators.[10]

Given the clear similarities in the issues being considered in this and the Infigen rule changes, the Commission encourages stakeholders to also engage with the Infigen consultation process. Additional detail about Infigen's rule change and why the rules are being run separately and contemporaneously can be found in section 7.1 of this document. Submissions to this process also close on **20 May 2021**.

8 See chapter 6 of this consultation paper for more information on the treatment of this rule change request as urgent.

9 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 4.
Native demand in a region is demand that is met by local scheduled, semi-scheduled, non-scheduled, and exempt generation and by generation imports to the region, excluding the demand of local scheduled loads. See AEMO, *Demand terms in EMMS data model,* June 2019, p. 9.

10 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 6.

1.3 Crossover of issues between AEMO and Infigen consultation papers

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

ISSUES FOR CONSULTATION	ISSUES RELEVANT FOR AEMO	CROSSOVER WITH THE INFIGEN CONSULTATION PAPER
Assessment framework	The paper seeks feedback on the proposed assessment framework, including whether there are additional considerations that should be considered in the framework.	The two papers have similar assessment frameworks. • AEMO's rule change examines whether the proposed rule provides administrative certainty. This is because effective administrative processes and administrative certainty should enhance the confidence of participants in the market. • Infigen's rule change examines whether the rule change provides efficient market signals as there is a focus on the incentives market customers face during low operational demand.
Risks of settlement disruption	The paper seeks feedback on the risks identified by AEMO including additional risks that have not been identified.	• NEM settlement risks are also identified in Infigen's rule change request. However, this issue is only being consulted on in this paper.
Proposed solution	The paper seeks feedback on AEMO's proposed solution to the issue and if there are better ways to respond to the issue.	• Infigen proposes a different solution to AEMO. It proposes to floor a market customer's AGE at 0 MWh, rather than substituting values in place of a market participant's AGE, in the event that aggregate AGE for a trading interval is below 1 MWh. • Infigen's paper also consults on applying a 150 MWh threshold in place of AEMO's proposed 1 MWh threshold. This solution addresses Infigen's concerns about the potential for low demand to distort cost allocation calculations and the settlement concerns noted by AEMO when regional demand is less than 1 MWh.

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

2 BACKGROUND

This section provides background information on:

- the existing arrangements for settlement under the national electricity rules (NER)
- AEMO's responsibilities under chapter 3 of the NER.
- current non-energy costs recovery from market customers
- AEMO's ability to issue directions and instructions under the national electricity law (NEL) and the NER.

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.[11] It also sets out AEMO's responsibility for the operation and administration of the wholesale electricity market, including the following functions:

- registering market participants[12]
- operating and administering the spot markets for electricity and market ancillary services[13]
- managing dispatch[14]
- settling transactions and trades[15]
- prudential monitoring to manage financial risks, such as default risk.[16]

2.1.1 NEM settlement

AEMO is responsible for facilitating the billing and settlement of payments due in respect of all transactions under chapter 3 of the NER, which includes:

- spot market transactions under clause 3.15.6
- reallocation transactions under clause 3.15.11[17]
- some non-energy cost transactions under 3.15.6A[18]

AEMO relies on net metering data from connection points so that it can determine fees, allocate cost recoveries and settle transactions. Net metering data is used because under the NER the registration categories and the connection point categories represent either

11 See clause 3.1.1 of the NER.
12 See clause 3.2.1 of the NER.
13 See clause 3.2.2 of the NER.
14 See clause 3.2.2 of the NER.
15 See clause 3.2.6 of the NER.
16 See rule 3.3 of the NER.
17 A reallocation, under the NER, is a transaction under which two market participants and AEMO agree to AEMO making matching debits and credits to the position of the market participants. See definition of 'reallocation' in Chapter 10 and clause 3.15.11 of the NER.
18 Non-energy costs in the NEM include payments for market and non-market ancillary services, compensation for directions, market suspensions or administered pricing, and reserve contract payments. Under the NER, AEMO recovers these costs from market participants based on their registration category and the energy associated with the connection point they have classified in that category. AEMO, *NEM settlement under zero and negative demand conditions,* rule change request, 8 February 2021, p. 3.

'generation' or 'load', the former generally flowing into the network and the latter taking flow from the network.

Rule 3.15 also sets out processes for how AEMO is to operate its settlement systems and for market participants to transact.[19]

The provisions in rule 3.15 also provide formulas to allow AEMO to calculate the amount paid by, or to a market participant, based on its sale or purchase of electricity and its resulting liability for non-energy costs.[20]

As noted above, one of AEMO's settlement responsibilities is to recover payments from wholesale market customers[21] for non-energy costs.[22] These service payments include:

- payments for market and non-market ancillary services
- compensation for directions, market suspension or administered pricing
- reserve contract payments.

Table 2.1 below provides additional details about how NEM non-energy costs are recovered from market customers.

Table 2.1: Current NEM non-energy cost recovery from market customer

PAYMENT TYPE	COST RECOVERY BASED ON AGGREGATE DEMAND	NER CLAUSE
Market Ancillary Services		
Frequency Control Ancillary Services (FCAS) — contingency lower	Trading interval	3.15.6A(g)
FCAS — regulation	Trading interval	3.15.6A(i)(2)
Non-market ancillary services		
Network support control ancillary services	Trading interval	3.15.6A(c8),(c9)
Interventions		
Compensation for direction — energy, FCAS or other services	Trading interval(s) when direction in effect	3.15.8(b),(f),(g)
Reliability & Emergency Reserve Trader (RERT) payments Affected participant compensation for RERT	Split between: • RERT usage charges and compensation payments — trading intervals when RERT was	3.15.9(d)

19 See clause 3.15.2 of the NER.

20 See clauses 3.15.6 and 3.15.6A of the NER.

21 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 of the NER.

22 See clauses 3.15.6A, 3.15.8, 3.15.8A, 3.15.9, and 3.15.10 of the NER.

PAYMENT TYPE	COST RECOVERY BASED ON AGGREGATE DEMAND	NER CLAUSE
	used • RERT availability/other charges — billing week when paid	
Compensation — market suspension — energy and FCAS	Trading interval(s) within a market suspension pricing period	3.15.8A(b),(f)
Other events		
Administered price cap or administered price floor compensation	Market customers	3.15.10(b)

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

2.1.2 Prescriptive non-energy cost formulas

As mentioned above, rule 3.15 establishes the formulas for how AEMO is to recover non-energy costs. These clauses are prescriptive in establishing how cost recovery for these services should take place and typically involve AEMO apportioning the total costs for each non-energy cost in a trading interval, across the relevant market participants in the region according to their net load during the trading period.

