NEMMCO

National Electricity Market Management Company Limited
ABN 94 072 010 327

Semi-Dispatch of Significant Intermittent Generation

Request for Rule Change

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Summary

Purpose of this Request for Rule Change

The purpose of this Request for Rule Change ("**the Rule Change proposal**") is to seek changes to the National Electricity Rules to ensure that NEMMCO can continue to efficiently control network flows within secure operating limits where significant amounts of generation of an intermittent nature (such as wind farms) are likely to emerge in the NEM.

The proposed Rule Changes achieve this by requiring that owners of significant intermittent generation participate in Central Dispatch and comply with instructions from Central Dispatch that limit the output from their intermittent generating units at times when that output would have otherwise violated secure network operating limits.

Implementing the proposed Rule Changes will provide for greater control over significant intermittent generation and enhance power system security, while reducing the reliance on local NSP control schemes and market intervention through unit directions. Further, operating margins on affected network limits will be reduced through greater confidence in the output from these intermittent generators.

The proposed Rule Changes will effectively integrate significant intermittent generation into the common Central Dispatch framework that currently applies to scheduled generation in terms of the structure of dispatch offers, the optimal dispatch of those offers and the control of generation through network constraint equations. In doing so, significant intermittent generation can compete with scheduled generation in market roles other than being the traditional 'price-taker'.

NEMMCO believes that if the proposed Semi-Dispatch Rule Changes are implemented then the above issues will be reduced in a way that will serve the long term interests of consumers of electricity, and thus promote the NEM objective as described in Section 6.

Background to the Issues

The amount of intermittent generation participating in the NEM has grown rapidly over the last few years, particularly wind farm development in South Australia. This strong trend is expected to continue into the foreseeable future supported by the ongoing financial incentives made available through the various government renewable energy initiatives.

The proportion of installed wind capacity in South Australia is already high by international standards, and with the future projects planned could place Australia amongst the world leaders in wind development. The prospect of leading the world in wind energy reinforces the need to ensure that the NEM is structured appropriately so that such high levels of intermittent generation can be safely, securely and reliably accommodated, thus promoting the long-term interests of electricity consumers in accordance with the NEM objective.

In particular the increasing penetration of intermittent generation in the NEM poses challenges to NEMMCO in efficiently managing the operation of a secure power system.

Under Clause 4.3.1 of the National Electricity Rules ("**the Rules**") NEMMCO is responsible for maintaining the power system in a secure operating state. To meet this obligation NEMMCO runs a Central Dispatch process which uses network constraint equations developed by NEMMCO in order to control the dispatch of all scheduled generation and ensure that network flows remain within secure operating limits.

Currently non-scheduled generating units are not required under the Rules to participate in the Central Dispatch process nor are they obliged to control their output to assist in the management of network flows.

Clause 2.2.3(b) of the Rules requires that NEMMCO approve applications to classify intermittent generating units (such as wind farms) as non-scheduled. This requirement is predicated on the notion that intermittent generators are unable to control their electrical power output "on demand", as the energy source supplying the generator is not readily predictable or controllable relative to generator technologies typical of scheduled units.

The Rules were originally developed at a time when only minimal levels of non-scheduled generation existed in the NEM and network flows could be readily controlled through adjusting scheduled plant loadings as determined by the Central Dispatch process.

However this is no longer the case, with some parts of the network containing only non-scheduled generating plant (such as the wind farm developments on the Eyre Peninsula in South Australia) that would on some occasions have to operate at reduced output to avoid network overload.

If the Central Dispatch process does not manage the dispatch from all significant generating plant (both scheduled and non-scheduled generation) that can materially affect network loadings and transfer limits then the network may become overloaded or its technical envelope infringed and hence the power system operates in an insecure state.

This issue may be exacerbated where the non-scheduled generation involved is of an intermittent nature, given the greater short-term variability of its uncontrolled output compared with non-intermittent generation and hence the greater risk of violating network limits that are binding or close to binding.

The increasing short-term variability of uncontrolled wind farm output may translate into a greater risk of violating existing secure network limits (particularly in relatively remote areas with limited local network capacity) and hence place further pressure on NEMMCO to increase network operating margins in order to maintain local network flows within limits. This wind farm clustering trend has already been observed in South Australia (in the south-east area and on the Eyre Peninsula) and may continue with the future establishment of substantial wind farm capacity planned for the northern area of South Australia.

If the above issues are not addressed on a NEM-wide basis then the ability of NEMMCO to maintain power system security in an economically efficient manner may deteriorate over time as the levels of non-scheduled intermittent generation in the NEM increase.

Additionally, if these issues are not addressed through a consistent national framework such as the National Electricity Rules the ensuing regulatory uncertainty may serve to hinder future investment in electricity generation based on renewable energy technologies, particularly those of an intermittent nature.

Structure of this Document

This Document is structured as follows:

Section 1

States the issues with the National Electricity Rules that this Rule Change proposal seeks to address, and why those issues are believed to be material.

Section 2

The current approaches used by NEMMCO and the jurisdictions to deal with these issues.

Section 3

A full description of this Rule Change proposal, including how the Rule Change proposal would be effective in addressing the issues and how the proposed Rule would be implemented, with references to the Summary of Rule Changes in Appendix E.

Section 4

The chronological background to how the issues emerged, the consultation on those issues and the development of the Rule Change proposal.

Section 5

Other projects relating to, or are a pre-requisite of, the implementation of this Rule Change proposal.

Sections 6 and 7

How this Rule Change proposal promotes the NEM Objective, including a qualitative assessment of the benefits and costs of the proposal.

Section 8

A summary of the potential impacts on wind farm development and operating costs of implementing the proposed Rule.

Section 9

A summary of how the proposed Rule may affect market participants, regulatory bodies, planning bodies and NEMMCO.

Section 10

A list of alternative proposals considered during the development of this Rule Change proposal, and reasons for rejecting these alternatives.

1 Statement of the Issues

The issues that this Request for Rule Change seeks to address fall into three categories:

1. Primary issues that relate to the impact of intermittent generation on the control of network flows, and for which the proposed Rule amendments only apply to the new class of intermittent generation. The majority of this proposal addresses these issues.

2. Secondary issues that emerged during the development of the proposal to address the above issues, and for which the proposed Rule amendments generically apply to both scheduled generation and to the new class of intermittent generation.

3. Minor issues such as spelling errors, incorrect grammar, inappropriate or missing italicisation and extraneous text, for which corrections are proposed to improve and clarify the understanding of the existing Rule.

1.1 Primary Issues

The amount of intermittent generation participating in the NEM has grown rapidly over the last few years, particularly wind farm development in South Australia.

This trend is expected to continue, supported by the financial incentives made available through various government renewable energy initiatives.

Since the start of the NEM all generation with an intermittent output has been able to classify as non-scheduled under the Rules and is hence exempted from control by NEMMCO's central dispatch, on the basis that their electrical output cannot be controlled "on demand" as their available energy source is inherently uncontrollable. Non-scheduled generation therefore effectively has firm network access and dispatch priority over scheduled generation unless and until directed by NEMMCO or their agents to operate otherwise.

Consequently a number of network control and market efficiency issues have emerged for the NEM, and are expected to worsen over time as both the size and number of these intermittent non-scheduled generation sources steadily increases.

The primary issues are:

1. <u>Increased Risk of Violating Secure Network Limits</u>

Significant contributions from non-scheduled generation may risk overloading a network element or otherwise infringing the technical envelope for secure power system operation, as the relevant Generator is not obliged to control its output to prevent this occurring and is typically aiming to maximise output whenever possible.

This situation may be exacerbated where the non-scheduled generation involved is intermittent, given the greater unpredictability of its output and hence the greater risk of violating network limits that may already be binding or close to binding.

The ongoing ability of NEMMCO to maintain power system security in an economically efficient manner may deteriorate over time as the levels of non-

scheduled generation increase.

2. Reduced Market Efficiency due to higher Network Operating Margins

To mitigate the risk of violating network limits that involve significant non-scheduled generation, the operating margin for that network limit may be increased (and network flow reduced by that amount) to create more spare transfer capacity (headroom) on that network element than would otherwise by necessary if only scheduled generation were involved in that network limit.

Network operating margins are generally implemented as a static value on the RHS of the constraint equation, and apply at all times that the relevant network constraint equation is invoked.

It is standard, accepted practice to apply network operating margins to adjust for the inaccuracies inherent in the forecasting of demand and network limits or to cater for the regulating response of generators involved in the constraint.

As an inevitable outworking of the use of operating margins, affected network constraint equations used in Central Dispatch are likely to bind for longer periods, with the following undesirable outcomes:

- Low-cost scheduled generation ("competing" with non-scheduled generation on the "wrong" side of the network constraint) is substituted with higher-cost scheduled generation that is on the "right" side of the network constraint for longer periods, thus increasing overall market dispatch costs and leading to higher market prices in the long term.
- Where scheduled generation in the affected network constraint faces the prospect of being constrained-off before non-scheduled generation, there may be an incentive for the Scheduled Generator to bid in a manner that does not reflect the marginal costs of their scheduled generation in order to maintain dispatch volumes, further distorting dispatch outcomes and reducing market efficiency.
- Where the affected network constraint involves inter-regional limits, inter-regional transfers are reduced for longer periods, thus diminishing the "firmness" of inter-regional settlement residue contracts, and possibly discouraging future inter-regional trading.
- The affected network element operates at a consistently lower limit, thus potentially under-utilising the network asset.

Further increases in network operating margins to compensate for significant intermittent non-scheduled generation, only would serve to exacerbate the above undesirable outcomes.

3. Reduced Market Efficiency due to increase in Market Interventions

There may be an increasing reliance on the use of directions and Clause 4.8.9 instructions to Non-Scheduled Generators to avoid network security violations, with their attendant additional non-market costs and administrative overheads.

The intervention decision-making process is largely manual, off-line and therefore inherently imprecise compared to what would be possible if the decision were integrated into the automatic Central Dispatch process.

The market intervention approach involves a periodic assessment only of the required intervention levels and the intervention units involved based mainly on off-market costs, as opposed to the Central Dispatch process which uses market-based costs to automatically assess every 5 minutes the optimal intervention levels that would precisely restore network flows within real-time secure limits while minimising overall dispatch costs across the NEM.

Hence an increased use of market intervention to address network security issues also increases the risk of excessive constraining-off of scheduled generation and/or inter-regional power transfers, which results in higher market dispatch costs and a greater incidence of distorted market pricing outcomes.

The efficiency of the market intervention approach also depends on how promptly NEMMCO can detect the violation condition and how readily the Generator can respond to NEMMCO's direction within the required time-frame. This process may be difficult to manage effectively on a 5-minute basis if a number of non-scheduled generating units are involved.

The regular use of directions and Clause 4.8.9 instructions as a proxy for a centrally co-ordinated optimal dispatch may also create uncertainty in the market with respect to:

- The signalling of appropriate dispatch priorities for scheduled versus non-scheduled generation;
- The potential risk of inconsistency between NEMMCO and its agents in the exercise of their discretionary powers of market intervention;
- The lack of transparency in the various approaches to market intervention; and
- The amount of compensation that is appropriate for maintaining power system security, and the market transparency of such costs.

4. Use of Interim Measures

In the absence of a permanent NEM-wide solution to the above issues, the South Australian jurisdiction have implemented their own preventative measures for wind farms, including local dispatch control schemes operated by NSPs and special licensing pre-conditions for new wind farms requiring them to classify as scheduled generation.

Under the local dispatch control schemes if a Generator does not respond to control signals from the NSP, the NSP may disconnect the entire wind farm rapidly in order to restore network security, which may result in extended periods of foregone generation if not promptly reconnected once security is restored, an obviously undesirable outcome for the wind farm owner.

There is also the potential for other jurisdictions to develop their own interim measures, with the attendant risk of increasing regulatory uncertainty for wind farm developers operating in different jurisdictions.

1.2 Secondary Issues

In addressing the primary issue of intermittent generation control by mandating their participation in Central Dispatch alongside scheduled generation, questions then arise as

to what extent (if any) the existing Rule requirements for scheduled generation should also apply to the new class of intermittent generation.

To this end all of the existing Rules referring to scheduled generating units were reviewed, and during this review the issues listed below became apparent.

In addressing these issues amendments to the Rules are proposed that would affect scheduled generation and the new class of intermittent generation. These proposed Rule amendments are indicated in the summary tables of Appendix E as 'S' (secondary) in the column headed "Type".

1. Unit Self-Dispatch Level is redundant in STPASA

The unit self-dispatch level (defined in Chapter 10 as the sum of band MW with negative band prices in the dispatch offer) is no longer used in the STPASA process.

It is therefore proposed to delete the explicit requirement under Clause 3.7.3(e)(4) for Scheduled Generators to provide such data to NEMMCO.

2. Inappropriate Treatment of Aggregated Generating Units

The current aggregation guidelines for scheduled generating units Clause 3.8.3(d) states that **all Rule requirements apply equally** to each individual generating unit and to its aggregated form:

> (d) All requirements in the *Rules* applying to *generating units*, *scheduled network services* and *scheduled loads* are to apply equally to aggregated *generating units*, aggregated *scheduled network services* and aggregated *scheduled loads*.

However this Clause is incorrect and misleading as:

- Unit aggregation only applies to Central Dispatch and Settlements (as stated in Clause 3.8.3(a)) and therefore only relevant to the Rule requirements of Chapter 3 (Market Rules) and Clause 4.9, and not applicable to "all requirements in the Rules".

- The Rule requirements of Chapter 3 (Market Rules) and Clause 4.9 are designed to only apply at the aggregated unit level, and not also to each individual scheduled generating unit within the aggregate, as would be suggested by the phrase "apply equally".

  A strict interpretation of the current Rule would require the submission of dispatch offers and the management of dispatch for each individual scheduled generating unit in addition to the aggregated unit, which we believe is unintentional and which defeats the purpose of aggregation to rationalise the number of units participating in Central Dispatch.

The only exceptions to this are the Rules for unit commitment and synchonisation (Clauses 3.8.17, 4.9.4, 4.9.6) and for unit de-commitment and de-synchonisation (Clauses 3.8.18, 4.9.4, 4.9.7), which should only apply to the connection or disconnection of physical (hence individual) generating units.

