SUBMISSION

AEMO CONSULTATION ON AUTOMATION OF NEGATIVE RESIDUE MANAGEMENT FOR THE IMPLEMENTATION OF TRANSMISSION LOOPS

11 JULY 2025

INTRODUCTION

The Energy Users' Association of Australia (EUAA) is the peak body representing Australian commercial and industrial energy users. Our members are the engine room of the Australian economy, producing many of the products that households and business use every day including bricks, glass, steel, aluminium, paper, food and beverages. Combined, our members employ over 1 million Australians, pay billions in energy bills every year and in many cases are exposed to the fluctuations and challenges of international trade.

EUAA members are focussed on making products that meet their own customers' requirements where energy is just one input to the process albeit a critical one. Their expectation is that the energy industry continues to provide energy services that are fit for purpose and consistent with the National Electricity Objectives (NEO) so that our members can continue to provide a fit for purpose product for their customers.

Thank you for the opportunity to make a submission under the Consultation on Automation of Negative Residue Management for the Implementation of Transmission Loops.

At the EUAA, we support the design of rules, legislation and procedures that achieve efficient, cost effective and equitable outcomes for all participants including networks, developers, generators and consumers. In the energy sector under most circumstances, this is best achieved through a national approach and a sharp focus on the NEO. From our perspective, this has not been achieved across the proposed automation of negative residue management (NRM) for the implementation of transmission loops.

Given the PEC loop will include three regions, when the electrical loop is in effect, one arm will always have an Inter-Regional Settlement Residue (IRSR) that is either the opposite sign or zero to the other two arms. This arises due to the three regions in the loop generally having different prices. Where two regions have the same dispatch price, one arm will have zero IRSR. This is normal operation of a looped electrical network.

This means that the likely operating scenarios are:

- a net negative IRSR loop with one or two arms having positive IRSR, or
- a net positive IRSR loop with one or two arm having negative IRSR.

Given the AEMC's current *National Electricity Amendment (Inter-Regional Settlements Residue (IRSR) Arrangements for Transmission Loops) Rule 2025 - Directions Paper* proposes a netting approach for both net negative and net positive IRSR loops:

- we see no reason for any intervention beyond those proposed by AEMC for net positive loops

- we consider that clamping should only occur on negative arms of a net negative loop

We understand that AEMO currently limits negative IRSR by imposing dispatch constraints in NEMDE when the negative IRSR is forecast to reach $100,000 per "instance" of negative IRSR arising. In AEMO's Automation of NRM, we understand the following:

- When negative IRSR is forecast (using a pred-dispatch (PD) estimate) to reach $100,000 the interconnector is "clamped" using dispatch constraints
- When IRSR is forecast (using PD) to result in a positive IRSR, the interconnector is "unclamped" by removing the dispatch constraints
- If negative IRSR continues, the $100,000 threshold is rest as it is a new "incidence"

We find that there are three problems with this current approach that will be exacerbated by the PEC loop.

1. By using PD and not NEMDE, the IRSR forecast uses data prior to rebids being received, does not necessarily consider the correct network constraints and is subject to forecast uncertainty
2. The IRSR returning to positive forecast is using clamped conditions to predict what will happen when the clamp is released, if the trading interval after unclamping has the same negative IRSR this leads to what AEMO refers to as "cycling"
3. Likewise, if the next trading interval has a negative IRSR, the threshold of $100,000 recommences, even if the second "incidence" is part of the same "event" i.e. the network or supply and demand conditions that lead to the negative IRSR are still occurring.

This approach to clamping and unclamping and recommencing the price threshold are inconsistent with the NEO.

We consider that these issues need urgent review, particularly as they relate to the PEC loop which AEMO estimates will significantly increase the occurrence of negative IRSR accumulation, and that current negative IRSR on radial interconnectors can be up to approximately $40 million quarterly, despite clamping.

We consider that the automation of clamping to accommodate the PEC loop, netting off etc can be simply performed through changes in procedures and guidelines by AEMO, but this also needs to address cycling without any further accumulation of costs to the Co-ordinating Network Service Provider (CNSP) and therefore consumers.

It would appear from the Consultation Paper that AEMO are looking for the "simplest" procedures to fix issues with the current Automated NRM, rather than complying with the NEO and finding the best fix to achieve efficient, cost effective and equitable outcomes. This is reflected in our responses to Questions below.

We suggest AEMO actually fix the problems identified with the automated NRM rather than finding suitably shaped band-aid solutions, that will likely need to be torn off and replaced in the future.

We would prefer that the NRM be incorporated into NEMDE, with the potential for three-way co-optimised dispatch of clamping, energy and FCAS. How we would envisage this:

- The NRM uses NEMDE's actual dispatch to count accumulation of negative IRSR
- When the $100,000 threshold is met, the NRM instructs NEMDE to clamp the interconnector.