Because of the prescriptive nature of these clauses, AEMO considers any changes to its settlement processes to resolve the issue identified in its rule change request would not be consistent with the requirements of the relevant rules.

In light of this, AEMO states that amendments to the NER are necessary to ensure a workable way of allocating non-energy costs to market customers. Otherwise, AEMO says it will be put in the position of either not paying non-energy costs, which would breach the NER and related contracts, or having no authorised means to recover them.[23]

2.1.3 Power to direct 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. These powers were included in the original NEL in 1996 and the first version of the NER in 2005. However, these provisions cannot be used to maintain market efficiency.[24]

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.[25]

23 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, pp. 8-9.
24 See section 116 of the NEL and clause 4.8.9 of the NER.
25 See section 116 of the NEL.

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.[26]

Similarly, AEMO can require a registered participant to do any act or thing if AEMO is satisfied that it is necessary to do so to maintain or reestablish the power system to a secure operating state, satisfactory operating state or a reliable operating state.[27]

Directing market participants to curtail rooftop solar

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 PV when necessary.[28]

With this new set of technical standards, dubbed '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.[29]

These new powers complement the existing powers that AEMO has under both the NEL and the NER.

Recently, on 14 March 2021, AEMO issued a market notice informing participants that it had detected there was insufficient forecast scheduled demand to maintain a secure operating state in South Australia and noted that it may need to instruct participants or implement an AEMO intervention event in order to maintain power system security in South Australia, noting that this could result in actions such as the curtailment of non-scheduled wind power and rooftop solar.[30]

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26 See section 116 of the NEL.

27 See clause 4.8.9(a)(1) of the NER. Note under clause 3.8.2(e) of the NER, AEMO can also instruct otherwise exempted participants from participating in the central dispatch process for adequate system operation and the maintenance of system security. However, the Commission understands that this is very rarely used and would not be relevant to the present circumstances.

28 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 See AEMO's website: https://www.aemo.com.au/market-notices. Forecast scheduled demand differs from operational demand as operational demand includes local scheduled wind and solar generation that is 30 MW or more. Scheduled demand is a measure to meet scheduled generation and load.

AEMO ultimately instructed ElectraNet, the transmission network operator, to take steps to maintain grid-demand above 400 MW for around an hour from 3:00 pm.

It chose this figure because previous research undertaken by AEMO notes that this demand is what is the minimum sufficient to support minimum loading levels for synchronous generating units in the region, required for secure provision of frequency control, inertia and system strength services when South Australia is islanded.[31]

This resulted in the curtailment of a range of larger distribution-connected solar generation and residential solar customers.[32] This was the first time that AEMO had used these new curtailment powers for this purpose.

It is important to note that AEMO cannot necessarily rely on these provisions to address the risks posed by AEMO and Infigen in their rule change requests. This is because whilst regional demand below 1 MWh 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.

31 AEMO, *2020 Electricity Statement of Opportunities*, August 2020, p. 19. 'Islanding' occurs when a region becomes separated from the rest of the NEM.

32 AEMO, *Solar PV curtailment initiative by SA Government supports the NEM*, media release, 18 March 2021.

3 DETAILS OF THE RULE CHANGE REQUEST

This chapter provides a brief overview of the issues and proposed solutions in the rule change request, along with the expected costs, benefits and impacts of the proposed rule.

A copy of the rule change request and proposed rule can be found on the AEMC website at www.aemc.gov.au.

3.1 Issues raised in the rule change request

AEMO's proposed rule change focuses on the formulas for certain non-energy cost allocations to market customers under rule 3.15 of the NER.[33]

Table 2.1 above showed all the categories of non-energy costs applicable to market customers. However, AEMO's rule change request does not propose changes for the formulas relating to reserve contract and compensation for administered price cap or floor events.[34]

These formulas rely on numerators and denominators that include the adjusted gross energy (AGE). AGE is measured as the flow of electricity at a participant's connection point, in the relevant category for recovery, either as load or generation. If a connection point both generates and consumes energy, then the AGE for a trading interval is the difference between this produced and consumed energy at the connection point.[35]

AEMO notes that if the aggregate AGE, which is the AGE of all customers in a region, falls below 1 MWh for a trading interval, the non-energy cost recovery formulas cannot be solved by its market settlement systems.[36]

If this occurs during a trading interval in which non-energy costs are incurred and need to be recovered from market customers, AEMO would be unable to recover these costs.[37]

This has further consequences because once a recovery amount cannot be allocated by AEMO's systems, AEMO's automated settlement runs will stop working, impacting the settlement of all transactions, including energy and reallocations.[38]

This will 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 call requirements.[39]

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33 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 8.

34 AEMO, *NEM settlement in zero and negative demand conditions*, rule change request, p. 9.

35 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, pp. 5; 8.
In discussing AEMO's rule change request, the Infigen consultation paper explains that operational demand is declining. AEMO's rule change request uses both operational demand and regional demand, these concepts are similar concepts that are used to measure the demand of market customers for electricity, though because of the way each is measured there may be differences in their values. Operational demand includes local scheduled demand, including wind and solar, which is greater than 30 MW. Regional demand refers to the sum of all market participants' AGEs in the relevant NEM region. AEMO also relies on Scheduled demand, this measure does not include wind and solar greater than 30MW. Scheduled demand is a measure to meet scheduled demand and load.

36 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 8.

37 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 8.

38 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 8.

39 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 8.

3.1.1 Falling operational demand

Historically, market loads were thought to almost always be net consumers of energy. As a result of this, AEMO analysis suggested that the likelihood of regional demand falling below 1 MWh for a trading interval was too remote to necessitate a rule change, particularly as other rule changes were likely to be made that would ultimately address this potential issue.[40]

However, aggregate AGE continues to fall across regions. In its rule change proposal, AEMO notes that on 11 October 2020 South Australian operational demand reached a new low record of 300 MW, which was around 160 MW lower than the previous low record which had taken place in 2019.[41]

3.1.2 Increased risk with the introduction of the Five-minute settlement rule

Under the current arrangements, some generators and other wholesale market participants submit bids or offers to the market operator (AEMO), signalling their willingness to generate or consume electricity or offer market network services.[42]

The dispatch price is the bid of the most expensive generator (also called marginal generator) that needs to be dispatched in order to balance demand and supply in each five-minute period.[43]

While the dispatch price is determined for each five-minute dispatch interval, the settlement price is calculated on a 30-minute basis. The settlement price is the time-weighted average of the six dispatch prices that occurred during the 30-minute trading period.[44]

The introduction of the *Five-minute settlement* on 1 October 2021 will align the dispatch and settlement and the trading interval at five minutes.

