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Dear Mr Tutaan

Comments on Issues Paper: Management of negative inter-regional settlements residues

Thank you for this opportunity to contribute to the Review of the management of negative inter-regional settlements residues.

The Australian Energy Market Operator (AEMO) operates the National Electricity Market (NEM), the Victorian Declared Wholesale Gas Market (DWGM) in Victoria and the Short Term Trading Markets (STTM) for gas at hubs in Adelaide, Sydney and Brisbane. AEMO is also responsible for the procurement and planning of the shared network and for connections to the electricity transmission network in Victoria, and has a range of national planning functions for electricity and gas transmission.

AEMO has assisted the preparation of the issues paper by providing data, procedures and demonstrations. I would like to take this opportunity to thank you for taking the time to understand the complex dispatch process in detail.

Please find attached our submission. If you would like to further discuss any matters raised in this submission, please contact Ben Skinner on 03 9609 8769.

Yours sincerely

David Swift

Executive General Manager, Corporate Development

Attachments: AEMO submission

AEMO Submission to Issues Paper: Management of negative inter-regional settlements residues

1. Scope of the Review

The issues paper provides an excellent introduction and explanation of negative inter-regional residues and AEMO's management of them. This scope meets the requirements of clause 3.8.10(g).

AEMO considers this review provides an excellent opportunity to highlight the circumstances that bring about negative residues, and why, despite AEMO's efforts to manage them, large negative residues continue to accumulate. AEMO has discussed some of the circumstances below in section 3. Whilst these market problems cannot be addressed in this review, information gained could be useful in other forums, such as those considering implementation of the main recommendations of AEMC's Transmission Frameworks Review.

At the same time the review is likely attract views on details of AEMO's procedures for managing negative residues. Like all AEMO procedures, these sit a layer below the rules, and are developed and consulted upon by AEMO directly. AEMO considers that the current scope of the negative residue management procedure is appropriate. Whilst we welcome the AEMC's high-level insight from this review, we suggest procedural improvements should continue to occur through existing approaches.

2. Context of the Review

When it was originally implemented, the concept of AEMO intentionally constraining the dispatch engine away from its objective function without a security rationale was controversial. Many consider this an "intervention", inhibiting what should presumably be the least-cost dispatch. When the current review was specified in the Rules, it was hoped that the problem would ease over time such that interconnector clamping might be discontinued.

This has not occured. Negative residues remain significant even after AEMO's attempts to clamp, and have in fact been increasing as a proportion of positive residues. It is clear that had AEMO not attempted to clamp the Qld to NSW directional interconnector 23 times during January 2013 then much greater than $6.1million of negative residues would have accrued[1].

It therefore seems unlikely that clamping can be discontinued until the underlying causes of these counter-price flows have been addressed. AEMO considers it important for the AEMC to consider as part of this review, what the underlying causes of negative residues are, and whether any other actions may be taken to limit their growth at the cause.

These underlying causes have market impacts beyond the funding of negative residues. Even if negative residues are successfully managed through clamping, positive residues would still not accrue during the regional price separation. This means that the Settlement Residue Auction (SRA) instrument is ineffective in providing an inter-regional hedge, thereby affecting the capacity of participants to trade inter-regionally.

[1] The January 2013 events repeated the events of the previous summer, described here http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/Market-Event-Reports/NEM-Operations-Review-Queensland-Summer-2012-855-871-Congestion. Reports on individual days in January 2013 can be found here: http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/Pricing-Event-Reports/January-2013.

3. Negative Residues Causes

Figure 2.1 of the issues paper describes a circumstance of an efficient counter-price flow, where the output of a $20 generator in a region priced at $100 spills into the adjacent region priced at $50. These generators are bidding reflective of cost, and a small negative residue arises due to an imperfect regional boundary. In this case clamping reduces dispatch efficiency.