- From the point of clamping, NEMDE runs twice for each subsequent dispatch interval. Once with the clamp and once without.
    - If the negative IRSR would continue in the next dispatch interval without the clamp, NEMDE sends instructions for dispatch with the clamp in place.
    - If the negative IRSR would cease in the next dispatch interval, NEMDE unclamps the interconnector and sends instructions for dispatch without the clamp
- NEMDE would then resume normal operation until the NRM advises that the $100,000 threshold has again been reached.

By using actual dispatch outcomes, all of the problems identified by AEMO are resolved e.g. Cycling would only occur if a network constraint or the supply and demand balance were also cycling.

This is the only solution to the list of problems identified by AEMO that meets the NEO and protects consumers from unnecessary costs due to mismanagement of negative IRSR.

RESPONSES TO CONSULTATION QUESTIONS

Question 1: When considering AEMO's proposed approach to the inclusion of transmission loops within the automated NRM process, what do stakeholders consider are the main challenges? Why?

When the electrical loop is in effect, one arm will always have IRSR that is either the opposite sign or zero to the other two arms. This arises due to the three regions in the loop generally having different prices or where two regions have the same dispatch price, one arm will have zero IRSR. This is normal operation of a looped electrical network.

This means that the likely operating scenarios are:

- a net negative IRSR loop with one or two arms having positive IRSR, or
- a net positive IRSR loop with one or two arm having negative IRSR.

In reading the proposed measures for "Including the new transmission loop within the NRM process", AEMO are recommending that a clamp is applied on all arms in the loop when negative IRSR exceeds $100,000. However, when a net negative loop accrues $100,000 in IRSR, there will almost definitely be one or two arms that have positive IRSR.

For this reason, we ask AEMO why the positive IRSR arms of a net negative loop are to be clamped when they represent efficient dispatch? We recommend that only the negative IRSR arms of a net negative loop should be clamped.

Question 2: Do stakeholders agree that AEMO's proposed NRM process updates have been appropriately specified?

We do not consider that AEMO's proposed NRM process updates have been appropriately specified.

- Due to AEMO using PD to estimate IRSR, the actual dispatch outcomes will sometimes be different due to participant rebids, forecast uncertainty and constraint representation.

- To release the clamp, the current process uses "clamped" PD. This will almost always result in a release of the clamp as the clamp is preventing negative IRSR in the PD. Again, we recommend incorporating IRSR into NEMDE.

Question 3: Do stakeholders consider the proposed measurement periods for loop-aggregate residues prior to commencement of, and exit from, a NRM management period are appropriate? Why?

We see the use of PD to commence and end clamping as flawed, as it does not take into account actual dispatch outcomes.

- We recommend that IRSR calculations need to incorporated into the dispatch process i.e. NEMDE.
- In this way NEMDE can run with and without the clamp and dispatch the outcome that does not contribute further negative IRSR accumulation if the $100,000 threshold has been met.

In terms of the time period for exit of an NRM management period, as described above, after 30min (i.e. six 5min dispatch intervals), participant bidding may have altered due to the clamp but if the network or supply and demand conditions still exist that caused the negative residue then the participant bidding will quickly return to what it was prior to the clamping.

Instead, we suggest that the clamp remain in place until either the network conditions return to "normal" or the supply and demand balance improves, rather than having a quasi-time-based exit of the clamped period.

Question 4: Do stakeholders consider that the proposed NRM constraint equation step sizes for PEC are appropriate in the current market?

We question AEMO as to why the proposed NRM constraint equation step sizes for NRM_NSW1_SA1 and NRM_SA1_NSW1 are significantly smaller than other interconnector NRM constraint equation step sizes with similar transfer capacity and will be part of the same loop?

i.e. NRM_NSW1_VIC1 and NRM_VIC1_NSW1 have step sizes of -100MW and -50MW while the equivalent NRM_NSW1_SA1 and NRM_SA1_NSW1 are -75MW and -40MW while both have a transfer capacity of roughly 850MW.

Question 5: Has AEMO correctly identified the causes of cycling observed under the existing NRM process?

We consider that the primary cause of "cycling" is caused by the release of a network clamp using PD estimates of future dispatch while the clamp is in place.

Question 6: Is AEMO's proposed modification to minimum flow limits for NRM constraints an appropriate solution to reduce cycling? Are there any unintended consequences?

As is described in the Consultation Paper, the proposed modification to minimum flow limits for NRM constraints will still result in negative IRSR accumulation. While this is an "easy to implement" fix, we do not see this as a solution to cycling, and is inconsistent with the NEO.

