

B Review of Charles River Associates work on constraint management for MCE and associated submissions

This Appendix reviews Charles River Associates (CRA) 2004 draft recommendations to the Ministerial Council on Energy (MCE) ²²⁶ on constraint formulation and pricing plus the submissions to the associated consultation. Under clause 3.3 of the Terms of Reference the Congestion Management Review should have regard to the previous work undertaken by CRA on constraint management and pricing as part of their report “NEM-Transmission Region Boundary Structure”. Clause 3.3 also states that submissions to the associated consultation should form the basis for the Commission’s review on constraint management.²²⁷

A total of 24 submissions were received by the MCE on CRA’s draft report, although a number of parties were part of two large joint submissions. The Queensland Generators²²⁸ and a collection of market participants who labelled themselves the “Group”²²⁹ made detailed joint submissions. Organisations which made submissions are listed at the end of this Appendix and submissions can be accessed from the MCE website.²³⁰

B.1 Charles River Associates: NEM - Transmission Region Boundary Structure, Consultation Draft to MCE, September 2004

CRA’s consultation draft to the MCE addressed the criteria for setting future boundaries for price regions and advocates the staged approach for congestion management. It also looked at the representation of the technical characteristics of the transmission network in the constraint formulation process by NEMMCO. The key elements of CRA draft recommendations are:

- Implicit absorption within the energy market of the costs of minor levels of congestion;
- Regular publication of information on existing and emerging congestion in the NEM;
- Introduction of consistent constraint formulation throughout the NEM combined with a practical measure to limit the scope for counter price flows between regions;

²²⁶ Charles River Associates, Consultation Draft, NEM - Transmission Region Boundary Structure, September 2004.

²²⁷ Ministerial Council on Energy, Congestion Management Review Terms of Reference, 5 October 2005, p.4.

²²⁸ The Queensland Generators include CS Energy, Enertrade, InterGen, Stanwell and Tarong Energy.

²²⁹ The Group consists of AGL, Delta Electricity, Loy Yang Marketing Management Company, Macquarie Generation, Stanwell Corporation, Yallourn Energy, Powerlink and Transgrid. Their submission was prepared by Frontier Economics.

²³⁰ www.mce.gov.au

- Introduction of an economic test in the criteria for assessing proposed changes to the regional structure;
- Establishment of a timeframe for conducting regional boundary reviews, announcing boundary changes and maintaining any new regional structure;
- Need to ensure consistency between the application of the Regulatory Test and boundary reviews;
- Development of a contracting/pricing mechanism to deal with material congestion until the problem is addressed through investment or regional boundary change; and
- Market authorities should be requested to develop a program for implementation of a congestion management contracting and pricing regime using the proposal for Constraint Support Pricing and Contracting presented as the starting point.

CRA's recommendations are based upon the view that transmission constraints, at least within regions, will not be prolific as transmission investment will occur in a timely manner and that stability in the market environment promotes the certainty and predictability required to encourage suitably located generation investment. CRA concluded that full nodal pricing (and settlement) of both generation and load was not required. However, CRA did recommend that given the regulatory framework for network investment, there would be benefits from implementing a form of targeted generator nodal pricing and settlements, which would be utilised to manage material congestion. It considered that such an approach would continue to have regional pricing and settlement for loads.

CRA prepared a Final Report to the MCE which was dated April 2005 on these recommendations which the MCE published in 2007.²³¹ The Final CRA Report affirmed the recommendation in the draft report, and clarified a number of matters in light of submissions on the draft report. CRA maintains the same recommendations as in its draft report in the Final and this Appendix also summarises any further thoughts by CRA contained in its Final Report.

Regarding constraint management and pricing, CRA's views and recommendations fall into four categories:

- Constraint Formulation;
- Responding to strategic bidding behaviour by generators;
- Managing counter-price flows; and
- Constraint Contract and Pricing Mechanism.

This Appendix notes CRA recommendations and summarises the submissions received on these four topics. CRA's additional thoughts in the Final Report are also noted below.

²³¹ Charles River Associates, Final Report, NEM - Transmission Region Boundary Structure, April 2005.

