NEMMCO

National Electricity Market
Management Company Limited
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Sydney

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Chairman
Australian Energy Market Commission
PO Box H166
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Dear John

Implementation of a region boundary change

Thank you for your letter of 13 July 2006, seeking NEMMCO's perspective on steps and timeframes for implementing a regional boundary change, in relation to the three Rule change proposals that the Commission is currently considering.

Two of the proposals address the Snowy region boundary, and were proposed by Snowy Hydro Ltd (Snowy) and Macquarie Generation (Macquarie). It is estimated that the earliest either proposal could be implemented is early November 2007.

The estimated timeframe is based on the draft Determination being published on 15 December 2006 and the final Determination being published March 2007. A section has also been prepared to guide the Commission on steps that will influence the timing of an alternate date for region boundary change.

Unlike the Snowy proposal, the Macquarie proposal shifts load from the existing NSW and Victorian regions to two additional load bearing regions in the form of a Northern Victorian (NVic) and a South West New South Wales(SWNSW) region. It is this component that will require a greater level of resources than the Snowy proposal.

Nonetheless it is expected that the majority of the implementation work for either proposal will be undertaken by NEMMCO staff with some steps being addressed externally. A detailed analysis will be required to determine if there will be a material impact on NEMMCO's budget. Stakeholders should appreciate that NEMMCO's ability to implement additional 2007 initiatives without additional costs may be restricted.

The last section of this response dealing with "other Rules or protocols", lists a number of items that NEMMCO has identified in determining the timeframe. These items can be viewed as risks, that if not appropriately managed could undermine the timeframe.

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NEMMCO

The two steps that NEMMCO experienced most difficulty in attaching a firm timeframe to were:

1. The installation of revenue metering, used to calculate the settlement residue distribution for Auction Participants, on the new boundaries;

2. The practicality of TNSPs being able to provide information within NEMMCO's proposed time requirements. This information is needed for preparation of constraints, loss factor and loss equations, forward looking items such as SOO/ANTS, ST and MT PASA and pre-dispatch.

   At this stage NEMMCO has not specifically discussed these timeframes with the TNSP's but subject to the Commission's request we would be prepared to consult with the TNSPs on the feasibility of the NEMMCO proposed timeframes.

To an extent there is scope for NEMMCO to manage these time requirements through transitional arrangements such as:

1. Using existing SCADA data to calculate the settlement residue distribution;

2. Permitting NEMMCO to substitute estimated limit equations where it is not practical for TNSPs to deliver within NEMMCO's timeframe. The trade-off is that NEMMCO may have to over-ride or apply larger safety margins to constraints that proved to be ineffective at maintaining security.

It is expected that transitional arrangements would be needed more for the Macquarie proposal and if required, would only apply to the early stages of a region boundary change until the permanent arrangements could be introduced.

One area of TNSP information that would be difficult for NEMMCO to substitute is the regular forecasts used for the SOO/ANTS each year. A disruption to the date that TNSPs deliver these forecasts to NEMMCO, could delay the publication of the SOO/ANTS after the rule requirement of 31 October.

A detailed response is attached to this letter. For further details, please do not hesitate to contact Sean Buggy on (02)9239 9141.

Yours faithfully,

Brian Spalding

Brian Spalding
Chief Operating Officer

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What steps must be undertaken to implement a boundary change?

Constraint Equations

Constraint equations will need to be defined so that the NEM dispatch engine can determine solutions that will not violate the technical limits on individual transmission lines resulting from the region boundary change. The change in definitions will cover both thermal and stability constraint equations.

To define constraint equations NEMMCO requires the:

- region configuration relative to the network configuration (regional reference nodes, cutset definitions and metered line ends); and
- network limit equations in accordance with the boundary change.

NEMMCO would seek advice from TNSPs on revised stability limits but would not require advice on thermal limits as NEMMCO will be able to use existing network data.

Loss Factors and Loss Factor Equations

Transmission loss factors are calculated annually by NEMMCO and will need to be re-calculated. Information used to re-calculate loss factors and loss factor equations comprise:

- network limit equations in accordance with the boundary change;
- region configuration;
- TNSP datasets of:
  - connection point demand forecasts; and
  - potential changes in network configuration..

For efficiency purposes NEMMCO intends to use the same TNSP dataset as the one used for the latest annual re-calculation of loss factors.