The statement in the Consultation Paper that:

> *"AEMO does not consider there are any associated risks with targeting a non-zero minimum NRM constraint limit, apart from a small additional accumulation of negative residue during a management period"*

Demonstrates a lack of awareness of the actual impacts of these accumulations. What is AEMO's definition of "small" over the course of a year? Several million? Would AEMO consider these unnecessary accumulations if it were to pay rather than CNSPs and consumers?

We would like to understand the impact of AEMO's proposed solutions as compared to IRSR calculations being incorporated into the dispatch process i.e. NEMDE, where NEMDE can run with and without the clamp and dispatch the outcome that does not contribute further negative IRSR accumulation if the $100,000 threshold has been met.

Another alternate solution is to manually clamp the interconnector operating with negative IRSR until the network condition or supply and demand balance return to conditions favourable for no negative IRSR accumulation, i.e. in the example provided, a binding constraint in NSW's transmission network caused counter flows into Victoria and negative residue accumulation. While the automated NRM released and re-clamped the interconnector several times (causing cycling), a manual clamp could have been applied until the binding constraint on the NSW transmission network was removed.

Question 7: Is the proposed minimum flow limit of 20MW an appropriate value? AEMO has implemented this release in AEMO's pre-production environment and is seeking feedback on whether there are any unintentional consequences arising from such changes.

As is described in the Consultation Paper, the proposed minimum flow limit of 20MW for NRM constraints will still result in negative IRSR accumulation. While this is an "easy to implement" fix, we do not see this as a solution to cycling, and is inconsistent with the NEO.

The statement in the Consultation Paper that:

> *"AEMO does not consider there are any associated risks with targeting a non-zero minimum NRM constraint limit, apart from a small additional accumulation of negative residue during a management period"*

Demonstrates a lack of awareness of the actual impacts of these accumulations. What is AEMO's definition of "small" over the course of a year? Several million? Would AEMO consider these unnecessary accumulations if it were to pay rather than CNSPs and consumers?

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times (causing cycling), a manual clamp could have been applied until the binding constraint on the NSW transmission network was removed.

Question 8: Describe whether AEMO should or should not also pursue the addition of a graduated release stage to NRM management periods to reduce the possibility of loop-level cycling?

A graduated release stage during the release of a negative IRSR clamp will still accumulate negative IRSR should the conditions that created the negative IRSR still be present.

We would like to understand the impact of AEMO's proposed solutions as compared to IRSR calculations being incorporated into the dispatch process i.e. NEMDE, where NEMDE can run with and without the clamp and dispatch the outcome that does not contribute further negative IRSR accumulation if the $100,000 threshold has been met.

Another alternate solution is to manually clamp the interconnector operating with negative IRSR until the network condition or supply and demand balance return to conditions favourable for no negative IRSR accumulation, i.e. in the example provided, a binding constraint in NSW's transmission network caused counter flows into Victoria and negative residue accumulation. While the automated NRM released and re-clamped the interconnector several times (causing cycling), a manual clamp could have been applied until the binding constraint on the NSW transmission network was removed.

Question 9: Are the process criteria and parameters outlined in Appendix C appropriate for a graduated release stage being added to the NRM process?

While the process criteria and parameters outlined in Appendix C seem appropriate for a graduated release stage being added to the NRM process, the following statement:

> *"While the NRM constraint marginal value and RRP relativity conditions are generally good tests of whether conditions for counter-price flows have subsided, testing shows they are not perfect predictors. Commencement of graduated release after 6 dispatch intervals with no IRSR recorded will allow controlled observation of market outcomes at higher flow limits."*

Is in effect testing the PD assumptions against the NEMDE output. We would suggest skipping the PD step and linking the NRM directly to NEMDE.

Question 10: Do stakeholders consider it appropriate to use 5MS calculations in the NRM process?

We see the current use of a 30 min settlement basis (30MS) inefficient and inaccurate and are surprised that the NRM was not updated as part of the process to change to 5 minute settlements (5MS).

We believe that changing the IRSR calculation to 5MS will have benefits to both CNSPs and consumers as well as Settlement Residue Distribution (SRD) unit holders, as the 5 min cycle will allow more accurate estimation of future IRSR.

However, and noting *"AEMO's congested workflow"*, implementation of our proposed NEMDE IRSR and NRM process would eliminate the need for this extra "project" on top of those AEMO has proposed for cycling.

Question 11: Should the use of Predispatch estimates of future IRSR be removed from the NRM process, wholly or selectively (for example, only for entry to/exit from a NRM management period)?
Question 12: Are there any pre-conditions for, or possible unintended consequences of this change?

We do not support the removal of PD estimates of future IRSR from the NRM unless AEMO intends to switch to actual dispatch inputs (i.e. NEMDE) to the NRM.

Question 13: Do stakeholders consider this to be sufficiently material for AEMO to consider in the future? If yes, please provide justification.