The risk of operational demand falling below 1 MWh for a trading period is likely to be heightened by the introduction of five-minute settlement. This is because non-energy costs, such as FCAS, have their costs settled on a five-minute basis already, but the apportionment of these costs between market customers is completed following the aggregation of demand and costs for a full 30-minute trading interval. When a trading interval becomes five minutes, demand will no longer be aggregated in this way, and this creates a greater risk that a trading interval will be a negative value.[45]

3.2 Proposed solution

AEMO proposes to amend rule 3.15 of the NER to allow for the substitution of AGE values, when necessary, to create numerators and denominators for non-energy cost allocation formulas that will work in AEMO's settlement systems.[46]

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40 These rule changes include *Integrating energy storage systems into the NEM rule change* and *Global settlements and market reconciliation rule change* both of which were proposed by AEMO.

41 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 6.

42 Clause 2.5.2 of the NER.

43 AEMC, *Five-minute settlement*, consultation paper, 19 May 2016, p. i.

44 AEMC, *Five-minute settlement*, consultation paper, 19 May 2016, p. i.

45 AEMO, *Settlements guide to ancillary services payment and recovery*, February 2020, p. 9.

46 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 9.

As the non-energy cost recovery settlement calculations will fail when the denominator of a relevant formula is less than 1 MWh, AEMO proposes to only substitute values when aggregate AGE falls below 1 MWh.[47]

In such situations, AEMO will determine the value for substitution using an average of the AGE amounts in the last four billing periods for each affected market customer and will substitute aggregate AGE for a region with the sum of the substituted market customer average AGEs in the region.[48]

AEMO's request notes it has also excluded RERT costs and compensation for administered price cap or floor events from the proposed rule, in order to minimise the scope of work and the cost required to implement system changes, as these non-energy costs are highly unlikely to be incurred during periods of minimum demand.[49]

AEMO recognised that the proposed rule change would be a temporary solution to address a critical system issue resulting from the application of the current cost recovery framework in very low operational demand conditions.[50]

A long-term solution is currently being considered by the AEMC as part of the *Integrating energy storage systems into the NEM* rule change , which is explained in further detail in section 7.4.

3.3 Expected costs, benefits and impacts of the proposed rule

AEMO considers that the key benefit of the rule change is that it ensures it will still be able to calculate a market customer's non-energy cost allocation amounts when regional demand is zero or negative during a trading interval.[51] Importantly this means that:

- AEMO's automated settlement systems will continue to function
- AEMO will be able to continue to meet its obligations under rule 3.15 NER, including settling energy, FCAS and reallocation transactions
- the potential for market disruption is substantially reduced
- the wholesale market integrity is maintained.[52]

While AEMO notes that it will incur costs associated with the development, testing and certification of the system changes needed to implement the proposal, it considers this to be a low-cost solution.[53]

AEMO's rule change request points out that market customers' settlement outcomes would only be impacted if zero or negative regional demand occurs and values are substituted,

47 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 9.
48 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 9. Chapter 10 of the NER defines A *billing period* as the period of 7 days commencing at the start of the trading interval ending 12.30 am Sunday.
49 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 9.
50 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 3.
51 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 13.
52 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 13.
53 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 13.

however, it believes any impact would be minimal because of the use of recent customer-specific AGE values.[54]

AEMO indicated that its rule change proposal contributes to the National Electricity Objective (NEO) by facilitating a more efficient operation of the NEM. It notes that its solution avoids the costs and impacts that would occur if market settlements were allowed to fail, while, the solution itself is low cost and allows market settlement systems to operate, with minimal disruption.[55]

3.4 Previous consultation

On 26 November 2020, AEMO released an issues paper discussing the settlement issue raised in its rule change proposal and its proposed solution to prevent the risk of ongoing settlement systems disruption.[56]

In the issues paper, AEMO asked stakeholders their views on the proposed solution and the reference values that should be used as a substitute for a market customer's AGE.

The consultation period closed on 15 December 2020 and AEMO received six submissions from the following stakeholders: Australian Energy Council, AGL, ENGIE, Infigen, Origin and SA Water. No stakeholder disagreed with AEMO's assessment that the problem needed to be urgently addressed, but there were divergent opinions on the most appropriate substitution value to be used.[57]

The Commission has now commenced its own consultation process and is seeking stakeholder feedback on AEMO's proposed solution.

More details on the previous consultation can be found in Appendix B.

54 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 13.
55 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 13.
56 AEMO, *NEM settlement under zero and negative demand conditions,* issues paper, 26 November 2020.
57 AEMO, *NEM settlement under zero and negative demand conditions,* issues paper, 26 November 2020, p. 9.

4 ASSESSMENT FRAMEWORK

This chapter outlines the:

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

4.1 Achieving the NEO

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 NEO.[58] This is the decision-making framework that the Commission must apply.

The NEO is:[59]

> to promote efficient investment in, and efficient operation of wholesale electricity services for the long-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.

4.2 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 the market operator to appropriately manage against foreseeable risks?
- **Minimises uncertainty and market changes:** does the proposed solution minimise uncertainty for market participants and AEMO to manage risks?
- **Minimises regulatory and administrative burden:** is the cost of implementing the proposed solution proportional to the importance of the issue to be resolved?
- **Administrative certainty**: does the proposed solution facilitate effective administrative processes and provide administrative certainty for market participants?

58 Section 88 of the NEL.
59 Section 7 of the NEL.

QUESTION 1: ASSESSMENT FRAMEWORK

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

4.3 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.

4.4 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 Ministerial Council on Energy (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 relates to parts of the NER that currently do not apply in the Northern Territory (i.e. Chapter 3), the Commission does not propose to assess the proposed rule against additional elements required by the Northern Territory legislation.[60]

60 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.

5 ISSUES FOR CONSULTATION

Taking into consideration the assessment framework set out in chapter 4, the Commission is interested in stakeholders' views on the risks posed by the potential inability to settle the NEM and AEMO's proposed solution.

This chapter also provides background information and poses questions in order to facilitate stakeholder feedback, specifically it explains:

- why AEMO would be unable to settle the NEM if regional demand is less than 1 MWh and why the issue needs to be addressed urgently
- the risks that arise from the issue
- AEMO's proposed solution
- the implementation constraints AEMO is currently responding to.

5.1 Inability to settle the NEM

AEMO's settlement systems will be disrupted if the cost recovery formulas used by AEMO to allocate non-energy costs cannot solve. This will happen if the denominator in these non-energy cost recovery equations, the aggregate AGE (the sum of all market customers' AGE in a region), in a region is less than 1 MWh during a trading interval.[61]

AEMO notes that if this occurs, its capacity to settle all other transactions will also be disrupted because settlement is an integrated process.[62] Where it cannot settle these markets, AEMO would be unable to comply with its settlement and prudential responsibilities under the NER.[63]

5.1.1 Why does this issue need to be addressed urgently?

The risk of aggregate AGE falling below 1 MWh in a trading period has always existed. However, until recently, AEMO's analysis suggested that this risk was too remote to necessitate a rule change such as this.