This exception is covered by insertion of the phrase "unless the context requires otherwise".

The proposed Clause 3.8.3 amendments are explained in further detail in Section 3.1.3 of this proposal.

3. Unit Commitment and Decommitment Unnecessarily Onerous

In the process of the general review of all Rule requirements for scheduled generation, the existing requirements for notification of commitment and decommitment decisions were found to be unnecessarily onerous, in that there is no minimum nameplate rating threshold at which such notice should apply for an individual generating unit.

There are currently only a relatively small number of aggregated units that comprise individual generating units < 30 MW nameplate rating, and to date it has generally been NEMMCO practice to waive advance notice for such units.

However with the prospect of an ever-increasing number of smaller intermittent generating units electing to classify in the NEM as aggregated semi-scheduled (typically 2-3 MW for an individual wind turbine) the current Rule requirements for notification would become unwieldy for NEMMCO and the affected participant to manage on a regular basis, and for little purpose given their minimal impact on power system security.

Other issues relating to the current Rules for commitment and decommitment are:

- The current Clause 3.8.17(e) only requires self-commitment notice to NEMMCO via the PASA process, which does not cover unit movements in the current trading day as covered by Pre-dispatch.
- There is no Clause for self-decommitment that mirrors the notification procedure for self-commitment under Clause 3.8.17(e).
- Clause 3.8.17(f) states that synchronisation times will be subject to NEMMCO direction, which conflicts with other provisions that only suggest that NEMMCO may so direct at their discretion.
- The confirmation of synchronisation and de-synchronisation intentions under Clauses 4.9.6 and 4.9.7 makes no reference to the related procedures for self-commitment and self-decommitment notification under Clauses 3.8.17 and 3.8.18.
- Under Clause 4.9.6(a)(2) the Scheduled Generator must advise NEMMCO when its committed generating unit reaches self-dispatch level, even though its self-dispatch level may not have any significance (that is, may not correspond to its minimum loading level indicated in its dispatch target).

Amendments to the following Rule Clauses are proposed to address the above issues:

- Clause 3.7.3(e)(2) - Short term PASA
- Clause 3.8.17(e),(f),(h) - Self-Commitment
- Clause 3.8.18(b1) - Self-Decommitment (new Clause)

- Clause 4.9.4(a1)(1),(b)(3),(d) - Dispatch Related Limitations on Scheduled Generators
- Clause 4.9.6(a),(a)(1),(a)(2) - Commitment of Scheduled Generating Units
- Clause 4.9.7(a),(b) - Decommitment, or Output Reduction, by Scheduled Generators

These amendments are further explained in Sections 3.1.3 and 3.6.3 of this proposal.

4. Aggregated Generator Requirements for Remote Monitoring

Under Schedule 5.2.6.1 it is unclear how the minimum and automatic technical requirements for remote monitoring systems apply to aggregated scheduled generating systems, with references to aggregated metering quantities where the type of unit listed does not appear to include units aggregated under Clause 3.8.3.

Following a review of these requirements amendments to the following affected Rule Clauses are proposed:

- S5.2.6.1(b)(1),(b)(2) – Automatic Access Standard
- S5.2.6.1(c)(2),(c)(4),(c)(5)– Minimum Access Standard

These amendments are further explained in Section 3.1.3 of this proposal.

1.3 Minor Issues

In the course of reviewing the existing Rules (as described in Section 1.2) a number of minor issues were identified that relate to spelling errors, incorrect grammar, inappropriate or missing italicisation for defined Chapter 10 terms, or extraneous text.

Corrections to these issues are proposed to improve and clarify the understanding of the existing Rule - these Rule amendments are indicated in the summary tables of Appendix E, highlighted as 'M' (minor) in the column headed "Type".

1.4 Are the Primary Issues of Network Control Material?

There is a significant amount of wind farm generation planned for the NEM in the near future, which will impact to varying degrees on the effective management of network flows within secure operating limits.

At the time of writing, wind farms with an aggregate nameplate rating of ≥ 30 MW[1] accounted for 611 MW of the total installed wind farm generation in the NEM[2], with:

- 388 MW in South Australia;
- 83 MW in Victoria; and
- 140 MW in Tasmania.

[1] 30 MW is the current threshold for classifying a generating unit as scheduled, and that proposed in this Request for classifying a *semi-scheduled generating unit*.

[2] Data Source: "Wind Energy Projects in Australia", AusWind website, http://www.auswind.org/auswea/index.html

In addition there is a further 5,185 MW of significant wind farm generation across the NEM that is either under construction, with or seeking planning approvals or subject to feasibility studies, as follows:

- South Australia: 344 MW under construction, 610 MW with planning approval, and 890 MW in feasibility stages (total 1844 MW):
- Victoria: 357 MW under construction, 725 MW with or seeking planning approval, and 667 MW in feasibility stages (total 1749 MW);
- Tasmania: 130 MW with planning approval, and 190 MW in feasibility stages (total 320 MW);
- NSW: 581 MW with or seeking planning approval, and 515 MW in feasibility stages (total 1096 MW); and
- Queensland: 124 MW with planning approval and 52 MW in feasibility stages (total 176 MW).

In South Australia alone, the currently installed plus future committed wind farm projects (those under construction or with planning approvals) would amount to a total installed capacity of 1342 MW, or around 40% of the total South Australian generating capacity of 3,260 MW assumed available for summer 2006/2007.

Further, if all the current plus planned South Australian wind farms were to generate at an average capacity factor of around 35% at the time of the minimum South Australian demand of around 1,000 MW, this would represent around 45% of the South Australian demand.

Hence generation from wind farm developments is likely to have a significant and growing influence over the operation of NEM within the foreseeable future.

Appendix A provides a simplified example of the adverse affect that significant non-scheduled generation may have on the ability to manage network flows within secure operating limits.

NEMMCO has also conducted some recent studies to confirm the materiality of the network management issue in South Australia – this study is discussed in detail in Appendix B.

The studies indicate that network congestion from significant sources of intermittent non-scheduled generation continues to occur on a reasonably regular basis, at least within the south-east area of South Australia.

2 Current Approaches to Managing the Network Control Issues

The current approaches used by NEMMCO and the jurisdictions to manage significant non-scheduled generation within network operating limits, and the issues associated with those approaches, are described in the following Sections.

2.1 NEMMCO Approach

2.1.1 Increase Network Operating Margins

NEMMCO apply higher, more conservative operating margins to network transfer limits (over that normally required to cover the 'N-1' credible contingency) in order to mitigate the risk of violating those limits at times when there are excessive output variations from uncontrolled sources of non-scheduled intermittent generation.

Higher operating margins result in less utilisation of available network transfer capability. This in turn results in inefficient and sub-optimal Dispatch outcomes and may incur additional costs to the market where cheaper sources of scheduled generation are displaced by more expensive scheduled generation elsewhere in order to maintain the increased network operating margins.

2.1.2 Issue Unit Directions or Clause 4.8.9 Instructions

If the higher operating margins adopted under the above approach were insufficient to avoid network limits being violated, NEMMCO would then need to resort to its powers under Clause 4.8.9(a)(1) to address the power system security violation by issuing a direction to Scheduled Generators, or a direction/Clause 4.8.9 instruction to Non-Scheduled Generators if that were the only option available.

The effectiveness of this manual intervention approach would largely depend on how promptly NEMMCO detects the violation condition and issues the appropriate direction/Clause 4.8.9 instruction, and whether a Non-Scheduled Generator can respond to that direction/Clause 4.8.9 instruction within the relatively short timeframe required.

This approach would be particularly difficult to manage effectively on a 5-minute basis if a number of significant non-scheduled generating units were involved.

These approaches are not seen as appropriate long-term measures moving forward given the increasing penetration of intermittent generation in the NEM.

NEMMCO believes that implementation of the proposed Semi-Dispatch Rule Changes will reduce the need for the above approaches.

2.2 Jurisdictional Approach - Interim SA Wind Farm Arrangements

2.1.1 NSP Control of Existing Wind Farms

For a number of existing significant wind farm generators in South Australia the relevant NSPs (ElectraNet SA and ETSA Utilities) have imposed conditions in their connection agreements requiring wind generators to install appropriate remote control equipment to enable their generating output to be limited by the NSP as necessary in order to manage local network flows within limits.

Clearly, while such an arrangement is desirable it is neither required under the Rules, nor co-ordinated with the Central Dispatch process managed by NEMMCO. The decision as to which wind farm generators are required to reduce output levels is outside the Central Dispatch process and may be on the basis of such mechanisms as "first in", proportional to nameplate rating, or some other method.

Good regulatory practice would seem to dictate that the means of rationing network capacity should be undertaken on a common basis across the NEM, preferably through the Central Dispatch process.

While such arrangements give the South Australian NSPs an ability to manage network flows it may also introduce some complexity for wind farm developers if potentially different approaches were to be adopted by NSPs in other jurisdictions. Again good regulatory practice would be to have common NEM-wide arrangements for the dispatch of such plant, rather than having different arrangements in place at different locations of the NEM.

2.1.2 Licensing of Significant New Wind Farms

In September 2005 the Essential Services Commission of South Australia (**ESCOSA**) issued a policy statement titled "Wind Generation Licensing - Statement of Principles"[3] that, in part, imposed as a condition of licence (Licensing Principle 3) that all licensees of new wind farm generation with nameplate rating of greater than 30MW classify with NEMMCO as a Scheduled Generator in the NEM.

In addition the licensee, as a Scheduled Generator, would be required to provide forecasts of expected generation output for incorporation into the Central Dispatch and PASA processes operated by NEMMCO.

This interim licensing condition was put in place pending the implementation of the NEM-wide Semi-Dispatch Arrangements proposed in this Rule Change. ESCOSA would remove that licensing condition once satisfied that the original intentions of the license condition are met by the Semi-Dispatch Rule changes.

[3] "Wind Generation Licensing - Statement of Principles", ESCOSA website, http://www.escosa.sa.gov.au/webdata/resources/files/050930-R-WindGenerationStatementofPrinciples.pdf

ESCOSA's decision was based on recommendations by the Electricity Supply Industry Planning Council (**ESIPC**) in their April 2005 report "Planning Council Wind Report to ESCOSA"[4]. Their recommendations proposed that wind farm generation licences should only be issued subject to terms and conditions that, for the period from when the generation commences operation in the NEM until the implementation of appropriate measures at the national level, would serve to ensure that the risks identified in the ESIPC report were managed effectively.

In particular, recommendation #3 in the ESIPC report suggested that NEMMCO should be able to automatically optimise unscheduled wind generation (as is currently done for scheduled generators) to ensure that the market continues to operate efficiently and securely.

The ESIPC report concluded that such measures were necessary based on independent studies indicating that there would be adverse impacts on the power system resulting from penetration rates of wind generation in South Australia exceeding 500 MW of installed capacity.

The ESCOSA report also noted that ElectraNet SA currently requires (as a condition in its connection agreements) that wind generators connecting to its network install control equipment to enable their output to be limited as necessary to manage local network flows. This requirement applies equally to existing licensed wind generators as well as to proposed new wind generators, and is designed to facilitate the participation of the current wind generators in any future centralised dispatch process developed by NEMMCO.

[4] "Planning Council Wind Report to ESCOSA", April 2005, ESIPC Website, http://www.esipc.sa.gov.au/webdata/resources/files/Planning_Council_Wind_Report_to_ESCOSA.pdf

3 Description of the Proposed Rule

To address the issues outlined in Section 1, NEMMCO is proposing to implement a new set of market arrangements (**the "Semi-Dispatch Arrangements"**) that apply specifically to persons that own, operate or control sources of significant intermittent generation.

The proposed Semi-Dispatch Arrangements would apply to all new generating unit classifications in the NEM that meet the *semi-scheduled* criteria described in Section 3.1.1, with the relevant person required to participate in the Central Dispatch and PASA processes and to ensure that its *semi-scheduled generating units* comply with dispatch instructions representing a maximum generation limit (a "**dispatch cap**") at times when that unit is "semi-dispatched".

The Semi-Dispatch Arrangements outlined in this Rule Change proposal comprise the following key elements:

1. Registration and Classification of Intermittent Generation;
2. Participation in Central Dispatch and PASA;
3. Control of Intermittent Generation through Network Constraints[5];
4. Use of Unconstrained Intermittent Generation Forecasts;
5. Conditions for Semi-Dispatch Compliance;
6. Requirements for Dispatch Cap Compliance;
7. Monitoring of Dispatch Cap Conformance by NEMMCO; and
8. Transition into the Semi-Dispatch Arrangements.

Each of these elements contributes to the overall operation of the proposed Semi-Dispatch Arrangements.

Figure 1 below illustrates how the elements of the Semi-Dispatch Arrangements fit together. The header numbers in the diagram refer to the various subsections of Section 3 of this document.

Implementation of the Semi-Dispatch Arrangements would require changes to:

- The National Electricity Rules (this Request);
- NEMMCO's Registration procedures[6];
- NEMMCO's Dispatch Conformance Monitoring procedures[7]; and
- NEMMCO's Network and FCAS Constraint Formulation policy[8].

[5] Sections 3 and 7 are not part of the requested Rule Changes, but are included for completeness & to describe changes to NEMMCO's underlying business processes.