The vast majority of negative residue events do not arise in such benign circumstances. Instead they mainly result from constrained generators bidding at the market floor price, causing a spillover across interconnectors. Whilst the dispatch engine will determine the most economic dispatch based on the bids presented to it, in these circumstances the outcome is not efficient because market floor price bids would rarely represent true costs. As a result, the counter-price flows are unlikely to be efficient and therefore their clamping is more justifiable.

Where looped constraints combine with floor price bidding, a low co-efficient on an interconnector term can cause the dispatch engine to drive very large counter-price flows. These large flows redirect supply away from the exporting region, causing the regional price to increase. The clamp actually interrupts this process, frequently dropping the regional price. Thus in these situations the clamping process seems to both lessen inefficient dispatch as well as interrupting the price spikes that frequently arise during these "disorderly bidding" scenarios.

AEMO's clamping role is unarguably affecting commercial outcomes, creating winners and losers. Whilst clamping may be preferable to negative residues, it is an uncomfortable role for the market operator. It draws attention to the day to day management of the clamping, which inevitably requires arbitrary thresholds and operational judgement.

Other less significant causes of negative residues can include:

- Five minute pricing/thirty minute settlement averaging during a reversal of price relativities.
- Uneconomic flows to manage system security during unusual network conditions, such as power system separation not at the regional boundary.

This review provides the AEMC with an ideal opportunity to investigate the key causes and provide information for the purpose of ultimately removing the need for relatively arbitrary market interventions such as clamping.

4. Rates of Change

AEMO's clamping works through the action of a constraint directly upon an interconnector flow. This has a dispatch priority[2] of two times the market price cap. Where the counter-price flow has been caused by generator bids at the price floor, the clamp will be effective. If however the counter-price flow is caused by a conflicting constraint, the effectiveness will be determined by the relative positions in the Constraint Violation Penalty (CVP) priority order. The clamp has a relatively low priority, to ensure it will violate ahead of other constraint equations required to maintain power system security.

[2] Implemented via a "Constraint Violation Penalty" which is a multiple of the Market Price Cap. See http://www.aemo.com.au/Electricity/Market-Operations/Dispatch/Dispatch-Constraint-Violation-Penalty-Factors

AEMO presumes that participant entered constraints indicate the bounds of generator technical performance and so these have the highest priority at 440 times the market price cap. Otherwise the dispatch engine could converge upon impossible solutions, such as generator targets greater than capacity or below zero.

Normally the market incentives encourage generators to represent their full technical capability in their bids. However to limit the financial impact of being constrained-off, there is an incentive to enter a Fixed Loading Constraint or reduce the Rate of Change down. Where these are used to avoid being constrained-off, the clamp will be ineffective.

Using these rebidding techniques to overcome congestion is partially restricted by the National Electricity Rules. However a generator's legal use of a non-technical Rate of Change caused clamping to fail to control negative residues on 22 April 2010 when $19 million of negative residue accrued[3]. It has also affected other events to a smaller extent.

5. Managing negative residues through clamping

The management of negative residues is inherently difficult. Prices and therefore negative residues are an output of the dispatch process, not a dispatch variable that can be constrained. AEMO must observe input conditions that appear likely to result in negative residues, and then intervene in the market by directly constraining the interconnector flow.

5.1. Process Logic

The issues paper has accurately summarised the logic presently used in the automated clamping and revocation process, noting that the residues are detected within, and over successive, trading intervals rather than dispatch intervals.

The current logic used in the automated process appears to be working as designed. AEMO is aware of some areas for possible improvement:

- Manual process for price revisions. The automated process is currently suspended whilst a price is flagged for review. Recent experience is that the vast majority of flagged prices are ultimately accepted without change, so the disadvantages of rare false positives triggering the clamp may be outweighed by the benefits of avoiding the more frequent false negatives.
- Non-conformance. In order to implement the clamp in a managed fashion, the current procedure progressively ramps the interconnectors down from the previously measured flow. For example 100MW per dispatch interval for Qld-NSW. During high price events, interconnectors may deviate by 100MW from their dispatch target, caused by scheduled generator non-conformance and unscheduled response. This can mean that the clamp's effectiveness is substantially delayed. A faster ramp rate, or other technique may be necessary.