However, in the last six months, because of the unprecedented rooftop solar installation rate, AEMO has revised its previous forecasts and now recognises that a non-remote risk exists.[64]

Annually, AEMO publishes the *Electricity Statement of Opportunities* (ESOO) report, which forecasts electricity supply reliability in the NEM over a 10-year period to inform decisions by market participants, investors, and policymakers.[65]

The 2020 ESOO did not consider zero operational demand was likely to occur in South Australia until 2024-2026.[66] However, by October 2020 AEMO had recognised that the growth

61 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 8.
62 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 8.
63 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 9. See also rule 3.15 and clause 3.2.6 of the NER.
64 AEMO, *Minimum demand in South Australia,* fact sheet, 2021, p. 1.
65 AEMO, *2020 Electricity Statement of Opportunities*, August 2020, p. 19.
66 AEMO, *2020 Electricity Statement of Opportunities*, August 2020, pp. 42-43.

of rooftop solar in South Australia continued to accelerate.[67] By December 2020 new solar rooftop capacity was growing by around 30 MW per month in South Australia.[68]

Because of this, according to AEMO, there was approximately 330 MW of new rooftop solar installed in South Australia in 2020. This figure was substantially more than the 232 MW forecast in the 2020 ESOO's central scenario and 259 MW forecast in the 2020 ESOO's central downside high distributed energy resources (DER) scenario.[69]

AEMO states that the minimum operational demand figures experienced in South Australia were actually more closely in line with the 90 percent probability of exceedance in the ESOO central downside high DER scenario, which suggests growth continues to be substantially above trend.[70]

In response to this very high growth, AEMO decided to conduct additional modelling. In doing this, it relied on the following assumptions:

- focusing on actual demand from 2017, 2018 and 2019, to account for potential variations in prevailing weather and economic conditions.
- projecting the underlying load and rooftop solar generation levels in each half-hour of the relevant reference year based on the high level of rooftop solar installed.
- updating rooftop solar installation figures and assuming the continuation of recent uptake rates.
- increasing the amount of rooftop solar uptake to a rate of 330MW per year and making adjustments for increased loads in the projected years.[71]

67 AEMO, *Minimum demand in South Australia,* fact sheet, 22 October 2020, p. 1.

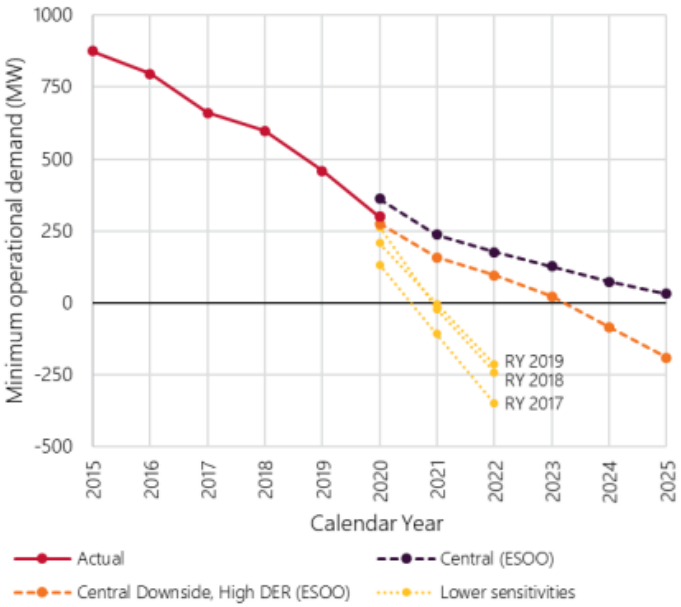
68 AEMO, *Minimum demand in South Australia,* fact sheet, 2021, p. 1.

69 AEMO, *Minimum demand in South Australia,* fact sheet, 2021, p. 1.
The *central scenario* is based on the AER's best practice forecasting guidelines, which require the reliability forecast and indicative reliability forecast to be determined on a neutral forecast. In addition to this, it also developed three further scenarios with different additional sensitivities.
The *central downside high DER scenario,* is designed to capture a sustained economic downturn and lower manufacturing activity before a return to trend by 2023-24, while also examining how higher rooftop solar uptake, possibly stimulated by Government recovery efforts, could affect grid consumption. See AEMO, *2020 Electricity Statement of Opportunities,* August 2020, p. 23.

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

71 AEMO, *Minimum demand in South Australia,* fact sheet, 2021, pp. 1-2.

Figure 5.1: Minimum demand in South Australia



Source: AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 7.

Based on this analysis, AEMO notes that all three of its modelled reference years showed minimum demand levels falling below 1 MWh in 2021.[72] Furthermore, AEMO noted that if 2017 demand and rooftop solar generation patterns occurred in 2021, there would have been 10 trading intervals below zero.[73]

5.1.2 Understanding the risks

In its rule change request, AEMO has pointed to the broader potential for damage posed by it being unable to settle the NEM. It points to the potential for cascading impacts, such as:

- inability to complete its prudential monitoring functions[74]
- inability to meet its obligations under the NER[75]
- potential for market disruption[76]
- risks to wholesale market integrity.[77]

72 AEMO, *Minimum demand in South Australia,* fact sheet, 2021, pp. 2-3.
73 AEMO, *Minimum demand in South Australia,* fact sheet, 2021, p. 2.
74 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 8.
75 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 9.
76 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, pp. 4; 13.
77 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 13.

QUESTION 2: RISKS POSED BY SETTLEMENT DISRUPTION

3. Are the issues identified by AEMO real?

4. Are there any other risks that should be considered?

5.2 AEMO's proposed solution

To ensure its settlement systems continue to work, AEMO proposes to amend rule 3.15 of the NER to allow it to substitute AGE values into its cost allocation equations when aggregate AGE falls below 1 MWh.[78]

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 and will substitute aggregate AGE for a region with the sum of the substituted market customer average AGEs in the region.[79]

By substituting the values in place of AGEs in these circumstances, the formula's will calculate because the region's aggregate AGE cannot be a number less than 1 MWh. In its proposal, which is discussed in greater detail in section 7.1, Infigen also suggests that the 1 MWh threshold in AEMO's rule change request could be substituted for 150 MWh.[80]

Infigen considers this a workable solution that would limit potential downside impacts of inequitable cost recovery and over procurement of non-energy costs. The Infigen consultation paper seeks stakeholders' feedback on a 150 MWh threshold.[81]

AEMO also proposes to exclude RERT 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.[82]

QUESTION 3: PROPOSED SOLUTION

5. Is AEMO's proposed solution a proportional way to respond to the issue it has identified in its rule change proposal?

6. Are there any alternative ways that deal better with this issue?

78 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 9.
79 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 9.
80 Infigen, *Settlement under low operational demand*, rule change request, p. 13.
81 AEMC, *Settlement under low operational demand*, consultation paper, p. 24.
82 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 9.