Energy and Demand Projections

NEMMCO co-ordinates with Jurisdiction Planning Bodies to produce regional energy and demand projections for the upcoming ten years.

These projections are used by NEMMCO in preparing:

- the SOO and ANTS;
- Medium-term projected assessment of system adequacy (MT-PASA);

NEMMCO produces half hourly regional demand projections for the current day and for the next eight days. These demand projections are used for:

- Short-term projected assessment of system adequacy (ST-PASA); and
- Pre-dispatch.

Because the Snowy proposal for region boundary change does not shift load to different regions minor work will be required in this area. However, it is expected that the Macquarie proposal impact on region loads will require significant effort by TransGrid and VENCorp to determine new regional forecasts.

Reserve Margin Calculations

The minimum reserve margin is the minimum necessary reserve capacity required to satisfy the reliability standard. The regional minimum reserve margins are used in the SOO, ST-PASA and MT-PASA. If the reserve in a region falls below that region's designated minimum reserve level, NEMMCO is authorised by the Rules to either:

- contract for additional reserves; or
- direct supply-side participants (generators, scheduled loads or market network services) to make their plant or facilities available to maintain reserve.

Both the Snowy and Macquarie proposals would require the minimum reserve margins to be recalculated.

Market Systems

To accommodate a region boundary change, software development would be required for applications supporting the functions of:

- regional energy and demand projections relating to: MT-PASA, Short-term ST PASA, and Pre-dispatch;
- NEM dispatch (NEMDE)[1];
- NEMMCO control room procedures; and
- Settlement Residue Auction including participant interfaces that are used to bid for auctions and view results.

Significant work will also be required in updating the region based market system data for the Macquarie proposal relating to:

- registering National Metering Identifiers and generator and customer connection points to new regions;
- recognising the new region structure in regional energy and demand projections; and
- de-registering the existing Vic-Snowy and Snowy-NSW associated SRA category units, registering new category units.

The Snowy proposal would require some updating of region based data but would not be as extensive as the Macquarie proposal.

Change Management Procedures

Market System development required to support region boundary change will be conducted according to NEMMCO's IT Change Management Procedures[2]. Compliance with these procedures is required to meet the general authorisation provided by the Australian Energy Regulator under Rule clause 3.17.1.

The Change Management procedures address participant involvement in the development of Market Systems including the use of the pre-production environment and dispute resolution processes. The pre-production environment allows participants to test the Market System

[1] A change to NEMDE is required because of some existing "hardcoding" of the region structure into the existing solver. As discussed later, NEMMCO will be making this change in the 2007 mid-year software release regardless of the outcome of the AEMC's determination.

[2] http://www.nemmco.com.au/registration/change.htm

software development before the change is promoted to production status. User groups representing participants have been established under the Change Management procedures.

A pre-production program for participants to exercise the region boundary changes will be discussed between NEMMCO and the established User groups. It is expected that the program will be extended beyond the one month minimum that is required by the Change Management procedures, and that it will have similarities to the approach used for introducing Tasmania to the NEM.

Settlement residue auction procedures

A plan to:

- withdraw units categories affected by the region boundary change;
- realign auction fees with the new category units; and
- auction new category units.

will have to be prepared and approved by the Settlement Residue Committee. Implementation of the plan will require co-ordination between NEMMCO and auction participants.

Prudential procedures

The Maximum Credit Limit (MCL) forms a central component to the monitoring of NEMMCO's exposure to participant outstandings. The MCL uses a number of region based inputs derived from historical data which will be affected by a region boundary change.

A consultation conducted by NEMMCO may be required where linkages between the new region boundaries and the available historical data is not clear. Participants may also need to undertake additional work to modify their reallocations and bank guarantees to correspond with MCLs that apply to the new region boundaries.

Control room procedures

Control room procedures will require modifications corresponding to the region boundary change. Training modules will also be prepared and delivered to control room staff and control room support staff.

Metering

Changes to boundaries will affect metering used to calculate the settlement residue distribution for Auction Participants. The first step requires NEMMCO to assess whether existing metering would be suitable for establishing revenue metering.

Which of these steps must NEMMCO undertake? Market participants? Others?