AEMO considers matters of this level of detail are best dealt with through standard procedure consultations.

5.2. Event definition

Throughout the NEM's history of managing negative residues, AEMO has measured the accruing negative residues against a threshold in each single "event" — a single event being a continuous series of trading intervals in which negative residue would occur in the absence

[3] See http://www.aer.gov.au/sites/default/files/5000Report_22%20April%202010%20-%20VIC%20.pdf and Appendix D of http://www.aemc.gov.au/Media/docs/AEMO-b64b3c62-db16-4a2b-aa28-316545eb4b38-0.pdf

of clamping. Measuring negative residues over other time periods would theoretically be possible, but would have advantages and disadvantages. It could, say, be over a rolling 24 hour period. This might:

- Improve the management of negative residues in situations like Qld-NSW January 2013 events where cycles of disorderly bidding, negative residues and clamping were observed to occur multiple times per day[4].
- Potentially interfere too early with brief transitory negative residues that occur some hours after unrelated serious negative residue events.
- Require greater implementation complexity as historical residues would need to be tracked over time.
- Result in simultaneous clamps in both directions upon one interconnector.

The revocation logic was designed to detect the conclusion of the event as quickly as possible. If it was determined from a policy perspective that the arrangements for managing negative residues should be changed to inhibit repeating events, then a practical way to marginally increase the event definition could be through increasing the number of tested non-negative residue intervals in the revocation logic.

5.3. Lowering the $100,000 threshold

AEMO has performed some simple analysis of historical negative residue events to test the significance of the $100,000 threshold. That data can be provided to the AEMC.

Of the events from 1 July 2010 to date, 69% of negative residues accrued during events accumulating in excess of $130,000 of negative residues[5]: events where other factors caused the clamp to fail to achieve its intent.

27% of negative residues accrued during events of between $10,000 and $130,000. A lower threshold may have reduced some of these, although it is not certain.

This analysis showed that had the threshold been lowered, the volume of negative residues accumulated over the years would have remained high. Therefore the question of lowering the threshold would not seem a significant matter for the review.

5.4. System Automation Experience

AEMO has now operated its automated clamping process for over twelve months. AEMO considers this to have been a very successful implementation, having both reduced operator workload and standardised our operational response. Although AEMO retains the ability to over-ride the automated process, to date this has not been necessary.

Whilst this has reduced the need for on-line judgement and interpretation, it should be noted that developing the process itself required judgement and interpretation, which is described in our published brief[6].

Given the success of the automation, AEMO considers that any future enhancements in the negative residue management procedure should be implemented through an automated system. We should avoid changes that require reverting to manual intervention.

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[4] In the 32 hours leading up to 6AM on 18 January 2013, this interconnector was clamped seven times.

[5] Events of greater than $130,000 were considered to be "well in excess". The clamp procedure is not expected to achieve exactly $100,000.

[6] http://www.aemo.com.au/~/media/Files/Other/Dispatch/Brief_on_Automation_of_Negative_Residue_Management.ashx

AEMO takes the view that participant risk is minimised by making our response to these events more predictable and transparent. A possible outcome of such a philosophy however is that participant behaviours might adjust in order to influence the AEMO response, which may have unintended effects. This has not been considered in our approach.

5.5. Transparency of procedures

AEMO has progressively released communications and briefs on the management of negative residues as it has evolved over time. Most of our participant contacts with dispatch interest are very experienced and appear to have a good understanding of the current practices.

AEMO would be interested in feedback from the AEMC and participants regarding the presentation of the material, and whether an investment in improving the presentation is worthwhile.

5.6. Transparency of operations

The automation process continues historic practice of publishing a market notice with every clamping action. The standardised format of the notices enables the events to be readily queried.

In the 2013 Congestion Information Resource consultation a participant suggestion was submitted regarding real time publication of the negative residue accumulation value which would enable traders to anticipate clamping actions. AEMO is presently investigating publishing this quantity real-time.