5.3 Implementation

This section sets out the proposed timeframe for implementing the final rule, including the interim steps that may need to be undertaken by market participants and AEMO before the commencement of the rule.

5.3.1 Preparing for implementation

AEMO will be required to update its systems to give effect to any rule change. In its rule change request, AEMO has stressed that it considers it essential for market system changes to be implemented by 1 September 2021 and that it is working towards finalising testing and certification of the system solution by the end of August 2021.[83]

5.3.2 AEMO's implementation constraints

AEMO has noted that it currently has limited time to implement relevant changes to its settlement systems, before spring 2021. This is because it will require time to test and certify any changes prior to spring 2021, while it is also already committed to implementing other major rule change projects during spring 2021 including:

- Five-minute settlement
- Wholesale demand response mechanism
- Reducing customer switching times.[84]

Given the significant scale of these projects, the Commission recognises that AEMO has limited capacity to implement additional rule changes, before summer 2021-22.

According to the expedited rule change process, a final determination is due by 17 June 2021. AEMO has advised that this will still allow enough time to conduct internal testing and certification processes and have its settlement systems operational from 1 September 2021.

5.3.3 Proposed commencement

The Commission recognises that system changes are not a trivial task and require careful planning and management, detailed design work, and thorough testing.

AEMO has already discussed its solution with industry and has started work towards being prepared. It has advised the AEMC that if a rule that is consistent with its proposal is determined, then implementation can occur and commencement will be ready for 1 September 2021.

83 AEMO, *NEM settlement in zero and negative demand conditions,* cover letter to rule change request, p. 1.
84 AEMO, *Regulatory roadmap v4,* 18 March 2021.

6 PROCESS FOR THIS RULE CHANGE

This section sets out the Commission's reasons for treating AEMO's proposed rule change as an urgent rule change, as well as details on how stakeholders can object to this expedited process and how to make a submission to the process.

6.1 Treatment as an urgent rule change

AEMO proposes the rule change request be treated as urgent in accordance with s. 96 of the NEL, such that it could be processed on an expedited basis. This request has been made on the basis that, if a rule that facilitates settlement when demand is below 1 MWh is not made and implemented before spring 2021, there would be a non-remote risk of:

- significant disruption to NEM energy and non-energy settlement
- significant disruption to AEMO's capacity to undertake its prudential management responsibilities
- AEMO being forced to choose between either not paying non-energy costs and breaching the NER, or being left with no avenue to recover non-energy costs.[85]

The Commission considers that the rule change request, if not made, will result in a threat to the effective operation or administration of the wholesale electricity market.[86] This is because there is a material risk that AEMO's settlement systems will fail on at least one occasion in 2021,[87] and such a failure is likely to have broader impacts on the NEM and its participants.

On this basis, the Commission has decided to use an expedited process to consider this rule change request provided that it does not receive any valid requests not to use the expedited process by **6 May 2021**.

6.2 Lodging a submission

The Commission invites requests not to make a rule under the expedited process and written submissions on this rule change proposal.

All enquiries on this project should be addressed to Edward Orum on (02) 8296 7852 or edward.orum@aemc.gov.au.

6.2.1 Lodging a request not to make a rule under an expedited process

Written requests not to make a rule under the expedited process in s. 96 of the NEL must include reasons for the request and must be lodged with the Commission by **6 May 2021**, online, in accordance with the process specified below.

85 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 4.
86 Definition of 'urgent Rule' in section 87 of the NEL.
87 AEMO, *Minimum demand in South Australia,* fact sheet, 2021, p. 2.

6.2.2 Lodging a submission to this rule change request

Written submissions on the rule change request must be lodged with Commission by **20 May 2021** online in accordance with the process specified below.

Where practicable, submissions should be prepared in accordance with the Commission's guidelines for making written submissions on rule change requests.[88] The Commission publishes all submissions on its website, subject to a claim of confidentiality.

6.2.3 Lodging online

Submissions, or requests not to make a rule under the expedited process, must be lodged online via the Commission's website, www.aemc.gov.au, using the "lodge a submission" function and selecting the project reference code **ERC0326**.

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

88 This guideline is available on the Commission's website www.aemc.gov.au

7 RELATED PROJECTS

The AEMC is currently undertaking two other rule change processes that aim to address issues arising in low or negative operational demand conditions.

- *NEM settlement under low operational demand* — from Infigen, discussed in greater detail in section 7.1.
- *Integrating energy storage systems into the NEM* — from AEMO, discussed in greater detail in section 7.4.

In addition, there are other two rule determinations — *Five-minute settlement* and *Global settlement* — that are relevant to this project which are discussed in greater detail in section 7.2 and section 7.3, respectively.

7.1 Infigen's rule change request

Infigen's rule change request *NEM settlement under low operation demand* was also initiated on 22 April 2021, with the release of a consultation paper. It was submitted to the AEMC on 18 February 2021.

7.1.1 Infigen's related concerns

Infigen's request focuses on the potential impact of low operational demand on non-energy costs from market customers, as low demand impacts the formulas used to allocate these costs. When operational demand reduces in a region, the remaining market customers with a net load pay a higher share of the costs, despite native demand remaining constant.[89]

Infigen further observes that as operational demand approaches 1 MWh, there would be an increase in the number of net exporting market customers and a reduction in the number of net importing market customers.