B.2 Constraint Formulation

In the October 2004 draft consultation to MCE, CRA advised the following regarding how constraints should be formulated in the NEM for optimal dispatch:

- No change should be made to existing dispatch objective to optimise each dispatch run on the basis of the prices presented at the time;
- That NEMMCO adopt a consistent approach for constraint formulation and that a direct physical representation for constraint formulation (either Option 4 or Option 5) be used. CRA noted this is consistent with the market design principles in the Code that call for NEMMCO decision making to be minimised;
- Either Options 4 or 5 allow for variables to be fully optimised by the dispatch engine and will produce physically equivalent outcomes assuming the same physical network representation. Option 4 is the constraint form if a regional model used for dispatch, with varying constraints orientations yielding prices corresponding to different regional reference nodes, and Option 5 if a full network model²³² was to be employed;
- That the issue of applying Option 5 is not dependent upon the implementation of nodal pricing because dispatch and pricing arrangements can be decoupled. The decision between Option 4 and Option 5 should be based upon system security and that NEMMCO should conduct a review if it believes a full network model (Option 5) is necessary in order to meet its obligations for system security;
- That constraint equations should be reviewed and updated on a regular basis; and
- That shadow prices behind intra-regional constraints be published.

B.2.1 Summary of Submissions on Constraint Formulation

There was overwhelming support for CRA's recommendation for NEMMCO to adopt a consistent approach for constraint formulation with direct physical representation of the network. Snowy Hydro agreed that dispatch and pricing can be decoupled and commented that the dispatch model must represent the underlying electrical network in order to correctly manage loading.

Regarding the choice between Option 4 and Option 5, most of the submissions were fairly neutral, while some argued in favour of Option 4.

The Queensland Generators group considered that Option 4 was best as it provided optimal dispatch of plant and secure utilisation of the full transmission capacity. It considered that CRA overstated the possible benefits for system security from applying Option 5 (full network model), and argued that the approximation of fixed

²³² A full network model directly represents the electrical characteristics of each and every physical transmission element, the limits applying to that element, as well as system security constraints that apply to more than one element.

loss factors under Option 4 was not a problem when many constraints used actual measured flows in feedback type constraints. The Queensland Generators also argued against other options previously raised because they gave a particular category of generators priority over others by removing them from the left hand side of the constraint and that the allocation of priority can be arbitrary.

Delta Electricity supported the adoption of Option 4 constraint formulation but believed it could be enhanced though the equalisation of constraint equation coefficients. It recommended that near identical constraint equations were equalised in order to prevent inappropriate and perverse constraints. The Group submission supported Delta's equalisation proposal.

The Group submission considered that that a full network model would not be required if Option 4 was supported by an appropriate counter flow management regime.

Energy Retailers Association of Australia (ERAA) commented that it would support the implementation of the full network model if NEMMCO could demonstrate that the cost of implementation was outweighed by the benefits.

Many submissions supported the recommendation for NEMMCO to consult on whether Option 5 was required for system security. Both the National Generators Forum (NGF) and Southern Hydro considered that the consultation should evaluate other costs and benefits besides system security. The Group argued against the consultation noting that Option 4 was in part proposed by NEMMCO for system security reasons.

Most of the submissions supported the publishing of shadow nodal prices with only the Queensland Generators arguing against it. It commented that the information would not mean much because of the bidding wars between generators and that bidding is driven by dispatch reasons rather than revenue.

B.2.2 Further thoughts in CRA's April 2005 Final Report

CRA maintained its position that a consistent and direct physical representation of the network (either Options 4 or 5) was best since it allowed decisions on physical representation to be decoupled from the design of the pricing regime.

B.3 Responding to strategic bidding behaviour by generators

In the draft consultation, CRA stated the following regarding responding to strategic bidding behaviour:

- CRA noted that addressing adverse bidding behaviour is required for congestion management and recognised that under the Options 4 or 5 representations of constraint equations, some generators may have incentives to bid below their short run marginal cost of production (SRMC) where intra-regional constraints bind. However CRA argued that the form of the general constraint equation should not be modified to prevent or deter distorted bidding. Rather, CRA's

recommendation is for such behaviour to be referred to and dealt with by the relevant (competition) authorities; and

- CRA also noted that changes to constraint formulation or to region boundary structure may only solve some bidding behaviour but could create new adverse bidding. This is because network congestion will always create pockets of localised market power.