NEMMCO

While the Macquarie proposal will require a greater level of resources than the Snowy proposal, it is expected that the majority of the implementation work for either proposal will be undertaken by NEMMCO staff. External resources may be used in some areas of Market Systems and the reserve margin calculation. A detailed analysis will be required to determine if there will be a material impact on NEMMCO's budget.

Implementation of a region boundary change would represent a major 2007 project for a significant portion of NEMMCO staff and is likely to dominate:

- the Market System upgrades; and
- Power system and planning operations.

For this reason NEMMCO's ability to implement additional 2007 initiatives without additional costs maybe restricted.

Market Participants

Market participants would be required to provide input to NEMMCO's Change Management Procedures, particularly the Pre-production steps.

Others

TNSPs must also provide information which is listed below:

Step	Information to be provided by TNSPs
Metering	New algorithms to determine and apportion losses between the boundary and the metering point.
Defining stability limit equations, and data to calculate Loss Factors and Loss Factor Equations	Advice on the re-calculation of network stability limits corresponding to the region boundary change.
Energy and Demand Projections ^	Provision of energy and demand projections reflecting the region boundary change by TransGrid and VENCorp

^ only relevant for the Macquarie Generation proposal.

This information is a pre-requisite for NEMMCO's activities in these areas and it is expected that TransGrid and VENCorp would undertake the bulk of this work.

What is the estimated timeframe to implement these steps and have them certified?

What provisions in the National Electricity Rules or other protocols affect implementation procedures and timeframes for a region boundary change?

Estimated timeframe based on draft and final Determination dates

It is estimated that the earliest either proposal could be implemented is November 2007. The estimated timeframe is based on the draft Determination being published on 15 December 2006 and the final Determination being published March 2007.

November 2007 coincides with the 2007 end-of-year market systems release. Appendix A provides detail on how the 2007 end-of-year releases will interact with the draft and final Determination dates.

Implications of the final Determination departing from the draft Determination

Tasks that are interdependent and extend beyond 6 months would be commenced on publication of the draft Determination, while tasks that are isolated and could be completed in less then six months would be commenced on publication of the final Determination. Because the work program of major tasks will be in month 3 at the final Determination publication date, any departure from the draft Determination could extend the estimated timeframe.

Rules - Intra and Inter-regional loss factors

NEMMCO publishes the relevant equations and loss factors by 1 April each year which are to apply to the next financial year (rules 3.6.1(d)(1), 3.6.1(d)(3)(i), 3.6.1(f), 3.6.2(e)(1), 3.6.2(f1)).

Given that November 2007 would not coincide with the financial year it would be necessary for the Determination to recognise that a transition arrangement may be required to allow NEMMCO to:

- use a one-off modified procedure for calculating loss factors without the need to undertake a Rules consultation process;
- implement Intra and Inter-regional loss factors;
- publish the Intra and Inter-regional loss factors possibly with less than the 3 months notification period provided by the Rules.

Practicality of TNSPs providing data within NEMMCO's time requirement

It is suggested that NEMMCO or the Commission consult with TNSPs on the feasibility of meeting the time requirements below. For certain situations there is scope to apply transitional arrangements. Any transitional arrangements would be confined to the early stages of a region boundary change until the permanent arrangements could be introduced.

<u>Energy and demand projections</u>

10 year regional energy and demand forecasts prepared by TNSPs is a central input to the

SOO/ANTS, which has a Rule requirement for publishing of, no latter then 31 October each year.

To comply with the publication date, NEMMCO's time-table for preparing the SOO/ANTS relies on receiving the 10 year regional energy and demand forecasts by 20 May 2007. NEMMCO requires a minimum of 5 months to publish the SOO/ANTS after receiving this information.

If TransGrid or VENCorp's preparation was complicated by the region boundary it may not be practical to deliver this information by 20 May 2007. In this case a transition arrangement incorporating estimates to allow the SOO/ANTS to be published by 31 October would not be feasible. It follows that an allowance may need to be built into the Rules to allow publication of the SOO/ANTS after 31 October.

This transitional arrangement could affect MT PASA. MT PASA also uses the 10 year regional energy and demand forecasts prepared by TNSPs. One benefit of using this data is that the MT PASA results are consistent with the SOO/ANTS. While a transitional arrangement of using estimates could be applied to MT PASA, the results may not be consistent with the SOO/ANTS because the input forecasts for MT PASA and the SOO/ANTS will be different.