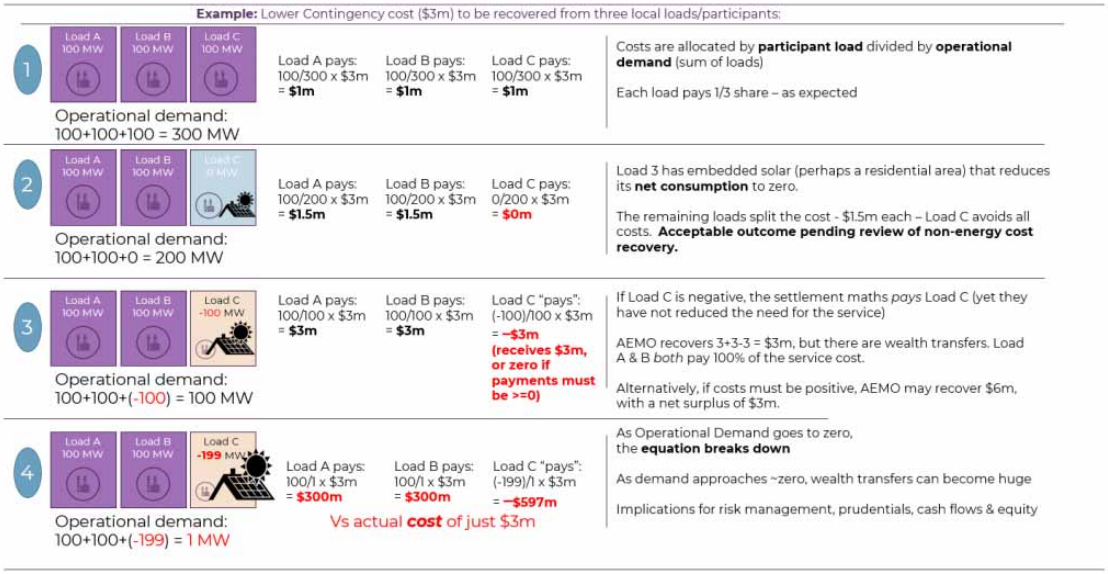
It notes that this will lead to a point where the remaining market customers with positive net loads are actually required to pay more than 100 percent of the total service charges.[90]

Figure 7.1 below provides a simplified example of this issue under scenario 4.

89 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 4. For a definition of native demand see footnote 9.
The Infigen rule change and the associated consultation paper discuss declining operational demand. AEMO's rule change request uses both regional demand and operational demand. These are similar concepts that are used to measure electricity demand of market customers, though because of the manner by which each is measured there may be differences in their values. 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.

90 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 6.

Figure 7.1: Infigen's simplified example of cost recovery with three local loads/participants



Source: Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 5.

Infigen notes that the extra amounts recovered are paid to the net exporting loads. This is despite net exporters not providing services to the NEM that would require the recovery of non-energy costs from market customers and also not contributing to their share of the non-energy costs that should be recovered from market customers.[91]

Infigen also suggests that as prices rise to very high levels, this issue could have potential impacts and drive behaviour that was not contemplated, including:

- Costs rising to what it describes as significant but spurious level where there will be disproportionate effects on particular classes of market customers (large industrial customers).[92]
- The potential for cascading defaults as retailers are unable to meet their settlement obligations to AEMO, potentially further reducing competition in the South Australian retail market.[93]
- Driving customers to disconnect in a manner that may lead to security and reliability risks.[94]

91 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 6.

92 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 8.

93 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 8.

94 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 8. Infigen notes that because high non-energy costs are likely to be in excess of the *Value of customer reliability* the remaining customers with positive loads will have strong incentives to reduce consumption, through load shedding. It notes that as most loads are non-scheduled, this shedding will not be communicated to AEMO ahead of time, and load may drop off suddenly and dramatically. When this happens, operational demand will further decrease, creating even sharper incentives for loads to disconnect and potentially greater load shedding.

7.1.2 Infigen's proposed solution

To address both its own issue and AEMO's settlement issue, Infigen suggests that instead of preventing aggregate AGEs from becoming negative (ie. the denominator in the equation in the cost recovery formula being negative), the rules should be amended so that the market customer's AGE, that is the numerator, is substituted in the cost recovery formula for zero MWh, in circumstances where the market customer's net flows are negative.

By substituting in this way Infigen's solution ensures that a market customer's AGE, which is the numerator in the equation is the greater of zero or the market customer's AGE.[95]

In doing this, Infigen's proposed solution prevents a market customer's AGE from being a negative value in the non-energy cost formula. The additional consequences of this, for the cost recovery formulas, are as follows:

- A market customer cannot have a negative AGE for a trading interval, which prevents that customer from receiving payment for their negative net flows.[96]
- While this does mean that regional demand can still fall below 1 MWh, this can only occur when all market customers in a region have a load that is net negative or zero. Infigen notes that this is very unlikely for at least the next 12-24 months.[97]

Because of this, Infigen considers that this solution insulates market customers in the short-term until the *Integrating energy storage systems into the NEM* process is completed and implemented, which should resolve the issue in the longer term, as discussed in more detail in sections 7.4 and 7.5 below.[98]

7.1.3 Infigen's proposed alternative solutions

Infigen also suggested a number of possible alternative solutions:[99]

- setting the threshold for substitution in AEMO's rule change at 150 MWh
- applying a settlement cap such that individual recoverable costs can not exceed the total recoverable costs
- redistributing excess recovered costs back to market customers who have been required to overpay as a result of non-energy costs being over-recovered
- using multiple trading intervals for recovery rather than a single trading interval.

Box 1 below explores the use of an alternative threshold for substitution, which is related to this rule change.

95 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 12.
96 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 12.
97 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 12.
98 Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021, p. 12.
99 Infigen, *Settlement under low operational demand,* Rule change request, 15 February 2021, p. 13.

BOX 1: THE THRESHOLD FOR SUBSTITUTING VALUES INTO THE NER COST ALLOCATION FORMULAS

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 addressing the issues identified by Infigen prior to at least mid-2022. AEMO's implementation constraints are discussed in greater detail in section 5.3.2 of this paper and section 4.3.1 of the "*Settlement under low operational demand*" consultation paper, published simultaneously with this one.

AEMO has stated that it would be able to implement one of Infigen's alternative solutions, which would involve raising the threshold for substitution from 1 MWh per trading interval, as proposed by AEMO, to a threshold of 150 MWh, per trading interval.

Infigen considers this solution would also limit the downside impacts of inequitable cost recovery and over procurement of non-energy costs, discussed above in section 7.1.1.

The Commission intends to address the settlement risks presented in AEMO's rule change request before spring 2021, as this is the more substantial risk facing the NEM. For that reason, the AEMC has initiated AEMO's rule change request as an urgent process, to be completed by 17 June 2021, allowing AEMO time to implement the final rule.

The Commission will consider addressing an alternative threshold level of demand through AEMO's rule change process if stakeholders demonstrate that there is a substantial consensus about what the substitution threshold value should be.

It is important to note that this threshold value would still need to be decided upon with sufficient time to code, test and implement the solution, but it is currently expected that the timeframe of AEMO's rule change request would allow for this to take place before September 2021.

Source: Infigen, *Settlement under low operational demand,* rule change request, 15 February 2021.
AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, 8 February 2021.
Infigen has also suggested that the threshold value could be informed by AEMO modelling the largest expected net market customer load in South Australia during low demand. The threshold could then be set to ensure it is triggered if net demand approaches some multiple of this net customer load.