B.3.1 Summary of Submissions on strategic bidding behaviour by generators

Some of the submissions questioned CRA's consideration that such strategic bidding behaviour is anti-competitive. Enertrade considered that it was grossly inaccurate to characterise bidding practises which responded to the current rules as inappropriate and that there was no evidence to support CRA's view that such behaviour was an abuse of market power. TXU Energy considered that the additional cost of the increased risk burden caused by uncertainty of dispatch needed also to be modelled to understand the current dispatch inefficiency, and noted that NEMMCO's constraint equations were not designed to deal with allocating transmission capacity. This in turn would lead to strategic behaviour which would result in the withdrawing of capacity from the contract market.

Other submissions questioned the value of referring these matters to the relevant competition authorities. The Group submission did not consider that referring market power issues to the ACCC would be effective. It noted that the ACCC's approval of NECA's rebidding Code changes did not follow directly from its enforcement of the part IV competition provisions of the Trade Practices Act, but rather from the Code requirement that virtually all Code changes are to be authorised by the ACCC. Therefore, simply 'referring disorderly bidding' to the ACCC was unlikely to result in any control over this behaviour unless accompanied by a relevant Code change proposal.

The Group considered that even in these circumstances, as with the rebidding Code changes, the ACCC was likely to be reluctant to intervene in participant bidding behaviour that does not involve an exercise of market power for a proscribed purpose or anti-competitive agreements. The Group argued that if the good faith bidding provisions in clause 3.8.22A were applied in a way that seeks to prevent disorderly bidding - by, for example, proscribing certain negative bids - this would represent a major behavioural intervention in the market and could create a great deal of uncertainty and dispatch inefficiency.

B.3.2 Further thoughts in CRA's April 2005 Final Report

CRA maintained its recommendation that concerns about inappropriate bidding behaviour should be referred to the relevant authorities. It considered that it was important to have a clear separation between market operations and responsibility for enforcing trade practise provisions. CRA noted that this sort of policy response was not new to the NEM as the ACCC had in the past imposed conditions on specific parties participation in the SRA contracting process (e.g. capping the number of IRSR units Snowy Hydro can bid for).

B.4 Managing counter-price flows

Under the current Chapter 8A, Part 8 Network Constraint Formulation derogation of the Rules, in instances where NEMMCO considers that counter-price flows will lead to the accumulation of negative settlement residues, it can use a discretionary constraint formulation to stop this accumulation. CRA stated that this derogation means that adverse bidding behaviour was being addressed through constraints formulation and commented that it would reduce short term bidding behaviour when adverse bidding behaviour was not presented and complicated the dispatch process. Furthermore CRA noted that negative residues could result as part of the economically optimal solutions to dispatch around a network loop, and therefore using constraint formulation to address this was inefficient.

However CRA considered that this approach was appropriate in the short term but in the long term such a derogation would decrease efficiency as more and larger loops are created in the network. They recommended that the derogation be allowed to continue and that the use of a simple constraint on network transfers to minimise negative settlement residues by NEMMCO also be allowed. CRA's preference was to use clamping of the interconnector instead of an Option 1 formulation to address negative residues.

However CRA advised that another mechanism which was external to the dispatch process should be implemented to address inefficient bidding behaviour. They suggested that a contracting mechanism (i.e. CSP/CSC) be assessed as a longer term and more general instrument to influence bidding and deal with negative IRSRs.

B.4.1 Summary of submissions on managing counter price flows

There was a mixed response to CRA's recommendation to continue the derogation to enable NEMMCO to intervene to manage counter-price flows.