[6] Registration Information, NEMMCO website, http://www.nemmco.com.au/registration/registration.htm

[7] Section 9 of "Dispatch System Operating Procedure SO_OP3705", NEMMCO website, http://www.nemmco.com.au/powersystemops/powersystemops.htm

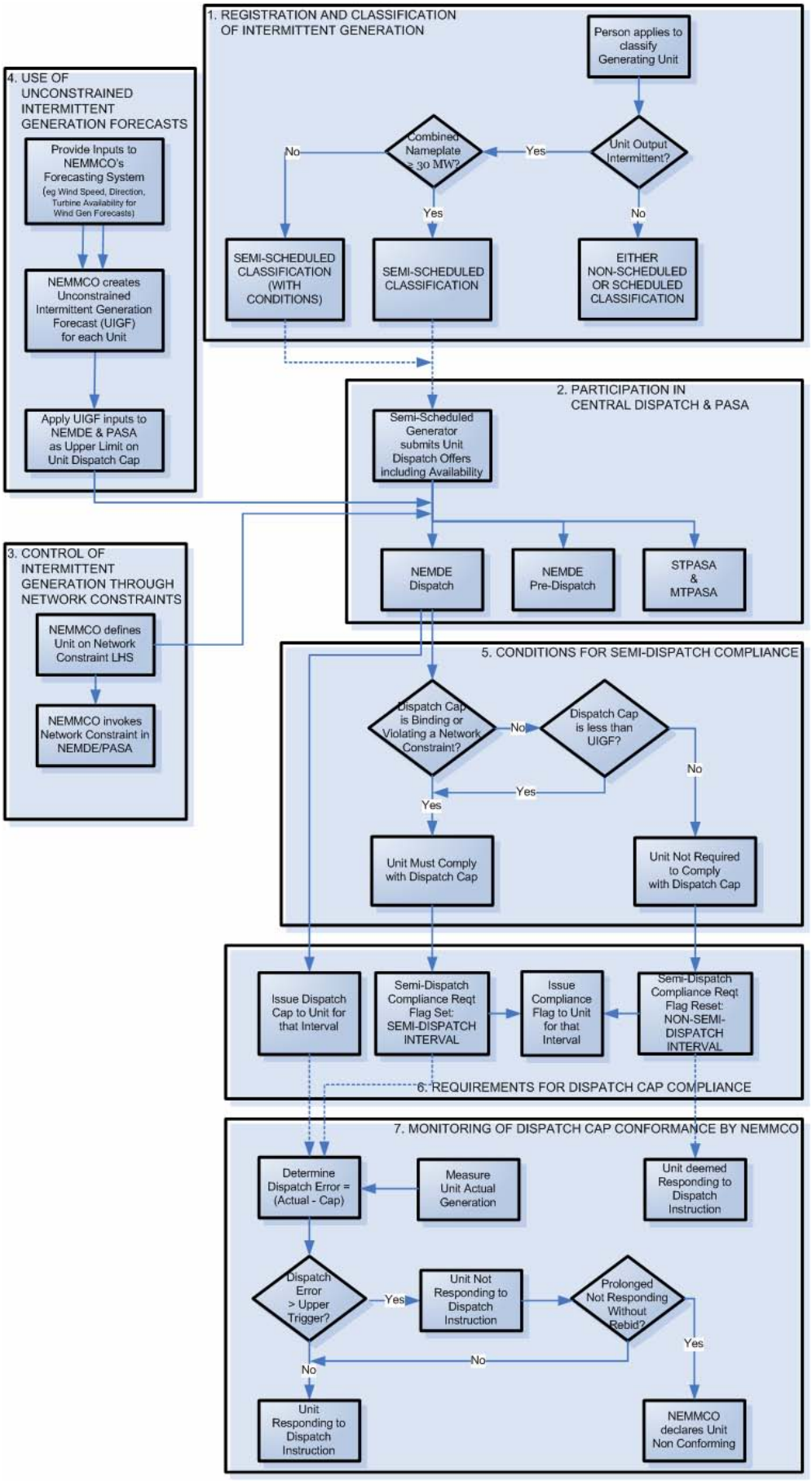
[8] "Network and FCAS constraint formulation", NEMMCO website, http://www.nemmco.com.au/dispatchandpricing/170-0030.htm

At the time of developing this proposal there were a number of other related projects underway or nearing completion with outcomes that are pre-requisite to the effective implementation of this Rule Change proposal - these projects and their likely impact are outlined in Section 5.

The next Section describes, for each element of the proposed Semi-Dispatch Rule Changes:

- What the changes are, and how they fit into the Semi-Dispatch proposal;
- Why those changes are effective in addressing the issues; and
- How those changes would be implemented.

Figure 1: Overview of the Semi-Dispatch Arrangements



3.1 Registration and Classification of Intermittent Generation

3.1.1 What Are The Proposed Changes?

New Classification of Semi-Scheduled Generating Unit

Under the current Rules a person registering a new generating unit in the NEM must apply to, and seek approval from, NEMMCO to classify that generating unit as either scheduled or non-scheduled unless otherwise granted an exemption by NEMMCO. A person may also subsequently apply to NEMMCO to alter this classification as part of a change to its unit registration details.

Under Clause 2.2.3(b)(3) NEMMCO must approve an application to classify a generating unit as non-scheduled if NEMMCO is satisfied, among other things, that its generating output is intermittent.

The proposed Semi-Dispatch Arrangements introduce a new generating unit classification of *semi-scheduled* and an associated participant category of Semi-Scheduled Generator.

Under the Semi-Dispatch Arrangements a person with a new or existing generating unit in the NEM that applies for classification as *semi-scheduled* would have that application approved if NEMMCO determines that the generating unit meets the *semi-scheduled* classification criteria described below. Once its classification is approved the *semi-scheduled generating unit* would be required to participate in the Semi-Dispatch Arrangements from its agreed Registration Effective Date.

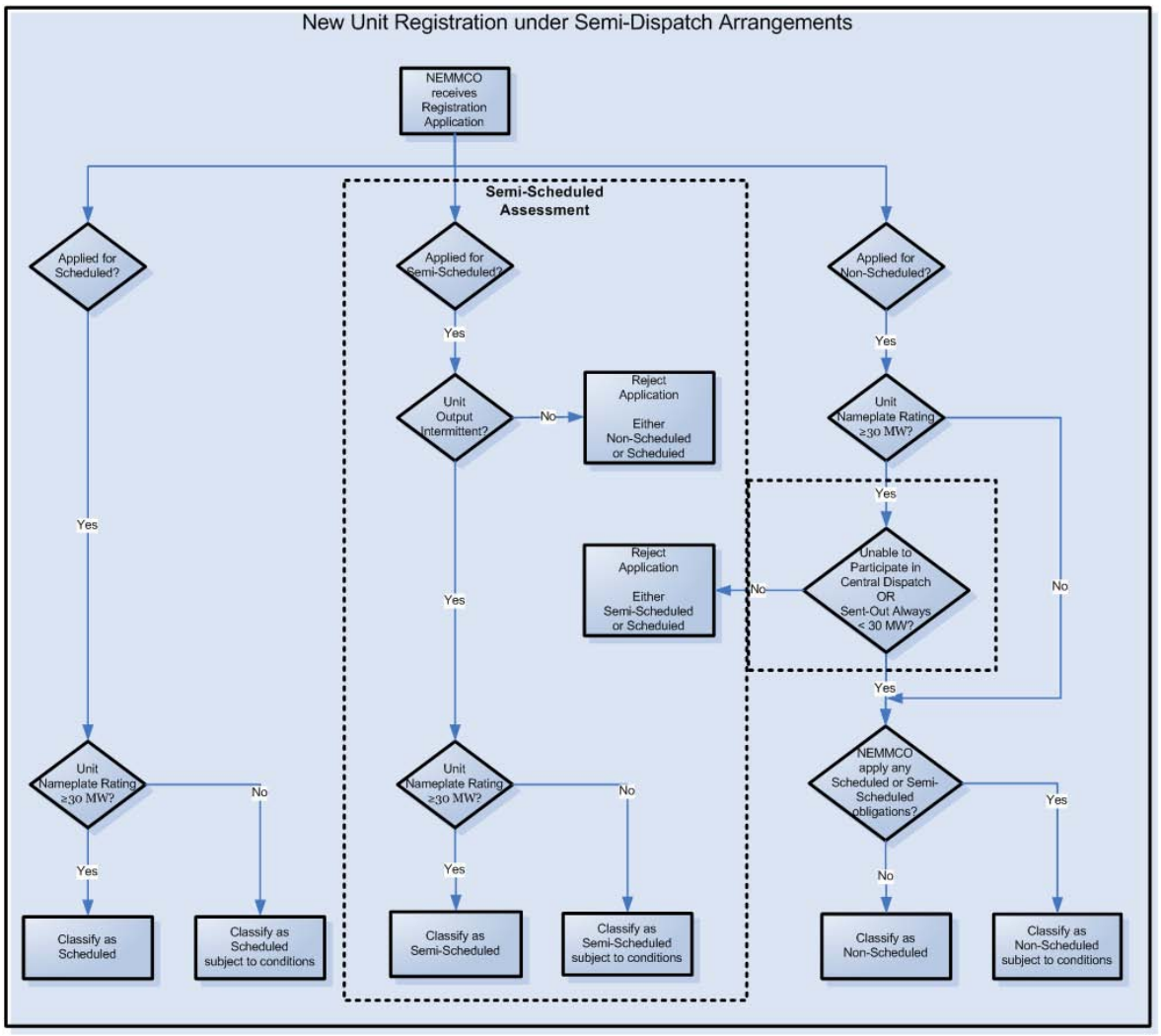
Conversely if a person applies to classify a new or existing generating unit as non-scheduled but NEMMCO assesses from the information provided that the generating unit meets the *semi-scheduled* criteria then NEMMCO would suggest that the application be modified or withdrawn. The applicant may then decide to re-apply for classification as either *semi-scheduled* (as a minimum requirement) or as scheduled.

Note that, at the time of writing, the majority of significant intermittent generating units in the NEM are wind farms, and after the Semi-Dispatch Arrangements are implemented all new significant wind farms would be expected to classify as *semi-scheduled*. It would also be expected that as other new intermittent generating technologies emerge and become significant they would also qualify as *semi-scheduled*.

Also note that a *semi-scheduled generating unit* must also be either a market generating unit or a non-market generating unit.

Figure 2 below illustrates the changes to NEMMCO's registration process (within the dotted box) to allow for the classification of generating units as *semi-scheduled*.

Figure 2: Classification Process for Generating Units (Semi-Dispatch Changes shown within dotted box)



Criteria for a Semi-Scheduled Generating Unit Classification

Under the proposed Semi-Dispatch Arrangements NEMMCO would apply the following criteria in classifying a generating unit as a *semi-scheduled generating unit*:

1. The generating unit has an output *nameplate rating* ≥ 30 MW
   OR
   The generating unit is part of a group of generating units (that is, a generating system) connected at a common connection point that has a combined output *nameplate rating* ≥ 30 MW

   AND

2. The generating unit has an output that is *intermittent*

Both *nameplate rating* and *intermittent* are defined terms in Chapter 10 of the Rules. These definitions (repeated below) do not change under the proposed Semi-Dispatch Arrangements.

Criterion #1 - Nameplate Rating

'*Nameplate Rating*' is defined as:

> "The maximum continuous output or consumption in MW of an item of equipment as specified by the manufacturer, or as subsequently modified".

Criterion #2 - Intermittent Output

An *intermittent* generating unit is defined as:

> "A generating unit that has an output that is not readily predictable including, without limitation, solar generators, wave turbine generators, wind turbine generators and hydro-generators without any material storage capability."

The definition of intermittent was considered by NEMMCO and its Wind Energy Industry Reference Group (**WEIRG**) and some options to clarify it were developed. However, at this stage it is not proposed to change the definition.

Other Pre-Requisites for a Semi-Scheduled Unit Classification

As a pre-requisite to classifying a generating unit as *semi-scheduled*, and prior to its operation under the proposed Semi-Dispatch Arrangements, the relevant person would be required to meet the following Rules obligations:

- Provision of Schedule 3.1 data to NEMMCO for each *semi-scheduled generating unit,* as currently required for scheduled generating units;

- Provision of adequate voice and electronic communications and operational data telemetry links (as currently required for Scheduled Generators under Clause 2.2.2(b)) to support the receipt of dispatch instructions from NEMMCO every 5-minutes for each *semi-scheduled generating unit*, and to enable NEMMCO to audit dispatch cap compliance of each *semi-scheduled generating unit*;

- Satisfy NEMMCO that the Generator will be capable of operating their *semi-scheduled generating unit* in accordance with the co-ordinated central dispatch process operated by NEMMCO under Chapter 3; and

- Satisfy NEMMCO that each *semi-scheduled generating system* will be capable of meeting or exceeding the performance standards registered with NEMMCO. These reflect the access standards negotiated in their connection agreement with the relevant NSP, for each of the technical requirements set out in Schedule 5.2 of the Rules.

Note that while most of the Schedule 5.2 technical requirements generically cover all significant generating units and systems, the following Schedule 5.2 technical requirements would require specific changes under this Rule Change proposal to accommodate the new *semi-scheduled generating unit* classification:

- Frequency Control (Clause S5.2.5.11)
- Active Power Control (Clause S5.2.5.14)
- Remote Monitoring (Clause S5.2.6.1)

Transition into the Semi-Dispatch Arrangements

If the proposed Semi-Dispatch Rules are implemented, then persons with "existing" generating units at the date that the Semi-Dispatch Rules take effect would not be required to apply to NEMMCO for classification as *semi-scheduled*.

The arrangements for transition into the proposed Semi-Dispatch Rules and the definition of "existing" generating units are described in Section 3.8.

Subsequent Changes in Generating Unit Classification

Under the registration arrangements, once a generating unit is classified at its initial NEM registration then that classification would remain indefinitely unless the relevant person applies to NEMMCO to change their registration details.

In the (albeit unlikely) event that a Generator applies to re-classify an existing generating unit:

- from scheduled to *semi-scheduled (*on the basis that the unit's output has become intermittent); or

- from scheduled or *semi-scheduled* to non-scheduled (on the basis that the combined unit nameplate rating is reduced to less than 30 MW);

NEMMCO would be required to approve such re-classification.

Note that under proposed changes to Clause 2.2.3(c) NEMMCO may approve a non-scheduled classification subject to the relevant Generator complying with either certain Scheduled Generator obligations or with certain Semi-Scheduled Generator obligations.