7.1.4 Infigen's rule change key dates

The Commission has initiated a standard rule change process on Infigen's proposal, by releasing a consultation paper. It follows a similar timeframe as this rule change. Key dates for that rule change process are:

- Consultation paper released: **22 April 2021**
- Submissions on consultation paper due: **20 May 2021**
- Draft determination published: **17 June 2021**
- Submissions on draft determination due: **29 July 2021**
- Final determination published: **26 August 2021.**

More information about the project can be found at http://www.aemc.gov.au/rule-changes/settlement-under-low-operational-demand

7.2 Five-minute settlement

In November 2017, the Commission made a rule to align operational dispatch and financial settlement at five minutes. The five-minute settlement rule reduces the time interval for financial settlement in the NEM from 30 minutes to five minutes. [100]

As noted in chapter 3, the risk of operational demand falling below 1 MWh for a trading period is likely to be heightened by the introduction of five-minute settlement. This is because non-energy costs, such as FCAS, already have their costs settled on a five-minute basis, but the apportionment of these costs, between market customers, is completed following the aggregation of demand and costs over a 30-minute trading interval.

Five-minute settlement removes this aggregation. This means that while previously the sum of the six consecutive dispatch intervals needed to be negative for there to be negative aggregate AGE during a trading interval, now one five-minute trading interval would have to be a negative value.[101]

The use of five-minute settlement in the spot market was initially scheduled to commence on 1 July 2021. However, in July 2020 the Commission made a rule to delay the commencement by three months to 1 October 2021, to balance the capacity constraints placed on the industry by COVID-19 against the additional costs and deferred benefits associated with a longer delay to the commencement of the respective rules.[102]

7.3 Global settlement and market reconciliation

In December 2018, the Commission made the *Global settlement and market reconciliation* rule (Global settlement) to introduce a 'global settlement' framework for the settlement of the demand side of the wholesale electricity market.

Global settlement moves away from the current 'settlement by difference' approach. Instead, 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.[103]

With the introduction of this rule change, AEMO will be able to facilitate the provision of the separate metering data streams, needed for *Integrating energy storage systems into the NEM* rule change described below.[104]

The Global settlement rule was due to commence in February 2022.[105] However, in July 2020 the Commission made a rule to delay the commencement of the *Global settlement* rule by

100 AEMC, *Five-minute settlement,* final determination, 28 November 2017, p. i.
101 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 8.
102 AEMC, *Delayed implementation of five-minute settlement and Global settlement,* final determination, 9 July 2020.
103 AEMC, *Global settlement and market reconciliation*, information sheet, 6 December 2018.
104 AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, p. 7.
105 AEMC, *Global settlement and market reconciliation,* final determination, 6 December 2018.

three months to 1 May 2022, to balance the capacity constraints place on the industry by COVID-19 against the additional costs and deferred benefits associated with a longer delay to the commencement of the respective rules.[106]

7.4 Integrating energy storage systems into the NEM

In August 2019, AEMO submitted the *Integrating energy storage systems into the NEM* rule change request, as a way to recognise and define energy storage systems, observing that the existing NEM framework and the processes and systems that surround it needed to transition and prepare for less traditional energy technologies and increased grid-scale connections with bi-directional flows.[107]

AEMO noted, in its rule change request, that since the start of the NEM, non-energy cost recoveries had been calculated based on net metering data. However, because there was an increasing number of registered participants with significant counter-flows, the use of net energy data now had the potential to create perverse outcomes, indicating 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, when they had sent out[108] more energy than they consumed.[109]

The AEMC is currently progressing this rule change, having released a consultation paper in August 2020 and an options paper in December 2020. A draft determination is expected to be published by 29 April 2021.

7.5 How *Integrating energy storage systems into the NEM* addresses AEMO and Infigen's issue in the long-term

The *Integrating energy storage systems into the NEM* rule change has the potential to provide a long-term solution to AEMO's settlement issue by allocating costs based on gross energy flows, rather than net energy flows. In its December options paper, the AEMC consulted 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).

106 AEMC, *Delayed implementation of five-minute settlement and global settlement,* final determination, 9 July 2020.

107 AEMO, *Integrating energy storage systems in the NEM,* rule change request, August 2019, p. 1.

108 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.

109 AEMO, *Integrating energy storage systems in the NEM,* rule change request, p. 19.

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.[110]

It is also worth observing that to correctly apportion costs, all of these proposed solutions will also require the implementation of Global settlement to ensure that AEMO has gross data on energy flows, which is due to be implemented by AEMO by May 2022. As a result of this, a more permanent solution cannot be implemented before this time. Hence, an interim solution is required.

7.6 Key dates for related projects

The key dates for the implementation of these related projects are as follows:

- *Integrating energy storage systems into the NEM* final determination expected: **August 2021**
- *NEM settlement in low, zero or negative conditions* expected commencement: **September 2021**
- *Five-minute settlement* commencement: **October 2021**
- *Global settlement* commencement: **May 2022**[111]
- *Integrating energy storage systems into the NEM* non-energy solution expected commencement: **September 2022 - September 2023**.[112]

110 AEMC, *Integrating energy storage systems in the NEM,* options paper, December 2020, p. 19.
111 AEMC, *Delayed implementation of five-minute settlement and global settlement rule,* final determination, 9 July 2020.
112 AEMO, *Regulatory roadmap v4,* 18 March 2021.

ABBREVIATIONS

AEC	Australian Energy Council
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AGE	Adjusted gross energy
Commission	See AEMC
ESOO	Electricity Statement of Opportunities
FCAS	Frequency control ancillary service
MCE	Ministerial Council on Energy
MWh	Megawatt hour
NEL	National Electricity Law
NEM	National electricity market
NEO	National electricity objective
NER	National electricity rules
RERT	Reliability and reserve trader

A AEMO'S PROPOSED DRAFT RULE

AEMO has included a draft rule incorporating proposed amendments to chapter 3 of the NER.

A.1 Proposed rule description

Clause 3.15.6AA(a) — definitions

Defines two key terms:

- The reference period for averaging the customer energy (AGE) amounts to be substituted when actual values in relevant calculations cannot work in settlement systems, because they are effectively zero or negative. This 'demand substitution reference period' is defined initially as the last four complete billing weeks ended prior to the target cost recovery period, with provision for AEMO to review that period if necessary with the benefit of operational experience. The review provisions are set out in paragraphs (d) and (e).
- The cost recovery periods ('relevant recovery periods' which may consist of one or more trading intervals), by reference to the non-energy cost recovery calculations in the NER that will be affected in zero demand periods. As discussed in section 2.1, these are limited to the market customer recovery components for:– Network support and control ancillary services - 3.15.6A(c8) and (c9)– Contingency lower FCAS - 3.15.6A(g)– Regulation FCAS not attributable to individual market connection points – 3.15.6A(i)(2) - System restart ancillary services - 3.15.6A(e) – Compensation for directions for energy, ancillary services or other services – 3.15.8(b), (f) and (g).– Compensation for market suspension periods for energy or ancillary service generation – 3.15.8(b) and (f).