Energy Retailers Association of Australia (ERAA), NGF, Southern Hydro, Ergon Energy and Powerlink supported NEMMCO intervention to manage counter price flows to restrict negative residues forming. Most of these submissions agreed with CRA that this was a temporary measure and that the intervention would face problems if increased loop flows appear between pricing regions.²³³

Origin Energy argued against the current intervention to manage counter price flows as it considered that this did not impart effective discipline on participants nor did it lead to a satisfactory allocation of access to market when constraints bind. Hydro Tasmania stated that the proposals do not adequately address the issue of negative settlement residues and that the different treatment of local generation to interconnector flows allowed under the derogation was not consistent with a national market.

²³³ Southern Hydro stated that the CSP/CSC mechanism should be developed for more persistent constraints or where loop flows make the current regime unworkable. Ergon Energy stated that continued intervention to limit negative residues was supported but should be reviewed once major AC transmission loops appear between pricing regions.

The Queensland Generators, instead, thought that negative residues should be funded out of auction proceeds. Since negative residues could be due to economic dispatch, AGL also preferred a better funding mechanism than for NEMMCO to intervene and artificially reduce inter-connector capacity and hence disagreed with CRA's recommendation.

The Group raised an alternative suggestion to the current intervention to minimise negative settlement residues. It stated that a more robust and transparent approach to reducing the occasional counter price flow outcomes of Option 4 could be achieved by implementing a look forward NEMDE run. This would effectively involve a double run of the NEMDE after ramping back inter-connector flow if the first run of the NEMDE showed that counter price flows would occur. The Group considered that the operating speed of the NEMDE is sufficient for this approach to be feasible.

B.4.2 Further thoughts in CRA's April 2005 Final Report

In its final report, CRA maintained the same recommendations. It considered that negative residues could be controlled by limiting flow on inter-connectors even though this may also curtail efficient dispatch. It also noted that future development of the network was likely to lead to more occasions when anything but a direct physical representation will reduce efficiency of dispatch, especially as more and larger loops are created in the network due to normal expansion. Therefore it stated its preference for a constraint contract and pricing mechanism, as it offers the opportunity for contracts to be employed to alter the incentives on market participants to encourage bidding in a manner that also limited flow on an inter-connector without the need to resort to flow limits.

B.5 Constraint Contract and Pricing Mechanism

In the October 2004 draft consultation, CRA advised that:

- There should be a selective introduction of contracting and pricing of network congestion within and between regions where there are economic benefits that would otherwise be lost, and in particular to create incentives for more efficient responses to congestion;
- Selective implementation of a contracting and pricing mechanism should be triggered when congestion passes an impact threshold. However region boundary change should be used for significant and persistent constraints;
- CRA considered the defining characteristic of that mechanism should be to create incentives for responses to manage particular constraint situations rather than a hedging insurance against price differences;
- Voltage control and Network support agreements are forms of a contracting and pricing mechanism which currently operate in the NEM;
- CRA developed a Constraint Support Pricing (CSP), accompanied by a contracting regime that can flexibly incentivise behaviour and offer price

insurance – Constraint Support Contracts (CSC) regime as a basis to develop such a mechanism;

- Due to the sensitive commercial impact of introducing such a regime, CRA advised that an operational investigation with a high level of involvement of market participants be instituted to assess implementation; and
- Criteria to introduce specific contracting and pricing for a constraint should be on a case by case basis.

B.5.1 Summary of Submissions on Constraint Contract and Pricing Mechanism

Most of the submissions commented that the CRA report did not provide sufficient detail on how a contracting and pricing regime would be implemented. Views were divided as to whether a contract and pricing mechanism would be required. Many submissions commented that the key issues of any mechanism would be how contracts were allocated and how to manage generators that could be exposed to negatively priced contracts. The other difficulty raised with contracts was how to define the expected efficient output of each generator. Some of the submissions recognised that there will never be agreement from market participants on the allocation methodology and that the decision will involve winners and losers.

The Queensland Generators stated that a mechanism external to the dispatch process was preferred to addressing inefficient behaviour and accepted CRA's CSP/CSC mechanism in principle, subject to further assessment, especially in the areas of allocation and governance.