Re-calculation of network stability limits

Both proposals require TNSPs to advise on the re-calculation of network stability limits corresponding to the region boundary change. This information is used during the early stages of:

- defining constraints, and
- loss factors and loss equations.

The estimated timeframe for these steps depends on TNSP information being passed to NEMMCO no latter then April 2007, or 6 months prior to the region boundary change date. If it is not practical for the TNSPs to meet this timeframe there is scope to apply transitional arrangements that do not require the full TNSP information, but do involve the use of estimates, possible transitional arrangements are outlined at appendix C.

The appendix C options may require significant liaison between NEMMCO and TNSPs to agree on a suitable work plan. Transitional arrangements would result in greater overheads that could have an adverse impact on 2008 projects associated with constraints. The Commission may need to balance achieving the time frame, with the ramifications that, dispatch may be affected by constraints defined with conservative safety margins to mitigate the use of estimates.

Substituting estimates for the Reserve Margin Calculation

A change of region boundary would require a change to the reserve margin calculation to meet the Reliability standard for each region. The process requires a statistical approach using stochastic analysis to re-calculate plant capacity to determine reserve margins.

It is expected that the minimum time for this task could be 9 months or longer and would probably be outsourced to a consultant. To avoid any doubt that this task would extend beyond November 2007 it would be possible to adopt a transition arrangement using estimates for NVic and SWNSW energy and demand projections. This may impact on how closely reliability can be maintained to a level of .002% of unserved energy.

Further boundary change detail required

The Determinations will need to provide further detail on placement of the boundary change so that NEMMCO and TNSPs could commence detailed technical work on implementation. This detail comprises:

- cutsets that form the interconnectors including specification of the line end; and
- substations that form the regional reference node.

If the Determination did not express this level of detail then NEMMCO may need to employ a full consultation process.

The consultation would serve as the vehicle to determine the placement of a regional reference node and the transmission lines and line ends constituting an interconnector. A consultation of this nature is likely to extend the estimated timeframe.

Provide guidance on metering status for the Macquarie Generation proposal

Based on the level of detail contained in the proposals, NEMMCO's view is that if the Snowy proposal was to be adopted it is likely that existing metering would be suitable for establishing revenue metering on the NSW-Vic interconnector. However further detail on the boundary placement is required to confirm that there are no issues on the Guthega transmission line.

The same may be said for the Macquarie proposal's equivalent interconnector of SWNSW-NVic, although NEMMCO has not confirmed this yet.

NEMMCO's preliminary view is that it is unlikely there is existing metering that would be suitable for establishing revenue metering for the remaining two boundaries of the Macquarie proposal, being NSW-SWNSW and NVIC-Vic. If revenue metering was required this could involve the installation of current transformer and voltage transformer equipment (CT/VT).

It would not be realistic to consider that this CT/VT equipment could be installed without extending the estimated timeframe. This CT/VT equipment may require long lead times (in excess of 6 months) to be manufactured and installed. The equipment could represent significant costs and the Rules do indicate how these costs would be funded.

On this note a Rule obliging the use of revenue metering to calculate the settlement residue distribution for Auction Participants has not been identified. Given that it is not clear there is an obligation requiring revenue metering, it maybe sufficient to use SCADA metering.

Because financial transactions depend on this metering, adoption of SCADA instead of revenue metering may require clarification by the Determination. A transitional arrangement could permit the use of SCADA metering to calculate the settlement residue distribution for Auction Participants until revenue meters could be installed.

Addressing other matters that arise from the Macquarie proposal

The Macquarie proposal contains matters that could complicate implementation, being:

- loopflows; and
- 66kV line (without metering) between Ballarat and Horsham.

It has been assumed that these matters will be addressed by the Determination. NEMMCO is happy to discuss an approach with the Commission to address each matter from an implementation perspective. Further explanation and possible approaches have been outlined at appendix B.

Generic estimated timeframe

Should the Commission consider an alternate timeframe the four steps that will have the most influence on the timing of a boundary change will be:

1. The Market System bi-annual release that will contain the boundary change system development.

   The minimum time for completion of a release is 6 months with the completion dates being May or November of each year. To assist with project planning a minimum 3 month lead time would also be required.