3.1.2 Why Would the Changes Be Effective?

The changes proposed in Section 3.1.1 would be effective for the following reasons:

- Under Clause 2.2.3(c) NEMMCO may impose certain Scheduled Generator obligations on a generating unit when approving its non-scheduled classification. In practice, however, NEMMCO has only applied this provision to the very limited extent of requiring the provision of unit availability data for demand forecasting purposes only and the provision of validated wind farm models, and not to the more onerous extent of requiring the submission of dispatch offers, automatic receipt of dispatch instructions and the conditional compliance with those dispatch instructions as would be required under this Rule Change proposal;

- Only relatively large sources of generation at a common connection point are likely to significantly affect network flows and therefore require centralised dispatch control. Therefore it is proposed that only intermittent generating units with a combined nameplate rating of ≥ 30 MW would be subject to centralised control, which is the same threshold that applies to mandating a scheduled generating unit classification[9];

- The current Rules automatically provide a blanket exemption for all intermittent generation from participating in Central Dispatch, on the basis that their energy source is inherently unpredictable.

  Such a complete exemption from any form of centrally co-ordinated output reduction may no longer be warranted, however, and presents an unnecessary barrier to the better integration of intermittent generation into the NEM, particularly where such control technology is both practicable and readily available;

- Significant intermittent generation should be required to compete with scheduled generation on a consistent basis for access to limited available network capacity rather than having unlimited, priority network access as is currently the case.

[9] It has been argued that the minimum participation threshold for *semi-scheduled generating units* should be higher given that by their very nature intermittent generators are unlikely to continuously operate as their nameplate rating - industry sources have variously quoted average wind farm capacity factors in the range of 30% to 35%. Nevertheless an intermittent generator may be operating at its nameplate rating at the very time that its output needs to be reduced in order to control network flows within secure limits.

3.1.3 How Would the Changes Be Implemented?

National Electricity Rule Changes

Table 1 in Appendix E summarises the Rule Changes relating to the classification of *semi-scheduled generating units* and the registration of Semi-Scheduled Generators.

Where Table 1 describes the changes as "Add *semi-scheduled* reference", this is short-hand for meaning that the relevant Clause should be logically extended to include the new classification of *semi-scheduled generating unit* or new participant category of Semi-Scheduled Generator, if the current Clause already refers to all generating units, either generically (as "generating units") or specifically to both scheduled and non-scheduled generating units.

Table 1 also lists "minor typos" which are either spelling, grammatical or factual errors that are self-evident and hence not further explained in this Section.

The proposed Rule Changes in this area are:

Chapter 2 – Registered Participants and Registration

New Semi-Scheduled Unit Classification and Participant Category
(New Clause 2.2.2A, amendments to Clauses 2.2.1, 2.2.2, 2.2.3, 2.12)

Add new Clause 2.2.2A "Semi-Scheduled Generator" to create a new generating unit classification of *semi-scheduled generating unit* and a new participant category of *Semi-Scheduled Generator* for owners or operators of *semi-scheduled generating units*.

The new Clause describes the process and criteria applied by NEMMCO when assessing and approving an application to classify a generating unit as *semi-scheduled*, including the pre-requisites on Semi-Scheduled Generators (which are the same as for Scheduled Generators) to provide:

- Schedule 3.1 registration data to NEMMCO; and
- Adequate voice and electronic communications and operational data telemetry links to support the receipt of dispatch instructions from NEMMCO every 5-minutes, and to enable the audit of dispatch cap compliance by NEMMCO.

There are also consequent amendments to Clauses 2.2.1 (Registration as a Generator), 2.2.2 (Scheduled Generator) and 2.2.3 (Non-Scheduled Generator) and 2.12 (Interpretation of References to Various Registered Participants) so that the new *semi-scheduled generating unit* classification is included when a person registers as a Generator, in their capacity as a Semi-Scheduled Generator.

Chapter 3 – Market Rules

Bid and Offer Aggregation Guidelines
(Clause 3.8.3)

A Semi-Scheduled Generator may also aggregate their *semi-scheduled generating units* for the purposes of Central Dispatch and settlements.

Delete Clauses (b)(3) and (b)(4), as the requirements for control systems and communication protocols are already covered as Technical Requirements under Schedule 5.2.

Delete Clause (b)(5), as special metering equipment is not needed to meter an aggregated unit.

Amend Clause (d), to clarify that if a group of classified scheduled generating unit or *semi-scheduled generating units* are aggregated, then all Chapter 3 & Clause 4.9 requirements that refer to a scheduled generating unit or a *semi-scheduled generating unit* only apply at its aggregated level, unless the context otherwise suggests. The current Clause says that these requirements apply equally at the individual unit and the aggregate level, which is generally incorrect and misleading.

Registered Bid and Offer Data
(new Schedule 3.1 Table)

Add a new "Semi-Scheduled Generating Unit" Table (with same items as for scheduled generating units) that covers the registered bid and offer data to be submitted to NEMMCO for each *semi-scheduled generating unit* prior to registering as a Semi-Scheduled Generator with respect to those units.

S*emi-scheduled generating units* are also referred to under Section "Aggregation Data".

Chapter 4 – Power System Security

Remote Control and Monitoring Devices
(Clause 4.11.1)

Amend Clause (a), so that a Semi-Scheduled Generator is required to install & maintain all remote control, operational metering & monitoring devices and local circuits in accordance with NEMMCO's standards and protocols as described in schedule 5.2, as currently applies to Scheduled Generators.

Chapter 5 - Network Connection

Recovery of Unit Commissioning Costs
(Clause 5.7.7 "Inter Network Power System Tests")

Amend Clause (d), so that an NSP has the right as a Proponent to recover from a Semi-Scheduled Generator all reasonable costs associated with commissioning tests conducted by the NSP on behalf of the Semi-Scheduled Generator (as listed in Chart 1), as for Scheduled Generators.

Frequency Control Systems
(Clause S5.2.5.11)

Add new Clauses (a)(5) and (a)(6), to define the "maximum operating level" and "minimum operating level" for *semi-scheduled generating units* and *systems,* in the same way as for scheduled generating units.

Active Power Control Systems
(Clause S5.2.5.14)

Add the following new Clauses (a)(3) and (b)(3), to define the proposed Minimum and Automatic access standard requirements for an Active Power Control System of a s*emi-scheduled generating unit*:

- Minimum Access Standard

  The minimum access standard is same as the automatic access standard that applies to a non-scheduled generating unit, which is:

  The provision of an Active Power Control system capable of, subject to energy source availability,

  (i) automatically reducing or increasing its active power output within five minutes, at a constant rate, to or below the level specified in an instruction electronically issued by a control centre, subject to subparagraph(iii);

  (ii) automatically limiting its active power output, to or below the level specified in subparagraph (i); and

  (iii) not changing its active power output within five minutes by more than the raise and lower amounts specified in an instruction electronically issued by a control centre.

  Note that paragraphs (i) and (iii) together imply a maximum output ramp rate capability.

- Automatic Access Standard

  The automatic access standard is the same as the minimum access standard as described above,

  Plus

  An additional requirement that the Active Power Control System is able to linearly ramp active power output from one dispatch level to another, subject to energy source availability.

  This is similar in concept to the automatic access standard for a scheduled generating unit under Clause S5.2.5.14 (a)(1)(ii).

Remote Monitoring Equipment
(Clause S5.2.6.1)

Apply the same remote monitoring equipment requirements for *semi-scheduled generating units* as is currently defined for scheduled generating units, so that the various metered quantities are transmitted to NEMMCO's control centres in real-time to facilitate Central Dispatch.

This is achieved by making the following amendments:

- Automatic Access Standard

  Add Clauses (a)(4) and (a)(5), to also include *semi-scheduled generating units* and aggregated generating systems (the latter referring to both scheduled and *semi-scheduled generating units*)

  Amend Clause (b)(1), as the metering requirements that follow also apply to non-aggregated *semi-scheduled generating units*.

  Amend Clause (b)(2), as the metering requirements that follow apply to aggregated generating units, including aggregated *semi-scheduled generating units.*

  Delete Clause (b)(1)(iii) and add Clause (b)(2)(iv), as the aggregate active and reactive power output metering requirement logically belongs under (b)(2) which covers aggregated generating units, and not (b)(1) covering non-aggregated units.

- Minimum Access Standard

  Amend Clause (c)(2), to refer to aggregated generating systems, which covers both scheduled and *semi-scheduled generating units*.

  Add Clause (c)(4), to also include *semi-scheduled generating units*. This change results in a re-numbering of the Clauses that follow.

  Amend (former) Clauses (c)(4) and (c)(5), to also apply those metering requirements to *semi-scheduled generating units* and to aggregated generating systems that include aggregated *semi-scheduled generating units.*

Chapter 8 – Administrative Functions

Exemption from Dispute on Classification as Semi-Scheduled Generating Unit
(Clause 8.2.1)

Add new Clause (h)(2A) - Decisions by NEMMCO to not approve the classification of a generating unit as a *semi-scheduled generating unit* are exempt from dispute, similar to the existing Clause (h)(2) dispute exemption on the classification of a scheduled generating unit.

Chapter 10 - Glossary

Amend the following Chapter 10 definitions relating to the above Rule changes:

- *registered bid and offer data*
- *semi-scheduled generating system*
- *semi-scheduled generating unit*
- *Semi-Scheduled Generator*

Other Changes

Changes to NEMMCO's Unit Registration procedures would also be required to elaborate upon and support the above Rule Changes.

3.2 Participation in Central Dispatch and PASA

3.2.1 What Are The Proposed Changes?

Participation in Central Dispatch

Under the proposed Semi-Dispatch Arrangements all Semi-Scheduled Generators with *semi-scheduled generating units* would be required to participate in Central Dispatch (which covers both the Dispatch and Pre-dispatch processes) as follows:

- Submit valid daily energy market offers ("dispatch offers") to NEMMCO for each *semi-scheduled generating unit* (including band MW, band prices and unit availability) in the same format and using the same offer mechanism as for scheduled generating units, in accordance with the relevant Rules;

- Allow dispatch instructions for each *semi-scheduled generating unit* to be centrally determined by NEMDE. These dispatch instructions would be calculated based on the competitive optimal dispatch of their relevant dispatch offer against the dispatch offers of all other scheduled and *semi-scheduled generating units* in the NEM, in accordance with the dispatch objective and subject to various unit and network constraints as described in Clause 3.8.1(b) of the Rules[10];

- Electronically receive dispatch instructions for each *semi-scheduled generating unit* in the form of a dispatch cap (which represents a maximum generation limit) and an associated new "semi-dispatch compliance" flag[11];

- Comply with dispatch instructions only during dispatch intervals where the *semi-scheduled generating unit* is subject to a "semi-dispatch compliance" requirement[12];

All dispatch offers and dispatch instruction data relating to a specific *semi-scheduled generating unit* (including the dispatch cap and "semi-dispatch compliance" flag data) would be confidentially published to the relevant Semi-Scheduled Generator during the trading day to which they apply, and made public after the end of that trading day, in a similar way as for scheduled units under the current Rules.

Participation in PASA

Under the proposed Semi-Dispatch Arrangements all Generators with *semi-scheduled generating units* would be required to submit valid STPASA and MTPASA inputs for use in NEMMCO's STPASA and MTPASA processes respectively, including PASA Availability and (optionally) any daily or weekly energy constraints.

[10] As an outcome of participating in the Central Dispatch process a *semi-scheduled generating unit* may also contribute to the setting of the energy market prices, in accordance with Clause 3.9.2(d) of the Rules.

[11] Refer to Section 3.5 for details of "semi-dispatch compliance" requirement flag.

[12] Refer to Section 3.6 "Requirements for Dispatch Cap Compliance" for more details.

3.2.2 Why Would the Changes Be Effective?

The proposed changes in Section 3.2.1 would be effective for the following reasons:

- Allow for the optimal, centrally-coordinated dispatch of both scheduled and significant intermittent generating units and thereby improves market price signals;
- Encourages a level playing field for all significant sources of generation in the NEM through more competitive, market-based access to limited network transfer capacity; and
- Better integrates significant sources of intermittent generation into the NEM and provides greater market transparency of their impact.

3.2.3 How Would the Changes Be Implemented?

National Electricity Rule Changes

Table 2 in Appendix E summarises the Rules Changes relating to the participation of *semi-scheduled generating units* in the Central Dispatch and PASA processes.

Where Table 2 describes the changes as "Add *semi-scheduled* reference", this is short-hand for meaning that the relevant Clause should be logically extended to include the new classification of *semi-scheduled generating unit* or new participant category of Semi-Scheduled Generator, if the current Clause already refers to all generating units, either generically (as "generating units") or specifically to both scheduled and non-scheduled generating units.

Table 2 also lists "minor typos" which are either spelling, grammatical or factual errors that are self-evident and hence not further explained in this Section.

There are a number of other Rule Changes proposed that would effectively confer the same rights and obligations on Semi-Scheduled Generators as currently exist for both Scheduled Generators, to ensure that *semi-scheduled generating units* participate in the Central Dispatch and PASA processes to the extent necessary under these Semi-Dispatch Arrangements.

The proposed Rule Changes in this area are:

Chapter 3 – Market Rules

Administration of PASA
(Clause 3.7.1)

Amend Clauses (c) and (d) - NEMMCO must collect and analyse MTPASA data from Semi-Scheduled Generators and report results to Semi-Scheduled Generators.

Medium Term PASA
(Clause 3.7.2)

Add new Clause (c)(4) - NEMMCO must prepare daily "unconstrained intermittent generation forecast" data (**UIGF**) for each *semi-scheduled generating unit* for input to the MTPASA process. "Unconstrained intermittent generation forecasts" are described in Section 3.4.

Amend Clause (d)(1) – Semi-Scheduled Generators must submit daily "unconstrained intermittent generation forecast" data for each *semi-scheduled generating unit* for input to the MTPASA process.

Add new Clauses (f)(3)(iii) and (iv) - NEMMCO must also include the capacity of *semi-scheduled generating units* in the calculation of the aggregate generating unit PASA Availability data that is publicly reported by NEMMCO for each region.

The capacity of a *semi-scheduled generating unit* is defined as the minimum of its PASA Availability and its "unconstrained intermittent generation forecast", and is determined to reflect any weekly energy constraint in a similar way to scheduled generating units.

Short Term PASA
(Clause 3.7.3)

Add new Clause (d)(4) - NEMMCO must prepare half-hourly "unconstrained intermittent generation forecast" data for each *semi-scheduled generating unit* for input to the STPASA process.