Enertrade considered that the current arrangements for addressing intra-regional constraints (namely Network Support Agreements (NSA) and constrained-on compensation payments) did not do enough but it needed to see more detail on the CSP/CSC scheme before endorsing it. Its initial view was that CSP/CSC arrangements will not be effective in managing intra-regional constraints that do not have a direct or indirect inter-regional impact because they would not generate net income for generators who relieved the constraint. Also, Enertrade considered it was important to examine all options, including possible improvements to the existing NSA and constraints on direction arrangements. Enertrade also stated that in relation to the CSP/CSC regime, dynamic changes in the right hand side of constraint equations would make it difficult for generators to predict and dispatch to their relative allocations under CSCs.

Snowy Hydro strongly supported the proposed CSP/CSC regime. It considered that it would eliminate the current perverse bidding incentives and would remove the requirement for intervention actions by NEMMCO, either to maintain system security or to minimise negative residues and hence would firm up IRSRs.

Origin Energy supported the implementation of a CSP/CSC regime to address significant congestion in between boundary reviews, but only to the extent that an acceptable allocation methodology could be developed for CSCs.

Ergon Energy disagreed with the use of CSP/CSC as an effective congestion management mechanism as it depended on some deemed average impact that the generator had on a constraint. It noted that the real time impact would not be constant. The deemed generators parameters needed to be updated regularly to maintain some degree of consistency with physical power flow behaviour. Ergon also considered that the CSC would be a non-firm hedging instrument. Overall, Ergon considered the CRA proposed CSP/CSC arrangements would lead to nodal pricing and in its submission it provided an analysis of Queensland and suggested that locational energy prices would not significantly affect generator investment for at least the next decade. Ergon considered that CRA had underestimated the amount of central control and regulatory intervention required to implement the proposed regime.

The Group did not support the CSP/CSC proposal as it considered that the primary mechanism for managing significant network congestion should be the regional boundary criteria.

InterGen stated that the allocation of CSC should ensure that incumbents' generators were not disadvantaged. They considered that it was essential for the integrity of the CRA recommendations that the contracts be allocated to existing generators free of charge so that they did not suffer significant revenue or value changes within a region review period. Failure to allocate to existing generators would create a major flaw in the logic for the proposed regime and fail to achieve desirable outcomes.

Macquarie Generation thought that a CSP/CSC regime was not necessary as it considered there were only a few instances of intra-regional congestion in the NEM. It argued that the proposal for periodic assessment of region boundaries combined with the transmission augmentation framework should be sufficient.

Powerlink considered that current intervention under the Derogation was a better measure than the proposed CSP/CSC mechanism. It did not consider that the CSP/CSC regime as proposed by CRA would provide the right signals to TNSPs for investment to alleviate the congestion.

ACCC advised that more work was required on examining the full nodal pricing solution, especially on the implementation costs/issues and it attached a report from IES that showed the potential benefits from nodal pricing to be significant.

ACCC commented that further work is needed on CSP/CSC, especially on the issue of allocation and its submission contained a paper from Dr Biggar on CSP/CSCs. Dr. Biggar noted that the CSP part of the CRA proposal provided the correct pricing signals to generators in the event of an intra-regional constraint. However, Dr Biggar raised a number of concerns with respect to CSCs. In particular, Dr Biggar noted that it was not clear how these grandfathered rights would be determined. He demonstrated that if the grandfathered rights were set in a particular way – specifically equal to the dispatch of the generator under the existing arrangements, the resulting outcome ensured that neither any generator nor the system operator was left worse off as a result. However, he thought that any attempt to define a set of grandfathered rights would be difficult and contentious. In addition to the issue of how to allocate these rights, it was also not clear for what period of time these rights would be set and how rights would be reallocated in the event that new

generation comes on line in an area where an intra-regional constraint occurs. Further, the party responsible for the determination and allocation of these rights must be established. ACCC also noted that another issue was that CSPs would provide the correct pricing signals to generators but not to load.