We are generally supportive of the process of changing the constraint equations for clamping of interconnectors to be "softer" rather than "binding" in order to have an overall economically efficient dispatch if negative residue accumulation results in cheaper dispatch outcomes overall. i.e.

$ Negative IRSR < $ energy + $ FCAS

However, this would need to be demonstrated to be a real solution and we would expect AEMO to commit to reporting on these events individually for analysis by the Settlement Residue Committee (SRC).

If AEMO does not want to, or will not report on events where negative IRSR accumulation exceeds the $100,000 threshold for the net benefit of consumers overall, then we do not support softening the constraint equations for clamping interconnectors.

Question 14: Are there alternative approaches to dealing with the issues described?

As has been described above, we would prefer that the NRM be incorporated into NEMDE, with the potential for three-way co-optimised dispatch of clamping, energy and FCAS. How we would envisage this (adding to our model above):

- The NRM uses NEMDE's actual dispatch to count accumulation of negative IRSR
- When the $100,000 threshold is met, the NRM instructs NEMDE to clamp the interconnector *unless additional negative IRSR meets $ Negative IRSR < $ energy + $ FCAS*.
- From the point of clamping, NEMDE runs twice for each subsequent dispatch interval. Once with the clamp and once without.
    - If the negative IRSR would continue in the next dispatch interval without the clamp *or if $ Negative IRSR < $ energy + $ FCAS*, NEMDE sends instructions for dispatch with the clamp in place.
    - If the negative IRSR would cease in the next dispatch interval *and $ Negative IRSR > $ energy + $ FCAS*, NEMDE unclamps the interconnector and sends instructions for dispatch without the clamp
- NEMDE would then resume normal operation until the NRM advises that the $100,000 threshold has again been reached.

By using actual dispatch outcomes, all of the problems identified by AEMO are resolved i.e. Cycling would only occur if a network constraint or the supply and demand balance were also cycling.

We see this is the only solution to the list of problems identified by AEMO that meets the NEO and protects consumers from unnecessary costs due to mismanagement of negative IRSR.

Question 15: Do stakeholders agree with the priorities assigned to these items?

While our preference remains for the NRM to be incorporated into NEMDE, we have suggested alternate priorities in a new column of your table.

Table 5 Automated NRM management process – change priority ranking

Item	Section ref.	Description	Benefit	Implementation complexity (AEMO System impact)	Priority	EUAA Priority
PEC-related changes	3.1	NRM Loop Flag and incorporation into NRM process. Addition of NRM constraint equations and step sizes for PEC directional interconnectors.	High	High	**Mandatory**	Mandatory
Cycling (1)	3.2.1	Modification of NRM constraint limits to set non-zero minimum flow.	High	Low	**High**	Moderate (not needed if using NEMDE)
NRM IRSR estimation	3.3.1	Replacement of 30MS residue estimation with 5MS calculations.	Moderate	Low to Moderate	**Moderate to High**	High
Cycling (2)	3.2.1	Addition of Graduated Release stage to NRM management periods.	Moderate to High	High	**Moderate**	Low-Moderate
Use of predispatch estimates	3.3.2	Remove use of predispatch negative residue estimates in NRM process.	Low	Moderate	**Low**	High if changing from PD to NEMDE
NRM constraint CVP value	3.3.3	'Soften' NRM constraints to mitigate unintended consequences, by reducing CVP below Market Price Cap.	Low	Moderate	**Low**	Moderate-High if 3-way co-optimised
FCAS co-optimisation	3.3.3	Exclusion from NRM automated process of NRM events driven by FCAS-energy co-optimisation constraints.	Low to Moderate	High	**Low**	Moderate-High if 3-way co-optimised

CONCLUDING REMARKS

At the EUAA, we support the design of rules, legislation and procedures that achieve efficient, cost effective and equitable outcomes for all participants including networks, developers, generators and consumers. In the energy sector under most circumstances, this is best achieved through a national approach and a sharp focus on the NEO.

We support the addition of transmission loops into the automated NRM, however disagree with the need to clamp all arms on a net negative IRSR loop.

While there is sufficient evidence of all other issues raised by AEMO in the Consultation Paper, we do not believe that the current, nor AEMO's proposed automated NRM are aligned with the NEO. Instead, we have proposed an alternative approach that links the NRM to NEMDE (rather than PD) and have provided an alternative to our model to co-optimise negative IRSR with the current energy and FCAS dispatch. We believe that this approach requires

less coding and results in a more efficient outcome than what has been proposed by AEMO, aligning with the NEO and *"AEMO's congested workflow".*

The EUAA welcomes further discussions around the issues raised in this submission.

Do not hesitate to be in contact with EUAA Policy Manager Dr Leigh Clemow, should you have any questions.

Andrew Richards
Chief Executive Officer