Add new Clauses (h)(4)(iii) & (iv) - NEMMCO must also include the capacity of *semi-scheduled generating units* in the calculation of the aggregate generating unit availability data that is publicly reported by NEMMCO for each region.

The capacity of a *semi-scheduled generating unit* is defined as the minimum of its PASA Availability and its "unconstrained intermittent generation forecast", and is determined to reflect any daily energy constraint in a similar way to scheduled generating units.

Amend Clause (e)(2), to qualify that synchronisation & de-synchronisation times are only required from Scheduled Generators and Semi-Scheduled Generators for slow start generating units with a nameplate rating ≥ 30 MW.

Delete (e)(4) - Generators are not required to submit unit self-dispatch levels for input to STPASA, as these are no longer used in STPASA.

Central Dispatch: Participation
(Clause 3.8.1)

Amend Clauses (a) and (e) – NEMMCO must also include *semi-scheduled generating units* in Central Dispatch and determine loading levels for those units based on Clause 3.8.1(b).

Add new Clause (b)(12) – Central Dispatch optimisation is also subject to new constraints resulting from the automatic application of the "unconstrained intermittent generation forecasts" as a maximum dispatch limit on *semi-scheduled generating units*.

Central Dispatch: Submission, Rebidding and Interpretation of Dispatch Offers
(Clauses 3.8.2, 3.8.4, 3.8.6, 3.8.8, 3.8.9, 3.8.22)

Amend the above Clauses so that Semi-Scheduled Generators must submit dispatch offers for the dispatch of their *semi-scheduled generating units*. These dispatch offers are in the same form, and subject to the same bidding and validation requirements as currently applies to scheduled generating units, as follows:

- Amend Clauses 3.8.2(a) and (b) - Semi-Scheduled Generators must submit dispatch offers for their *semi-scheduled generating units*, including a self-dispatch level which is the sum of negatively-priced price band capacity.

- Amend Clauses 3.8.4(a) and (c) - Semi-Scheduled Generators must advise the available capacity of their *semi-scheduled generating units*, including the half-hourly available capacity profile, commitment and de-commitment times, ramp rate constraints and any daily energy constraints.

- Amend Clauses 3.8.6(a), (c), (g), (h), (i) and (l) – Semi-Scheduled Generators must submit dispatch offers for a *semi-scheduled generating unit* in the same format as currently applies for a scheduled generating unit.

  A dispatch offer is defined by ten price bands, consisting of ten band prices for the trading day (which for the purpose of Central Dispatch are referred via the unit's intra-regional loss factor to the regional reference node) and ten band MW quantities for each half-hourly trading interval of the trading day.

- Amend Clauses 3.8.8(a), (b), (c) and (d) – the dispatch offer acknowledgment and validation provisions for a *semi-scheduled generating unit* are the same as currently apply for a scheduled generating unit.

- Amend Clauses 3.8.9(a), (b), (d) and (e) – the default dispatch offer requirements for a *semi-scheduled generating unit* are the same as currently apply for a scheduled generating unit.

- Amend Clauses 3.8.22 (b), (c) and (d) – the rebidding requirements for a *semi-scheduled generating unit* are the same as currently apply for a scheduled generating unit, including the provision of a rebid reason and time to NEMMCO, the next-day publication by NEMMCO of such information, and the provision of more detailed information to AER on request.

Central Dispatch: Treatment of Dispatch Offers
(Clauses 3.8.14, 3.8.16)

Amend Clauses 3.8.14(a) and (b), so that dispatch offers for all *semi-scheduled generating units*, including those under reserve contract, are dispatched during times of supply scarcity, as currently applies for scheduled generating units.

Amend Clause 3.8.16, so that *semi-scheduled generating units* are also included in the current arrangements for pro-rata dispatch of marginal price bands that are equally-priced at their regional reference node.

Dispatch Inflexibilities
(Clause 3.8.19)

Add new Clause (a1) - Semi-Scheduled Generators must submit a revised maximum loading level for their *semi-scheduled generating unit*, if for some reason that unit is unable to operate in accordance with its dispatch instruction during a semi-dispatch interval (that is, actually generating above its dispatch cap).

This somewhat differs from the requirement for a Scheduled Generator to submit a fixed loading level for a scheduled generating unit, as the dispatch instruction for a scheduled generating unit refers to a fixed point target rather than a dispatch cap.

Amend Clause (b) – Semi-Scheduled Generators must submit a reason to NEMMCO (or provide additional information to AER on request, unless confidential) if they declare their *semi-scheduled generating unit* as inflexible under Clause (a1), as currently applies for Scheduled Generators.

Amend Clause (c) – The revised maximum loading level defined in Clause (a1) will override the dispatch cap that would have otherwise been determined by Dispatch for that *semi-scheduled generating unit* based on its dispatch offer.

Amend Clauses (d) and (f) – Semi-Scheduled Generators may submit a dispatch inflexibility profile for a fast start *semi-scheduled generating unit*, and dispatch instructions from NEMMCO must be consistent with that dispatch inflexibility profile, as currently applies for fast start scheduled generating units.

Pre-dispatch
(Clause 3.8.20)

Amend Clause (c) - NEMMCO must also determine the Pre-dispatch schedule based on NEMMCO's "unconstrained intermittent generation forecast" for each *semi-scheduled generating unit*.

Amend Clause (g) - Semi-Scheduled Generators must also be able to dispatch its generation, if necessary by rebidding.

Amend Clauses (j) and (k) - NEMMCO must confidentially report to the relevant Semi-Scheduled Generator the following data for their *semi-scheduled generating units*, after each run of the Pre-dispatch process, as is currently done for scheduled generating units:

- Scheduled commitment and decommitment times;
- Scheduled half-hourly loadings;
- Scheduled ancillary services;
- Scheduled constraints due to network limitations;
- Operation outside of enablement limits (FCAS stranded)

On-Line Dispatch
(Clause 3.8.21)

Amend Clauses (d) and (e) – NEMMCO will where possible issue dispatch instructions electronically to a Semi-Scheduled Generator, who must have the facilities to receive those dispatch instructions, as currently applies for Scheduled Generators.

Amend Clause (j) – NEMMCO's Dispatch process must apply a dispatch inflexibility profile constraint to a *semi-scheduled generating unit*, if defined in its dispatch

offer, as is currently done for a scheduled generating unit. Units constrained by a dispatch inflexibility profile cannot set price.

Amend Clause (m) - NEMMCO must also confidentially report to the relevant Semi-Scheduled Generator for each of their *semi-scheduled generating units* whether the unit is operating outside of its enablement limits (FCAS stranded), after each run of the Dispatch process, as is currently done for scheduled generating units.

Network Constraints
(Clause 3.8.10)

NEMMCO must also determine constraints on the dispatch of *semi-scheduled generating units* arising from planned network outages.

Spot Market: Reporting of Unit Dispatch Cap and UIGF
(Clause 3.13.4)

Add new Clause (k1) - NEMMCO must confidentially report to the relevant Semi-Scheduled Generator the "unconstrained intermittent generation forecast" data for their *semi-scheduled generating units* during the trading day to which those forecasts apply, after each run of the Pre-dispatch process.

Add new Clause (q) – NEMMCO must also publicly report, for all *semi-scheduled generating units*:

- Actual generation;
- Dispatched generation (these are dispatch caps);
- Unconstrained intermittent generation forecast data, for each unit and as regional totals;

for each run of the Dispatch and Pre-dispatch processes, after completion of the trading day to which those forecasts applied.

Mandatory Restrictions
(Clauses 3.12A.1, 3.12A.4, 3.12A.5, 3.12A.7, 3.12A.9, 3.15.10B)

Semi-Scheduled Generators can also participate in the Mandatory Restrictions process, under the same arrangements that currently apply to Scheduled Generators:

- Amend Clauses 3.12A.1(b)(3), (b)(8), (c)(2) – Making of Restriction Offers
- Amend Clause 3.12A.4 - Rebid of Capacity under Restriction Offers
- Amend Clauses 3.12A.5(a) and (b) - Dispatch of Restriction Offers
- Amend Clauses 3.12A.7(a) and (b1) - Determination of funding restriction shortfalls
- Amend Clause 3.12A.9(b)(1)(ii) – Review by AEMC

Provision of Information
(Clause 3.13.1)

Amend Clause (a) - NEMMCO must also provide information on market operation to Semi-Scheduled Generators on their request, unless confidential or commercially sensitive, as currently applies for Scheduled Generators.

Systems and Procedures
(Clause 3.13.2)

Amend Clause (c) – Semi-Scheduled Generators may also transmit market information to and from NEMMCO in a format approved by NEMMCO.

Amend Clauses (f) and (g) – Semi-Scheduled Generators must also be able to access the market information bulletin board, and review and download published information via the electronic communication system.

Amend Clauses (h) and (i) – Semi-Scheduled Generators must also notify NEMMCO of changes to submitted information in accordance with the spot market timetable, and NEMMCO must publish and keep copies of such changes.

Amend Clauses (k) and (m) – Semi-Scheduled Generators may also withhold from NEMMCO confidential or commercially sensitive information, unless generally available.

Standing Data
(Clause 3.13.3)

Amend Clause (a) – NEMMCO must also publish a list of Semi-Scheduled Generators, including those applying for registration, ceasing to be registered or suspended.

Amend Clauses (b), (h) and (j) – Semi-Scheduled Generators must also provide registered bid and offer data under Schedule 3.1, including any planned changes at least one-month ahead, and NEMMCO must annually review such data in consultation with Generators and Market Participants.

Amend Clause (c) – Semi-Scheduled Generators must also provide Clause 5.6.1 connection point forecasts and Chapter 7 metering information for settlements purposes.

Amend Clause (d) – NSPs must also maintain a register of data provided by Semi-Scheduled Generators for planning and design purposes in accordance with Schedule 5.7, and provide that data to NEMMCO on request.

Amend Clauses (q)(5) and (t) – NEMMCO must publish a Statement of Opportunities (**SOO**) to also assist planning by Semi-Scheduled Generators, and Semi-Scheduled Generators must also provide NEMMCO with Statement of Opportunities data listed in Clauses (q)(2) and (q)(3).

Price Reporting by AER
(Clause 3.13.7)

Amend Clause (d)(3) – AER must also include *semi-scheduled generating units* in its identification of the marginal price-setting generating units, as part of its spot price monitoring activities.

Administered Price Cap Compensation
(Clauses 3.14.6, 3.15.10)

Amend Clauses 3.14.6(a) and (e)(3) - Semi-Scheduled Generators are also eligible to claim compensation determined by AEMC that arises from the application of an Administered Price Cap.

Amend Clauses 3.15.10(a), (b) and (c) – NEMMCO must also determine amounts to recover from Market Participants for any Administered Price Cap compensation payments to Semi-Scheduled Generators.

Directions: Payments and Additional Compensation
(Clauses 3.15.7, 3.15.7A, 3.15.7B)

Semi-Scheduled Generators may also be directed by NEMMCO, and NEMMCO must pay compensation to the relevant Semi-Scheduled Generators as a Directed Participant, in accordance with the relevant Clauses 3.15.7, 3.15.7A or 3.15.7B:

- Amend Clause 3.15.7(c) Table –Semi-Scheduled Generators are also included in the compensation formula for the directed provision of energy or market ancillary services.
- Amend Clause 3.15.7A(c)(1)(ii)(A) - Semi-Scheduled Generators are also included in the compensation formula for the directed provision of services other than energy or market ancillary service.
- Amend Clause 3.15.7B(a)(1),(a3) – Semi-Scheduled Generators may also claim additional compensation for foregone revenue or net direct costs.

Scheduling Error Compensation and the Participant Compensation Fund
(Clauses 2.11.3, 3.16.1, 3.16.2)

Amend Clauses 2.11.3(b)(8) and 3.16.1(a) - Semi-Scheduled Generators must also contribute to the Participant Compensation Fund, as currently applies for Scheduled Generators.

Add new Clause 3.16.1(g1) - Semi-Scheduled Generators are also not entitled to a refund from the Participant Compensation Fund if they are no longer a Semi-Scheduled Generator, as currently applies for Scheduled Generators.

Add new Clause 3.16.2(d1) - Semi-Scheduled Generators may claim under-dispatch compensation from the Participant Compensation Fund for a scheduling error, as currently applies in Clause (d) for a Scheduled Generator.

Add new Clause 3.16.2(f1) - Semi-Scheduled Generators may claim over-dispatch compensation from the Participant Compensation Fund for a scheduling error, as currently applies in Clause (f) for a Scheduled Generator.

Amend Clause 3.16.2(h)(1) – Dispute Resolution Panel must determine over-dispatch compensation to Semi-Scheduled Generators under new Clause (f1) on the basis of the actual loading level of the *semi-scheduled generating unit*, as currently applies for a scheduled generating unit.

Chapter 10 - Glossary

Add the following new Chapter 10 definitions relating to the above Rule changes:

- *energy constrained semi-scheduled generating unit*
- *unconstrained intermittent generation forecast*

Amend the following Chapter 10 definitions relating to the above Rule changes to include a reference to *semi-scheduled* for the purpose of Central Dispatch and PASA:

- *available capacity*
- *central dispatch*
- *Directed Participant*
- *dispatch*
- *dispatch inflexibility profile*
- *dispatch offer price*
- *dispatched generating unit* – to specifically only refer to scheduled units
- *generation dispatch offer*
- *inflexible, inflexibility* – separate Clauses for scheduled and *semi-scheduled*
- *loading price*
- *off-loading price*
- *PASA availability*
- *restriction offer*
- *scheduled plant*
- *statement of opportunities*

Other Changes

There are no other changes in this area other than the above Rule Changes.

3.3 Control of Intermittent Generation through Network Constraints

Under the proposed Semi-Dispatch Arrangements network constraints involving *semi-scheduled generating units* would be formulated using the same approach as for scheduled generating units, and in accordance with NEMMCO's "Network and FCAS Constraint Formulation" policy.