The submissions raised the following issues where more work and detail is required:

- Allocation of CSCs;
- The management of potential “property rights” issues;
- The likely governance frameworks to be implemented;
- Potential liability and accountability arrangements;
- Commercial risk management issues;
- Who would identify the need for CSP/CSC and what criteria or threshold would apply in implementing this regime?
- How will NEMMCO use the surplus revenues from this regime – will it be auctioned, allocated, and who will they go to and on what basis will this be determined?
- Who would be the winners and losers out of this process?
- Whether retailers will be allowed to hold CSC.

Some of the submissions commented on the possible triggers for a CSP/CSC implementation. The Group considered that the trigger threshold for any CSP/CSC implementation should be based upon the same methodology as region boundary assessments as it noted that the trigger thresholds set for the regional boundaries would determine the thresholds for any CSP/CSC implementation. As CRA noted, given that the CSP/CSC was a temporary substitute for any regional boundary the implementation triggers would be lower than those for regional boundaries. AGL raised its concern that temporary measures like CSP/CSC would become entrenched and therefore proposed that any application of these mechanisms was strictly time limited.

Snowy Hydro recommended the CSP/CSC implementation process be triggered by NEMMCO whenever constraint costs exceed \$10,000. It argued that the total transaction and implementation cost for a specific CSP/CSC location was extremely low.

InterGen stated that the criteria for selecting locations for CSP/CSCs needed to be very tight and also recognised that alternatives such as NSA would be equally as effective. The CSP/CSC criteria should also be a net benefit test and that participants transactions costs were to be included in that assessment.

B.5.2 CRA Final Report April 2005, further comments on constraint support pricing and contract mechanism

In its Final Report, CRA maintained its position that a flexible localised arrangement to create incentives to manage the effects of congestion should be developed to complement the proposed region boundary review process. It recommended that market authorities developed proposals for an intra-regional contracting/pricing mechanism based upon the broad design of its proposed CSP/CSC mechanism. It considered that that the contracts needed to be crafted to suit the important characteristics and objectives of each application.

Although CRA noted that the number and scope of such localised mechanisms can be set by policy requirements, it thought that the regime is most suited to manage a small number of local conditions under the broader regulatory framework, as it would become overly complicated if used universally across the NEM. CRA's expectation, based on the history of the NEM and analysis of the potential level of congestion under the investment framework, was that the regime might be applied to a relatively small number of key points of congestion, say five, at any one time across the NEM.

CRA also recognised that the proposal could be applied to manage the potential misuse of localised market power that occurs with congestion. It noted that this sort of policy response was not new to the NEM as the ACCC has, in the past, imposed conditions on specific parties' participation in the SRA contracting process.

B.6 List of submissions to CRA draft report to MCE – Transmission Region Boundary Structure.

Queensland Generators - Regional Structure Review Submission. The Queensland Generators include CS Energy, Enertrade, InterGen, Stanwell and Tarong Energy.

Australian Competition and Consumer Commission (ACCC) - Regional Structure Review Submission

Australian Gas Light Company (AGL) - Regional Structure Review Submission

Energy Networks Association (ENA) - Regional Structure Review Submission

Southern Hydro - Regional Structure Review Submission

Origin Energy - Regional Structure Review Submission

TXU - Regional Structure Review Submission

Creative Energy Consulting - Regional Structure Review Submission

CS Energy - Regional Structure Review Submission

Delta Electricity - Regional Structure Review Submission

Energy Retailers Association of Australia (ERAA) - Regional Structure Review Submission

Enertrade - Regional Structure Review Submission

Ergon Energy - Regional Structure Review Submission

Hydro Tasmania - Regional Structure Review Submission

InterGen (Australia) Pty Ltd - Regional Structure Review Submission

Macquarie Generation - Regional Structure Review Submission

National Generators Forum (NGF) - Regional Structure Review Submission

Powerlink - Regional Structure Review Submission

Snowy Hydro - Regional Structure Review Submission

Stanwell - Regional Structure Review Submission

Tarong Energy - Regional Structure Review Submission

The Group - Regional Structure Review Submission. The Group consists of AGL, Delta, Loy Yang Marketing Management, Macquarie Generation, Stanwell, Yallourn, Powerlink and TransGrid.

TransGrid - Regional Structure Review Submission

Gallaughher and Associates of Australia - Regional Structure Review Submission

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