   If 1 July change was planned, then work could be undertaken in the May release with a 1 July trigger to implement the boundary change. ie it is not necessary to coincide a boundary change exactly with a release date, a boundary change date can be after a release date. Please refer to appendix A for more Market System release detail;

2. It is expected that the minimum reserve margin calculation would take a minimum 9 months or longer.

   Alternatively, NEMMCO could use estimations in the interim that may not be entirely consistent with the Reliability Standard.

3. The likelihood that existing metering would be suitable for establishing revenue metering used to calculate the settlement residue distribution for Auction Participants.

4. The practicality of TNSPs being able to provide information within NEMMCO's timeframe. If the delivery date of the 10 year regional energy and demand projects was extended beyond the regular time of May, the publication of the SOO/ANTS may be delayed after the Rule requirement of 31 October.

As mentioned earlier it is possible to trade-off time with transitional arrangements for points 2-4. There would be a greater need for transition arrangements regarding a Macquarie style proposal that impact on regional loads, rather then a Snowy proposal that has minimal impact on regional loads.

Appendix A

Interaction between 2007 Market System releases and the draft and final Determination dates

The software modifications would be undertaken within the established MMS 6 monthly upgrade cycle agreed to by market participants and referred to by NEMMCO in previous correspondence. This correspondence can be found on the Commission's website[3].

While it may be possible for individual projects to be completed within 6 months, the upgrade provides a framework to efficiently allocate development and testing resources across a number of different projects. Such an orderly approach reduces the number of times that participants must make corresponding modifications to their systems.

A variance to the established MMS upgrade cycle could disrupt the allocation of resources, introduce idle periods between projects and create uncertainty for participant planning of corresponding modifications to NEM based systems.

Releases are programmed for May and November of 2007 with requirement and design work commencing November 2006 and April 2007 respectively.

The major steps of an MMS upgrade are:

- preparation of requirements and detailed software design;
- development of the application;
- unit testing and user acceptance testing;
- implement to the Pre-production environment; and
- implement to the Production environment.

Applications will require two types of modifications:

1. accommodate general boundary changes; or
2. fit the proposed boundary change adopted.

Modifications in category 1 will enable the application to accommodate either of the proposals, while modifications in category 2 will be customised to fit either the Macquarie or Snowy proposal. No work can be commenced on category 2 modifications until after the draft Determination has been published, as this will be the earliest notification of the boundary change.

Spreading the modifications for region boundary change across the two releases is also compatible with other work scheduled for the May 2007 release which includes:

- automation of calculating constraint costs associated with Australian Energy Regulator(AER) work on the impact of transmission network constraints and outages in the NEM;
- NEMDE modifications associated with ramping of network constraints;

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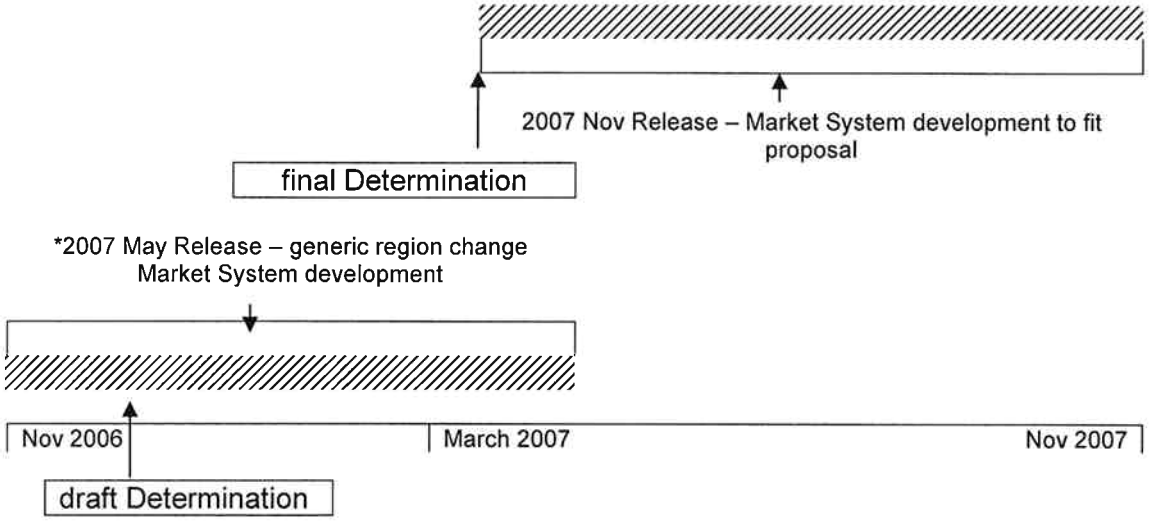
3 http://www.aemc.gov.au/pdfs/reviews/Management%20of%20negative%20settlement%20residues%20in%20the%20Snowy%20Region/submissions/011NEMMCO%20-%20Letter%20on%20Implementation%20Aspects%20(28%20April%202006).PDF
http://www.aemc.gov.au/pdfs/reviews/Management%20of%20negative%20settlement%20residues%20in%20the%20Snowy%20Region/submissions/013NEMMCO%20Section%2099%20Submission.PDF