This means that network constraint equations involving *semi-scheduled generating units* would be formulated so that their generation terms, if material, appear on the constraint LHS in order for their dispatch to be optimally determined and controlled by NEMDE in the same way as scheduled generating units.

The issue with the current approach of defining significant non-scheduled generation as fixed RHS terms in network constraint equations is briefly described in the example in Appendix A, and in further detail in the supplementary NEMMCO information paper titled "Semi-Dispatch of Significant Intermittent Generation - Proposed Market Arrangements" on the NEMMCO website.

Note that network constraint equations involving *semi-scheduled generating units* would be formulated so that their output can only be constrained-off, as a generating unit with intermittent output could not be expected to increase its output "on demand" unless sufficient energy were available at the time from its primary energy source.

It is also noted that minor changes to NEMMCO's "Network and FCAS Constraint Formulation" policy may be required to allow *semi-scheduling generating units* to also be defined as dispatch variables on the LHS of network constraint equations.

3.4 Use of Unconstrained Intermittent Generation Forecasts

3.4.1 What Are the Proposed Changes?

The proposed Semi-Dispatch Arrangements rely on the provision of regular "unconstrained intermittent generation forecasts" (**UIGF**) for each *semi-scheduled generating unit*, profiled across all dispatch intervals for use in the Dispatch, Pre-dispatch and PASA processes.

The "unconstrained intermittent generation forecast" is the equivalent forecast of electrical power output from a generating unit (or a generating system, if aggregated under Clause 3.8.3) based on the forecast amount of raw energy available for conversion into electrical power, as limited by the available generating capacity of that generating facility.

This generation forecast is "unconstrained" in the sense that it is based on the raw energy input to the unit's power conversion process and ignores overriding factors that are external to the power conversion process, such as the impact of network limits or an economic requirement to otherwise operate at reduced levels as signalled through the dispatch offer.

The unit "unconstrained intermittent generation forecasts" input to the Dispatch and Pre-dispatch processes would be determined based on the most probable forecasts (that is, 50% probability of exceedance), whereas the PASA processes would use 10% and 50% probability of exceedance forecasts of "unconstrained intermittent generation" in the same way that demand forecasts are currently provided for input to those processes.

For the Dispatch and Pre-dispatch processes the "unconstrained intermittent generation forecast" for each *semi-scheduled generating unit* would be automatically applied as an inviolable or "hard" upper limit on the value of the dispatch cap calculated by NEMDE for that generating unit. Hence the calculated dispatch cap for a *semi-scheduled generating unit* would never be constrained to above its "unconstrained intermittent generation forecast" through the action of any network constraint equation. However if the Semi-Scheduled Generator submits a maximum loading level inflexibility under new Clause 3.8.19(a1) then that value becomes the calculated dispatch cap and may override the "unconstrained intermittent generation forecast". This is analogous to the situation where a scheduled generating unit could not normally be constrained-on above its bid availability unless overridden by a submitted fixed loading level.

Similarly in the STPASA and MTPASA processes the unit "unconstrained intermittent generation forecast" would be automatically applied as an upper limit on the amount of generating capacity dispatched from each *semi-scheduled generating unit* to meet the PASA demand plus minimum reserve requirements.

Under the proposed Semi-Dispatch Arrangements if the "unconstrained intermittent generation forecast" data were unavailable or deemed to be of unacceptable quality, then the last known, good quality "unconstrained intermittent generation forecast" would instead be used.

3.4.2 Why Would the Changes Be Effective?

The proposed changes in Section 3.4.1 would be effective for the following reasons:

- More accurate forecasting of significant intermittent generation would result in more efficient dispatch and pricing outcomes and PASA assessments, better network utilisation and improved power system security and reliability; and

- Under the proposed Semi-Dispatch Arrangements the Dispatch process would use the "unconstrained intermittent generation forecast" to assess whether the relevant *semi-scheduled generating unit* is required to comply with its dispatch cap - Section 3.5 explains this in more detail.

3.4.3 How Would the Changes Be Implemented?

National Electricity Rule Changes

The proposed Rule Changes that cover the provision and reporting of unit "unconstrained intermittent generation forecast" data are described in Section 3.2

Other Changes

- A new centralised forecasting system would be required to provide the Dispatch, Pre-dispatch and PASA processes with unit "unconstrained intermittent generation forecasts" profiled across the relevant timeframes.

  For these purposes NEMMCO are planning to procure the Australian Wind Energy Forecasting System (**AWEFS**).

- Changes to the Dispatch and Pre-dispatch processes would be required to automatically apply the "unconstrained intermittent generation forecast" for each *semi-scheduled generating unit* as an upper limit in the calculation of its dispatch cap.

- Similarly, changes to the STPASA and MTPASA processes would be required to automatically apply the "unconstrained intermittent generation forecast" for each *semi-scheduled generating unit* as an upper limit in the calculation of its capacity target.

3.5 Conditions for Semi-Dispatch Compliance

3.5.1 What Are the Proposed Changes?

Under the proposed Semi-Dispatch Arrangements a *semi-scheduled generating unit* would only need to comply with its dispatch cap (as calculated by the Dispatch process) when the "semi-dispatch compliance" requirement for the relevant dispatch interval is also set.

The "semi-dispatch compliance" requirement would be assessed after the completion of each Dispatch run calculation, and would only be set for a *semi-scheduled generating unit* for a particular dispatch interval when either one of the following conditions is satisfied:

1. Dispatch Cap limited by Binding or Violated Network Constraint Equation

   The generating unit's forecast output (its dispatch cap) is explicitly limited by any binding or violated network constraint equation, and if the actual output were to exceed the dispatch cap this would result in violating (or further violating) that network constraint equation;

   OR

2. Dispatch Cap otherwise below Unconstrained Intermittent Generation Forecast

   The generating unit's forecast output (its dispatch cap) is not explicitly limited by a binding or violated network constraint equation

   BUT
   The generating unit's dispatch cap is less than its "unconstrained intermittent generation forecast" as a result of either a purely inter-regional limitation, or an offer or market-related limitation, the latter including:

   - Unit Ramp Rate;
   - Unit Fixed Loading Level;
   - Non-dispatch of uneconomic price bands;
   - Marginal dispatch of economic price bands;

When one of the above "semi-dispatch compliance" conditions is met for a particular *semi-scheduled generating unit* and dispatch interval, its "semi-dispatch compliance" requirement flag is set for that dispatch interval (a "**semi-dispatch interval**") and the generating unit is "semi-dispatched".

For all other dispatch intervals where neither of the above conditions is met the generating unit's "semi-dispatch compliance" requirement flag is reset for that dispatch interval (a "**non-semi-dispatch interval**") and the generating unit is "non-semi-dispatched".

In assessing the "semi-dispatch compliance" condition for each *semi-scheduled generating unit*, the following is assumed:

- The "unconstrained intermittent generation forecast" input, the calculated dispatch cap and the network constraint equation solutions used in the assessment are all from the same Dispatch run.

- The set of network constraint equations involved in the assessment of condition #1 are not restricted by the type of network limit modelled, which may include thermal, transient stability, voltage stability or oscillatory stability limits.

- The set of network constraint equations involved in the assessment of condition #1 are only restricted to those with the *semi-scheduled generating unit* explicitly defined as a controllable energy dispatch variable on the LHS of the constraint equation.

  Where such a constraint equation binds or violates the *semi-scheduled generating unit* would have a calculated dispatch cap that is **less than or equal to** its "unconstrained intermittent generation forecast".

- Where the only binding or violated network constraint equations involve interconnector LHS terms alone, NEMDE effectively includes all scheduled and *semi-scheduled generating units* from adjoining unconstrained regions in determining what units to constrain to meet the interconnector flow limit.

  For such constraint equations the specific contribution to interconnector flow from each unit (and hence the potential to violate the limit if its output exceeds its dispatch instruction) are both largely unknown.

  In this case, the test under condition #2 would be relied upon, with the assumption that the dispatch cap is **less than** its "unconstrained intermittent generation forecast" owing to the *semi-scheduled generating unit* being constrained off to meet that binding interconnector flow limit.

Note that while the requirement for "semi-dispatch compliance" only applies to the Dispatch process under this Rule Change proposal, consideration may be given to also determining and publishing this flag information over the Pre-dispatch and PASA timeframes as well as provide Semi-Scheduled Generators with advance notice of when the compliance requirement may apply.

Section 3.6 below describes how a *semi-scheduled generating unit* is required to interpret its "semi-dispatch compliance" requirement flag in order to comply with its associated dispatch cap in accordance with NEMMCO's Dispatch Conformance Monitoring procedures.

3.5.2 Why Would the Changes Be Effective?

The proposed changes in Section 3.5.1 would be effective as:

- Where condition #1 occurs, a *semi-scheduled generating unit* would be required to control its output when it is explicitly contributing to a binding (or violated) network constraint equation and there is a risk of violating (or further violating) that network constraint equation. This test would also cover (possibly extended) periods where a *semi-scheduled generating unit* is in a binding network constraint equation where its calculated dispatch cap is apparently unconstrained (that is, exactly equal to its "unconstrained intermittent generation forecast") yet to exceed that dispatch cap (all other things being equal) would clearly result in violating that network constraint equation.

- Where condition #2 occurs, a *semi-scheduled generating unit* is required to control its output at other times when its dispatch cap is less than its "unconstrained intermittent generation forecast". This may occur as a result of either:

    - Binding (or violated) network constraint equations with interconnector LHS terms only, where the *semi-scheduled generating unit* is indirectly constrained off as part of one of the unconstrained adjoining regions for that interconnector.

    - Changes to the desired loading of the generating unit (as reflected in a participant's dispatch offer); or

    - The *semi-scheduled generating unit* only being marginally dispatched (or not dispatched at all) in order to maintain the demand/supply balance at very low demand periods when a number of units are typically constrained-off to their minimum output levels.

3.5.3 How Would the Changes Be Implemented?

National Electricity Rule Changes

New Chapter 10 Definitions

The conditions for defining whether a *semi-scheduled generating unit* is required to comply with a dispatch cap for a particular dispatch interval are described in the proposed new Chapter 10 definitions for *semi-dispatch interval* and *non-semi-dispatch interval*.

Other Changes

- Changes to the Dispatch process would be required to automatically assess for each *semi-scheduled generating unit* whether the "semi-dispatch compliance" condition is met and to then set the "semi-dispatch compliance" requirement flag accordingly before issuing that flag along with its associated dispatch cap.

  These changes would also be made to the Pre-dispatch and the PASA processes for market information purposes only.

3.6 Requirements for Dispatch Cap Compliance

3.6.1 What Are the Proposed Changes?

The current Dispatch process determines a dispatch target for each scheduled unit for every dispatch interval, and electronically reports this confidentially to the relevant participant.

Under the proposed Semi-Dispatch Arrangements, for each *semi-scheduled generating unit* the Dispatch process would determine both a dispatch cap and an associated "semi-dispatch compliance" requirement flag, and electronically issue these quantities confidentially to the relevant Semi-Scheduled Generator.

Compliance Requirement during a Semi-Dispatch Interval

For all semi-dispatch intervals a *semi-scheduled generating unit* would be required to limit its output at the end of that dispatch interval to less than or equal to the value of its dispatch cap for that dispatch interval.

The *semi-scheduled generating unit* would not be required to follow a particular generation profile during a semi-dispatch interval, although linear ramping of its generating output is encouraged under the proposed Causer Pays provisions of new Clause 3.15.6A(k)(5) in order to minimise the use of frequency control services.

Under the Rules the dispatch instructions issued from the Dispatch process are interpreted as only applying at the end of each dispatch interval, at which time NEMMCO assesses dispatch instruction compliance.

While the proposed Rule Changes remain consistent with this interpretation, a potential interpretative issue is discussed in the supplementary information paper "Semi-Dispatch - Proposed Market Arrangements" published on the NEMMCO website.

Compliance Requirement during a Non-Semi-Dispatch Interval

For all other non-semi-dispatch intervals a *semi-scheduled generating unit* would not be required to comply with its dispatch cap for that dispatch interval, can ignore the dispatch cap and operate at any generating output level over that dispatch interval, subject to any direction or Clause 4.8.9 instruction issued by NEMMCO to do otherwise.

Interaction with the FCAS Regulation Causer Pays Process

In accordance with Clause 3.15.6(j) of the Rules, FCAS Regulation Causer Pays factors and the associated cost recovery liabilities are assessed for all Market Generators, including those with any market generating units that are classified as *semi-scheduled*. This would not change under this Rule Change proposal.

Under the proposed Semi-Dispatch Arrangements during a "semi-dispatch" interval the linear trajectory that would apply in the Causer Pays calculations for a *semi-scheduled generating unit* would be based on a linear ramp between successive dispatch caps. This is a similar concept to the linear ramp between successive dispatch targets calculated for scheduled generating units.

In all other "non-dispatched" intervals the linear trajectory that would apply in the Causer Pays calculations would be based on the calculated line-of-best-fit of actual

generation during that "non-semi-dispatch" interval. Note that this is how the linear trajectory is currently determined for non-scheduled generating units.

3.6.2 Why Would the Changes Be Effective?

The proposed changes in Section 3.6.1 would be effective for the following reasons:

- A *semi-scheduled generating unit* would be required to control its generating output to at or below its dispatch cap at times when its output is contributing to a binding (or violated) network constraint equation, in order to avoid violating (or further violating) that network constraint equation in order to maintain (or restore) power system security.

- A *semi-scheduled generating unit* would also be required to control its generating output to at or below its dispatch cap at times when that cap is less than its "unconstrained intermittent generation forecast". Examples where this may occur are:

    - The Generator deliberately withdrawing dispatch, signalled through their dispatch offer (for example, the unit is rebid unavailable); or

    - The Generator adjusts price bands in its dispatch offer to avoid dispatch in low price periods; or

    - Generation is generally being constrained-off to minimum loads during low demand periods.

  The "unconstrained intermittent generation forecast" is the maximum output that could be achieved from the generating unit based on the equivalent forecast of available energy source (for example, total wind energy input to the wind farm) ignoring the affect of any network constraints on that output;

- At all other times a *semi-scheduled generating unit* can ignore its dispatch cap, and can act as any non-scheduled generating unit; and

- The requirement that a *semi-scheduled generating unit* control its generating output to at or below its dispatch cap would allow for lower network operating margins than would otherwise be required to accommodate potentially large uncontrolled increases in output.