Clause 3.15.6AA(b) — trigger conditions

Sets out the conditions when substitution of AGE values for market customers will occur, namely:

- when determining an amount in a formula that relies on one of several terms representing aggregate customer energy, and
- the value of that term is less than 1 MWh.

Clause 3.15.6AA(c) — substitution calculation and application

Describes how the substituted customer energy values are determined for market customers individually and in aggregate, and applied in the relevant formulas, as follows:

- AEMO will determine an average AGE (or the equivalent term, depending on the formula) for each market customer's relevant connection points in the relevant region over the demand substitution reference period.
- This will yield an energy value per trading interval. As the relevant recovery period may be longer than a single trading interval, the substitution energy value will be aggregated for each trading interval in the recovery period.
- Scheduled load bid into dispatch during the actual intervention period is excluded from the energy amounts used for the recovery of compensation for directions, under clause

3.15.8(b). Therefore, the substituted average trading interval value representing scheduled load would be excluded from a market customer's AGE.

- The regional customer energy, which acts as the denominator in each cost recovery formula, is the aggregate of the substituted market customer AGE (or equivalent) values.

Clause 3.15.6AA(d) & (e) — review description, requirement and process

AEMO will review the demand substitution reference period if either AEMO itself considers that it may not yield a representative average adjusted gross energy value for relevant recovery periods, or a market customer forms that view and requests AEMO to review. The draft rule also specifies that there must be a minimum number of five billing weeks in which substitutions have occurred before a review can be required. The purpose of a review is to ascertain whether or not the existing period remains fit for purpose. Paragraph (d) specifies minimum process requirements as:

- consultation with market customers on the suitability of the current demand substitution reference period and any proposed alternatives;
- publication of a report of the review and reasons for any variation of the period;
- effective date for any variation to be at least four weeks after the date of publication of the report, noting that it will be applied to all relevant settlement calculations from the effective date, including settlement revisions relating to earlier billing periods

B PREVIOUS CONSULTATION

On 26 November 2020, AEMO released an issues paper explaining the issue that is raised in this rule change and its proposed market system solution to prevent the risk of ongoing settlement systems' disruption.[113]

The issues paper provided four substitution options:

1. substitute the market customer's AGE with its average AGE for all relevant connection points in the region over the previous calendar year and the aggregate regional demand with the sum of the substituted market customers' average AGE's in the region over the previous calendar year.[114]
2. use a rolling 365-day period average energy consumption which is calculated dynamically every time a factor is required[115]
3. use the last interval which has a total region consumption larger than 1 MWh[116]
4. divide the non-energy cost to be recovered by the number of active market customers and recovering an equal amount from each.[117]

AEMO's consultation 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.[118]

No stakeholder disagreed with AEMO's assessment that the problem needed to be urgently addressed,[119] but there were divergent opinions between stakeholders on the best substituted value to use:

Table B.1: Summary of submissions to AEMO's issues paper and AEMO's responses

STAKE-HOLDER	PREFERRED SOLUTION	AEMO'S RESPONSE
AEC	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.[a]	N/A

113 AEMO, *NEM settlement under zero and negative demand conditions,* issues paper, 26 November 2020.
114 AEMO, *NEM settlement under zero and negative demand conditions,* issues paper, November 2020, p. 9.
115 AEMO, *NEM settlement under zero and negative demand conditions,* issues paper, November 2020, p. 9.
116 AEMO, *NEM settlement under zero and negative demand conditions,* issues paper, November 2020, p. 9.
117 AEMO, *NEM settlement under zero and negative demand conditions,* issues paper, November 2020, p. 9.
118 See AEMO's website: https://aemo.com.au/en/consultations/current-and-closed-consultations/nem-settlement-under-zero-and-negative-regional-demand-conditions
119 AEMO, *NEM settlement under zero and negative demand conditions,* issues paper, November 2020, p. 9.

STAKE-HOLDER	PREFERRED SOLUTION	AEMO'S RESPONSE
AGL	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.[b]	AEMO notes that it considers that a shorter reference period to calculate the average customer energy amounts, which are substituted, reduces the risk of customer's churn distorting a market customer's demand.[c]
Engie	Engine preferred substituting a market customer's AGE, with the average AGE for all connection points in the region over the previous year.[d]	N/A
Infigen	Infigen noted its collateral issue, 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.[e] 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.[e]	AEMO acknowledged, that whilst it was likely never intended this way, a market customer with a net negative AGE, for a trading interval, could receive a payment, effectively funded by net consuming market customers. This payment would be over and above the total non-energy costs to be recovered.[c] AEMO also acknowledged a 1 MWh threshold for substitution could lead to market customers without significant rooftop solar being required to bear a disproportionate share of non-energy costs. Whilst also acknowledging that a different threshold value could be used to achieve a more equitable and efficient outcome.[c]
Origin	Substituting a market customer's AGE, with the average AGE for all connection points in the region over the previous year. Origin noted that manual adjustments could be made, to account for new customers that were not active in the previous calendar year.[f]	AEMO noted that there is no need for a manual adjustment, because, in substituting energy values, the market settlement systems will calculate a market customer's average customer energy each time relying on the latest data.[c]

STAKE-HOLDER	PREFERRED SOLUTION	AEMO'S RESPONSE
SA Water	1. SA Water preferred using the value from the last trading interval, where there was operational demand which was greater than 1 MWh. 2. SA Water felt the best option was a simplified implementation of an option noted in the *Integrating energy storage systems into the NEM* 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.[g]	AEMO noted that SA Water's first option was more complex and costly to implement than its preferred option. It was also concerned about over or under-representing a market customer's demand, as the lack of actual metering data could require it to use substituted metering data for affected trading intervals.[c] AEMO noted it would be unable to implement SA Water's favoured option before the Global Settlement rule comes into effect on 1 May 2022, because it would not have access to consumed and sent out metering data.[c]

Source: Submissions to AEMO's issues paper: AEC, AGL, ENGIE, Infigen, Origin, SA Water.
Note: [a] AEC, Submission to AEMO's issues paper, submitted 15 December 2020.
[b] AGL, Submission to AEMO's issues paper, submitted 7 December 2020.
c AEMO, *NEM settlement in zero and negative demand conditions,* rule change request, 8 February 2021.
d ENGIE, Submission to AEMO's issues paper, submitted 15 December 2020.
[e] Infigen, Submission to AEMO's issues paper, submitted 15 December 2020.
[f] Origin, Submission to AEMO's issues paper, submitted 15 December 2020.
[g] SA Water, Submission to AEMO's issues paper, submitted 15 December 2020.