- automation of short-term capacity reserves, and lack of reserves to improve control room procedures and compliance reporting to the AER.

Interaction between 2007 Market System releases and the draft and final Determination dates



* the design work on the generic region changes will be commenced prior to publication of the draft Determination

Because the category 1 modifications will enable applications to cope with general changes to boundaries, the benefits of this release should also be realised for any further region boundary changes that may arise from the Ministerial Council on Energy's Rule change request. Providing that the complexity of a future region boundary change does not exceed that of Macquarie's it is likely that Market System changes for subsequent boundary changes could be undertaken in a single release, instead of the two that is required for either of these proposals.

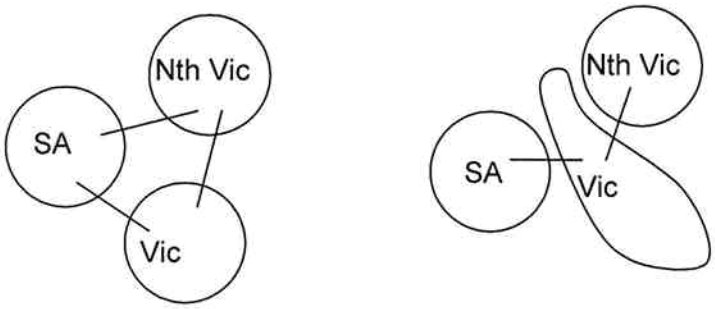
Appendix B

Further discussion on matters arising from the Macquarie Generation proposal

Loopflows

The Macquarie generation proposal requires that the existing Victorian region be separated into two regions, NVic and Vic. This has the potential to create a loopflow which could require material modifications to the NEM dispatch engine(NEMDE) and result in negative residues.

One possible approach could be to extend the Vic region so all flows between NVic and SA would pass through Vic.



66kV line connecting Ballarat and Horsham

Currently the Macquarie generation proposal has placed the interconnector between Ballarat and Horsham. There are two lines connecting Ballarat and Horsham. One is a 220kV line and the other is a 66kV transmission line. Implementing this region boundary would cause difficulties due to:

- the lack of metering on the 66kV line; and
- localised generation and demand issues impacts inter-regional transfer capability.

The Macquarie proposal places Ballarat in the Vic region. One possible approach could be to the transfer Ballarat node into North Victoria.

Appendix C

Alternate options for consideration if it is not practical for TNSPs to meet NEMMCO time requirements

If it was not practical for TNSPs to provide information on re-calculation of network stability limits for April 2007, there are a number of options that could be considered:

1. The TNSPs provide information to NEMMCO on an incremental basis as re-calculation of groups of network stability limits is completed. This could result in TNSP information being provided to NEMMCO in stages, starting prior to April 2007 and finishing not long after April 2007;

2. NEMMCO re-formulating the current stability constraints to apply to the new regional configuration without the TNSP information. This re-formulation may not reflect the networks physical transfer capability as accurately as if the TNSP information had been provided. To mitigate the use of estimation, additional safety margins maybe built into constraints to ensure that the network continues operating within its technical envelop;

3. A combination of 1. and 2. Where possible NEMMCO would define constraint equations according to TNSP information, and the balance would be defined without.

A form of double handling would be introduced if stability constraints were formulated without the TNSP information. The double handling would come about by NEMMCO firstly re-formulating the stability constraints without the TNSP information and secondly defining the stability constraints when the TNSPs provide the re-calculation of network stability limits.