3.6.3 How Would the Changes Be Implemented?

National Electricity Rule Changes

Table 3 in Appendix E summarises the Rule Changes relating to the dispatch cap compliance requirements for *semi-scheduled generating units*.

Where Table 3 describes the changes as "Add *semi-scheduled* reference", this is short-hand for meaning that the relevant Clause should be logically extended to include the new classification of *semi-scheduled generating unit* or new participant category of Semi-Scheduled Generator, if the current Clause already refers to all generating units, either generically (as "generating units") or specifically to both scheduled and non-scheduled generating units.

Table 3 also lists "minor typos" which are either spelling, grammatical or factual errors that are self-evident and hence not further explained in this Section.

The proposed Rule Changes in this area are:

Chapter 3 – Market Rules

Self-Commitment
(Clause 3.8.17)

The synchronisation and commitment requirements under Clauses 3.8.17 , 4.9.4 and 4.9.6 for *semi-scheduled generating units* are the same as for scheduled generating units.

Section 3.1.1 elaborates on the interpretation of these requirements for aggregated *semi-scheduled generating units*. Specific Rule changes are:

- Amend Clause (e) – Scheduled Generators and Semi-Scheduled Generators need only notify NEMMCO of their unit self-commitment and synchronisation intentions for scheduled generating units or *semi-scheduled generating units* (including aggregated) with a nameplate rating of ≥ 30 MW, unless otherwise agreed with NEMMCO. The current Rules do not place a MW threshold on this notification requirement, however in practice NEMMCO has only insisted on advance notification of significant planned generation movements.

  In addition, both Scheduled and Semi-Scheduled Generators must now advise such intentions via both Pre-dispatch and PASA process through changes in their unit's available capacity profile. The current Rules only required notice via PASA, however in practice Pre-dispatch is also used, and in any case PASA alone may not provide more up-to-date advice that may be required by NEMMCO under current Clause 4.9.6(a)(1).

- Amend Clause (f) – exact synchronisation times "may" (rather than "will") be subject to directions from NEMMCO. This is consistent with NEMMCO's current operating practices and with existing Clause 4.9.6(a)(1) where NEMMCO may require further notification immediately before synchronisation.

Dispatch-related limitations on Scheduled Generators and Semi-Scheduled Generators
(Clause 4.9.4 and Heading changed)

- Amend initial paragraph and Clauses (b)(3), (c), (e) and (f) - the same dispatch-related limitations apply to *semi-scheduled generating units* as currently apply for scheduled generating units.

- Amend Clause (a)(1) – Delete "up to the self-dispatch level" as Clause 4.9.6(a)(2) already covers this requirement.

- Amend Clause (d) – Requirement to obtain NEMMCO approval to synchronise or de-synchronise only applies to scheduled or *semi-scheduled generating units* with a nameplate rating ≥ 30 MW, unless otherwise in accordance with a dispatch instruction.

Commitment of scheduled generating units and semi-scheduled generating units
(Clause 4.9.6 and Heading changed)

- Add initial Paragraph under Clause (a) – the Self-Commitment procedures under Clauses (a)(1) and (a)(2) only apply to scheduled or *semi-scheduled generating units* (including aggregated) with a nameplate rating ≥ 30 MW

- Amend Clause (a)(1) - Scheduled and Semi-Scheduled Generators must confirm their unit synchronisation times with NEMMCO in accordance with Clause 3.8.17(e) – that is, by submitting an amended available capacity profile for their unit.

- Amend Clause (a)(2) - NEMMCO "may require" a Scheduled or Semi-Scheduled Generator to advise (rather than "Generator must advise") when its generating unit reaches its self-dispatch level. Self-dispatch level (which is the sum of negatively-priced MW band capacity) holds no particular significance to NEMMCO as it does not necessarily correspond to the unit's technical minimum loading level.

Self-Decommitment
(Clause 3.8.18)

The de-synchronisation and de-commitment requirements under Clauses 3.8.18 and 4.9.7 for *semi-scheduled generating units* are the same as for scheduled generating units.

Section 3.1.1 elaborates on the interpretation of these requirements for aggregated *semi-scheduled generating units.*

- Add new Clause (b1) – similar to amended Clause 3.8.17(e) above.

  Scheduled Generators and Semi-Scheduled Generators need only notify NEMMCO of their unit self-decommitment and de-synchronisation intentions for scheduled generating units or *semi-scheduled generating units* (including aggregated) with a nameplate rating of ≥ 30 MW, unless otherwise agreed with NEMMCO. Again rhe current Rules do not place a MW threshold on this notification requirement, but in practice NEMMCO only insists on advance notification of significant planned generation movements.

  Again, both Scheduled and Semi-Scheduled Generators must now advise

such intentions via both Pre-dispatch and PASA process through changes in their unit's available capacity profile.

De-Commitment, or output reduction, by Scheduled Generators and Semi-Scheduled Generators
(Clause 4.9.7 and Heading changed)

- Amend Clause (a) - Scheduled and Semi-Scheduled Generators must confirm their unit de-synchronisation times with NEMMCO in accordance with Clause 3.8.18(b1) – that is, by submitting an amended available capacity profile for their unit.

- Amend Clauses (a) and (b) – the decommitment notification requirements under this Clause only apply to scheduled or *semi-scheduled generating units* (including aggregated) with a nameplate rating ≥ 30 MW.

Variation of offer, bid or rebid
(Clause 3.8.22A)

Amend Clauses (a),(b) and (c) – Semi-Scheduled Generators must make a dispatch offer and rebids in good faith, as currently applies for Scheduled Generators.

Failure to Conform to Dispatch Instructions
(Clause 3.8.23)

Add new Clause (a1) - Describes how a *semi-scheduled generating unit* is assessed as responding to a dispatch instruction:

- For a semi-dispatch interval, a *semi-scheduled generating unit* is responding to its dispatch instruction from Central Dispatch if the unit's actual generation is less than its dispatch cap at the end of the dispatch interval; and

- For a non-semi-dispatch interval, a *semi-scheduled generating unit* does not need to respond to its dispatch instruction from Central Dispatch.

Amend Clauses (a), (b), (c), (d) and (e) - Apply the same non-conformance requirements to *semi-scheduled generating units* as currently apply for scheduled generating units, apart from how non-response to a dispatch instruction is assessed under the new Clause (a1):

- Clause (a) – NEMMCO declares unit as non-conforming if it fails to respond to dispatch instructions within a certain tolerable time and accuracy.

- Clause (b) – NEMMCO must advise a Generator that its unit is non-conforming, seek reasons and request rebids from the Generator to address non-conformance.

- Clauses (b) and (e) –NEMMCO must direct a non-conforming unit's output.

- Clause (d) – NEMMCO must issue non-conformance report to relevant Generator and AER.

Pricing for Constrained-on Generating Units
(Clause 3.9.7)

Amend Clause (a) - A *semi-scheduled generating unit* would also be required to comply with a dispatch cap resulting from being constrained-on by a network constraint equation. However this requirement, while consistent in principle with scheduled generating units, is somewhat superfluous given that compliance only requires the *semi-scheduled generating unit* to generate at or below its dispatch cap.

In any case NEMMCO would not design a network constraint equation that deliberately constrains-on a *semi-scheduled generating unit*.

Amend Clause (b) – Semi-Scheduled Generators are also not entitled to receive compensation for constrained-on *semi-scheduled generating units*, as currently applies for scheduled generating units.

Ancillary Service Transactions
(Clause 3.15.6A)

Add new Clause 3.15.6A(k)(6) - A *semi-scheduled generating unit* is not assessed as contributing to a frequency deviation within a dispatch interval if:

- actual generation is ramped at a uniform rate to its dispatch cap level (that is, between successive dispatch caps) during a "semi-dispatch" interval; or
- actual generation is ramped at a uniform rate to any level during a "non-semi-dispatch" interval; or
- unit is enabled for FCAS Regulation, and responds to a control signal to NEMMCO's satisfaction (as currently applies for scheduled generating units); or
- unit is not enabled for FCAS Regulation, but responds to reduce the aggregate frequency deviation (as currently applies for scheduled generating units).

Chapter 4 – Power System Security

Power System Security – Purpose
(Clause 4.1.1)

Amend Clause (a)(3)(iv) - *Semi-scheduled generating units* are also included within the dispatch processes established under Chapter 4.

Responsibility of NEMMCO for Power System Security
(Clause 4.3.1)

Amend Clause (i) - NEMMCO is also responsible for the dispatch of *semi-scheduled generating units*, including dispatch by remote control actions or specific directions, and allowing for the dynamic nature of the technical envelope.

Operational Frequency Control requirements
(Clause 4.4.2)

Amend Clause (a) - NEMMCO may also give dispatch instructions to *semi-scheduled generating units* to affect power system frequency control pursuant to Clause 4.9.

Managing declarations of conditions
(Clause 4.8.5)

Amend Clause (c)(2) - NEMMCO must also publish notice of significant changes in low reserve or lack of reserve conditions due to changed positions of Semi-Scheduled Generators.

Determination of the latest time for intervention by direction or dispatch of reserve contract
(Clause 4.8.5A)

Amend Clauses (c), (d) and (f) - Semi-Scheduled Generators must also provide information to NEMMCO in relation to directions, and NEMMCO must treat such information as confidential and for the use of issuing directions.

Instructions to Generators
(Clause 4.9.2, Heading changed)

Heading changed to remove “Scheduled” as the current Clauses (b) and (c) apply to all Generators (including Non-Scheduled Generators), and changed to remove “Dispatch” as instructions may also include Clause 4.8.9 instructions.

Add new Clause (a1) – Separately describes a dispatch instruction for a Semi-Scheduled Generator. NEMMCO nominates a maximum level of power to be supplied by the *semi-scheduled generating unit* (that is, a dispatch cap), rather than nominating a specific level or schedule of power (that is, a fixed point target) which applies to a scheduled generating unit under Clause (a).

Amend Clause (d) - Semi-Scheduled Generators must also ensure that appropriate personnel are available at all times to receive and immediately act upon dispatch instructions issued by NEMMCO, as currently applies for Scheduled Generators.

Form of Dispatch Instructions
(Clause 4.9.5)

Amend Clause (a) - the form of dispatch instruction to a *semi-scheduled generating unit* is the same as for a scheduled generating unit, except for (a)(6) below.

Add new Clause (a)(6) – NEMMCO must issue the “semi-dispatch compliance” requirement (whether a semi-dispatch or non-semi-dispatch interval) and the dispatch cap level (rather than a dispatch target for a scheduled generating unit) for each dispatch interval, as part of a dispatch instruction determined by the Dispatch process for each *semi-scheduled generating unit*.

General Responsibilities of Registered Participants
(Clause 4.9.8)

Add new Clause (b2) - Semi-Scheduled Generators must also ensure that systems are in place so that its *semi-scheduled generating unit* can comply promptly with a dispatch cap calculated based on their dispatch offer during a "semi-dispatch" interval. This Clause mirrors existing Clause 4.9.9 for Scheduled Generators.

Semi-Scheduled Generator plant changes
(Clause 4.9.9C)

Add new Clause 4.9.9C "Semi-Scheduled Generator plant changes" - Semi-Scheduled Generators must also notify NEMMCO promptly of changes to the availability of their *semi-scheduled generating units*. This Clause mirrors existing Clause 4.9.9 for Scheduled Generators.

Chapter 10 - Glossary

Add the following new Chapter 10 definitions relating to a dispatch instruction for a *semi-scheduled generating unit*:

- *dispatch cap*
- *non-semi-dispatch interval*
- *semi-dispatch interval*

Other Changes

Changes would be required to NEMMCO's process for determining FCAS Regulation Causer Pays factors and for calculating FCAS Regulation cost recoveries to accommodate *semi-scheduled generating units*.

3.7 Monitoring of Dispatch Cap Conformance by NEMMCO

Under Clause 3.8.23(a) of the Rules NEMMCO is required to continuously monitor the conformance of scheduled units with their dispatch target, and to declare that unit non-conforming if it fails to respond to a dispatch instruction within a tolerable time and accuracy, as determined in NEMMCO's reasonable opinion.

This would not change under this Rule Change proposal.

The dispatch conformance monitoring process, and the time and accuracy tolerances applied for assessing conformance, is embodied in NEMMCO's Dispatch Conformance Monitoring procedures. Appendix C briefly outlines NEMMCO's current Dispatch Conformance Monitoring procedures.

Under the proposed Semi-Dispatch Arrangements all *semi-scheduled generating units* would be subject to essentially the same conformance monitoring process that applies to scheduled generating units.

However there are some proposed changes to NEMMCO's Dispatch Conformance Monitoring procedures specific to *semi-scheduled generating units* in recognition of their intermittent nature.

Details of the proposed changes are described in the supplementary NEMMCO information paper titled "Semi-Dispatch of Significant Intermittent Generation - Proposed Market Arrangements" on the NEMMCO website.

3.8 Transition into the Semi-Dispatch Arrangements

There is a widely held view across the NEM that the retrospective application of regulatory requirements is undesirable as it introduces sovereign risk, increases investment uncertainty, incurs higher overall industry costs to cover such risks, as is generally considered poor regulatory practice.

To date, changes to the Rules have been designed to avoid forcing affected participants to upgrade existing plant to meet new requirements that could possibly undermine the financial viability of their investment.

The AEMC recently articulated this philosophy in their Final Determination on the Technical Standards Rules.

To avoid retrospectivity, Rule Change proposals are usually accompanied by a supplementary set of Chapter 11 provisions that either allow for a period of transition from the old to the new Rule requirements, and/or provide an existing class of participant or plant with a partial or complete exemption from the new Rule requirements.

Hence the following transitional arrangements are proposed following the commencement of the Semi-Dispatch Rules.

3.8.1 Proposed Semi-Dispatch Transitional Arrangements

The process of classifying a generating unit and registering in the NEM would remain voluntary, with NEMMCO retaining the right to either reject an application based on the classification criteria, or to impose certain Scheduled Generator obligations on a non-scheduled classification.

It is proposed to grant a complete, unconditional and ongoing exemption from any requirement associated with the proposed Semi-Dispatch Rules to all Generators that own or operate generating units assessed as “existing” at the date that the proposed Semi-Dispatch Rules take effect (the “Semi-Dispatch Rules Effective Date”).

Under the proposed Chapter 11 provisions NEMMCO would assess an “existing” generating unit as either:

1. A generating unit already classified in the NEM before the “Semi-Dispatch Rules Effective Date”

   OR

2. A generating unit for which an application to classify in the NEM is submitted on or after the “Semi-Dispatch Rules Effective Date”
   AND
   For which the network connection agreement with the relevant NSP was executed before the “Semi-Dispatch Rules Effective Date”.

This approach offers protection to owners of significant intermittent generating units that are either already classified as non-scheduled, or yet to classify, from otherwise having to incur belated unanticipated expenses in upgrading or retrofitting those units in order to operate as *semi-scheduled*, particularly where these requirements were not apparent at the time their original project plans were being finalised prior to construction.

Use of Executed Connection Agreement to Signify an "Existing" Generating Unit

A connection agreement executed with the relevant NSP signifies the approval for a generating unit to connect to the network subject to meeting the technical and performance requirements negotiated with the NSP and NEMMCO.

These negotiated requirements often result in the commitment of significant additional capital works.

An executed connection agreement is therefore a major milestone to be achieved before finalising project financing and giving internal approvals to proceed to construction.

It is therefore proposed to use this milestone in the exemption criteria, as it signifies that the project sponsor has already made a major commitment based on the Rules as they were at the relevant time, and that the future generating unit once classified in the NEM should not be exposed to these new Semi-Dispatch Rule requirements.

Note that the proposed Semi-Dispatch transitional arrangements did not have the unanimous support of the WEIRG, with the two alternative options considered, as discussed in Section 10.

Introduction of Participant Fees for Semi-Scheduled Generators

Participant fees must reflect the degree of involvement of a category of Registered Participant with NEMMCO's activities in operating the NEM. The current Participant Fee determination "Structure of Participant Fees under Clause 2.11 of the National Electricity Rules" was issued by NEMMCO on 26 March 2006 and it allocates fees to categories of Registered Participant as they existed at the time.

A new category of Semi-Scheduled Generator was not contemplated at the time and NEMMCO's determination does not permit a reconsideration of its conclusions. Therefore, unless a mechanism for allocating an appropriate proportion of NEMMCO's fees to this new Generator category is determined, Generators in this category would be getting a 'free ride' until NEMMCO could make a new Fee determination, an event that is not next scheduled to occur until the year 2011.

NEMMCO considers that the activities NEMMCO would engage in for the proposed category of Semi-Scheduled Generator are largely similar to those in respect of Scheduled Generators. It is therefore proposed that Semi-Scheduled Generators are treated as Scheduled Generators for the purposes of allocating fees to Semi-Scheduled Generators.

Waiving of Registration Fees for Re-Classifications to Semi-Scheduled

To encourage persons to apply for re-classification of their existing intermittent non-scheduled or scheduled generating units as *semi-scheduled generating units*, it is proposed to waive the payment of any registration fees associated with such classification applications for a period of up to two years after the Semi-Dispatch Rules Effective Date.

3.8.2 Why Would the Changes Be Effective?

The proposed Semi-Dispatch transitional arrangements in Section 3.8.1 would be effective for the following reasons:

- There is often an increased regulatory risk associated with changes to the National Electricity Rules.

  The introduction of the proposed Semi-Dispatch Rules without the appropriate supporting provisions for a smooth transition may itself act as a deterrent to future investment in intermittent generation plant.

- The technology to enable remote dispatch control capability is already available and it would therefore be prudent business practice for future developers of intermittent generation to consider including such capability at the feasibility and planning stages of their project.

- Under the new Technical Standards Rules (see Section 5.1) the proposed minimum and negotiated access requirements for Active Power Control and Remote Monitoring will already require all non-scheduled generating units with a combined nameplate rating ≥ 30 MW to install suitable dispatch control systems that can be upgraded to receive dispatch instructions from NEMMCO electronically to limit output within 5 minutes, if such upgrade were later required by NEMMCO due to excessive verbal instructions being issued.

- Some of the costs involved in meeting the new Technical Standards Rule requirements could be considered as "sunk" by the time the proposed Semi-Dispatch Rules become effective.

3.8.3 How Would the Changes Be Implemented?

National Electricity Rule Changes

Chapter 11 "Savings and Transitional Rules" would include provisions to:

- 'Grandfather' the proposed Semi-Dispatch Rules in respect of significant intermittent generating units that are assessed as "existing" at the Semi-Dispatch Rules Effective Date.

- Deem Semi-Scheduled Generators as Scheduled Generators under NEMMCO's "Structure of Participant Fees under clause 2.11 of the National Electricity Rules", until NEMMCO determines a new structure of Participant fees under Clause 2.11.

Other Changes

- Changes would be required to NEMMCO's Unit Registration procedures, to reflect the transitional arrangements and to describe the process for assessing "existing" generating units.

- NEMMCO to include the new Semi-Scheduled Generators participant category in its "Structure of Participant Fees" determination.

- The jurisdiction-specific licensing arrangements, special dispatch control provisions within connection agreements or other interim arrangements may potentially conflict with the NEM-wide Semi-Dispatch Arrangements. Therefore these interim arrangements may need to be wound up or amended to enable the transition into the Semi-Dispatch Rules.

  For example some NSPs already have interim operational arrangements in place under connection agreements with non-scheduled generators (for example the Generation Dispatch Limiter scheme in South Australia – refer Section 2.1.2). These connection agreements may need amendment to reflect the new Semi-Dispatch Arrangements, with conversion of the current local network management measures (including 'run back' schemes and dynamic line ratings) so that they are integrated into NEMMCO's Central Dispatch.

  Note that at this stage NEMMCO is not aware of any major inconsistency between the proposed Semi-Dispatch Arrangements and the current operational arrangements for wind farm output control to manage network flows in South Australia.

4 Development of this Rule Change Proposal

The Semi-Dispatch Arrangements described in this Semi-Dispatch Rule Change proposal have been developed in close and extensive consultation with key industry stakeholders, technical experts and jurisdictional policy makers.

The following Section describes the process undertaken in developing this Semi-Dispatch Rule Change proposal.

4.1 Initial Investigations and the MCE Review

NEMMCO and the NEM jurisdictions have for some time acknowledged that the entry of significant amounts of non-scheduled wind generation into the NEM may have an adverse impact on the ongoing management of network flows within secure limits.

In early 2003, as a result of the implementation of Federal and State-based renewable energy targets and related incentives schemes, NEMMCO conducted initial investigations into potential issues relating to the proliferation of more and larger scale intermittent generation projects in the NEM.

These initial NEMMCO investigations led to the publication of an information paper in March 2003 titled "Intermittent Generation in the NEM"[13] which presented a broad range of potential issues in the areas of:

- Generation Forecasting
- Frequency Control Ancillary Services ("**FCAS**")
- Network Management and Connection

In mid 2004 the Commonwealth, State and Territory Governments, under the auspices of the Ministerial Council for Energy's (**MCE**) Standing Committee of Officials (**SCO**), formed an inter-jurisdictional Wind Energy Policy Working Group (**WEPWG**) to review the range of policy level issues associated with the anticipated entry of large amounts of wind generation into the NEM.

The WEPWG review considered the range of technically related issues for wind generation as raised in NEMMCO's "Intermittent Generation in the NEM" information paper, as well as issues identified subsequently.

The WEPWG review recommended a number of short and long-term initiatives to address these wind-related issues, including an extensive review of the generator technical and performance standards in Chapter 5 of the Rules, the development of a centralised wind energy forecasting system, a review of the Regulation Frequency Control Ancillary Service (FCAS) cost recovery procedures and the introduction of market-based arrangements for the management of significant intermittent generation within network constraints.

[13] "Intermittent Generation in the NEM", NEMMCO website, www.nemmco.com.au/dispatchandpricing/260-0001.htm

In parallel with the longer term policy development undertaken by WEPWG, the South Australian jurisdiction implemented some interim arrangements (see Section 2.2) to address their immediate concerns with network loading control where significant wind farm generation is involved.

4.2 WETAG Technical Review

In late 2004 the WEPWG in turn requested NEMMCO to establish a Wind Energy Technical Advisory Group (**WETAG**) to investigate and report on the technical matters associated with the WEPWG policy review.

The WETAG gathered input from all industry sectors including wind farm developers, incumbent generators and retailers as well as end users, NSPs and NEMMCO. Table 1 in Appendix D lists the WETAG membership and the industry sector its members represent.

The WETAG report[14] raised a number of issues and options relevant for policy makers, including a number where different industry views were identified.

Among the measures recommended in that WETAG report were the following:

1. The application of the technical standards contained in the Rules to wind generators should be reviewed in accordance with a set of guiding principles as outlined in the WETAG report. In addition, future reviews should be undertaken at intervals of 3 to 5 years;

2. Evaluation of the power system security implications of increasing amounts of wind generation is urgently required. In addition, the Rules should be amended to require the provision of appropriate dynamic generating plant models for all significant generation;

3. Information regarding wind generation forecasts should be made available to market participants to facilitate transparency and efficient plant commitment. The Rules could be amended to require appropriate information disclosure;

4. The Rules should be amended to require that all market generators participate in "Causer Pays" arrangements for FCAS Regulation services; and

5. Large amounts of intermittent non-scheduled generation are incompatible with the optimised central dispatch process in the NEM, in part because the operational security limits of the network may be infringed.

In particular the WETAG Report recommended urgent attention be given to:

- The management of network flows involving wind farm generation; and
- Short-term variability of wind farm generation at the sub five-minute level.

[14] "Integrating wind farms into the NEM", WETAG report to WEPWG, 12 January 2005, http://www.mce.gov.au/assets/documents/mceinternet/WEPWGDiscussionPaperMar0520050510160534.pdf

Pursuant to Recommendation #5, the WETAG report postulated that if the issues were not addressed properly network transfer limits may be materially affected (exceeded) in some cases, resulting in insecure power system operation. Page 15 of the WETAG report states:

> *"…it is inevitable that significant non-scheduled generation plant will need to be controlled to reduced outputs in cases where network loading constraints become binding. There is merit in determining the acceptable loading level limits of non-scheduled generating plant using the central dispatch engine, particularly for any plant that is greater than 30 MW in size."*

The WETAG report recommended that some form of conditional dispatch control model should be applied to wind generators, and WETAG coined the term "semi-dispatch" for the proposed model.

The "semi-dispatch" model would involve a more direct, centrally co-ordinated control over the maximum output from significant sources of intermittent generation, as determined by NEMMCO's central dispatch algorithm (NEM Dispatch Engine, or **NEMDE**) using network constraint equations to keep network flows within limits.

The Dispatch process would then issue dispatch instructions to wind generators to limit generation where relevant network constraints are binding. WETAG noted that a wind farm owner would need to install appropriate communications and control facilities to ensure that the dispatch instructions could be followed.

The WETAG report also suggested that the "semi-dispatch" arrangement would provide incentives for significant intermittent generating units to reduce their sub-five-minute variations during dispatch intervals where they are required to control their output within secure network limits.

4.3 WEIRG Consultation on the Semi-Dispatch Proposal

In August 2005, in response to recommendation #5 of the WETAG report, the SCO requested NEMMCO to:

- Develop a more detailed description of the semi-dispatch arrangements proposed in the WETAG Report; and
- Advise on whether the proposed semi-dispatch arrangements could also address issues stemming from the management of short-term variability of wind farm generation.

NEMMCO then established a panel of industry and jurisdictional representatives called the Wind Energy Industry Reference Group (**WEIRG**) to assist NEMMCO in the above task of developing the semi-dispatch arrangements. The WEIRG met five times between August 2005 and November 2005, and a further three times between August 2006 and December 2006. Table 2 in Appendix D lists the WEIRG membership and the industry sector its members represent.

In December 2005 NEMMCO and the WEIRG completed its investigative work and confirmed to WEPWG that the semi-dispatch arrangements were indeed technically feasible.

In March 2006 WEPWG advised NEMMCO of their in-principle support of the proposed Semi-Dispatch Arrangements and requested NEMMCO to proceed to the next stage of developing the appropriate Rule Changes and specific Dispatch Conformance Monitoring procedures to support the proposed Semi-Dispatch Arrangements.

NEMMCO then proceeded, in consultation with WEIRG, to develop this Semi-Dispatch Request for Rule Change and a set of draft Rule Changes.

It should be noted however that not all aspects of the Semi-Dispatch Arrangements in this Rule Change proposal enjoy the unanimous support of the WEIRG.

In February 2007 MCE gave NEMMCO its 'in-principle' endorsement to proceed to the next phase of submitting this Semi-Dispatch Request for Rule Change proposal to the AEMC.

5 Relationship of this Rule Change Proposal to Other Projects

5.1 Technical Standards for Wind Generation and other Generator Connections – New Rule

In February 2006 NEMMCO submitted a "Technical Standards for Wind Generation and other Generator Connections" Rule Change proposal to the AEMC relating to the technical standards that apply to generation in the NEM, particularly wind generation.

The new Technical Standards Rules[15] became effective on 15th March 2007. The Technical Standards Rules included changes to the:

- Technical standards for generator connection;
- Information requirements on generators; and
- Framework for negotiating access by new generators.

Of particular relevance to this Semi-Dispatch Rule Change proposal are the Technical Standards Rules for:

- Active Power Control system requirements - Clause S5.2.5.14; and
- Remote Monitoring requirements - Clause S5.2.6.1

The Technical Standards Rules positively support the proposed Semi-Dispatch Rules and its objectives, but will require expansion to also cover the new *semi-scheduled generating unit* classification.

5.1.1 Active Power Control Systems

Under Clause S5.2.5.14(b)(2) the minimum access standard requires that a non-scheduled generating system with a combined nameplate rating ≥ 30 MW must have an Active Power Control system capable of:

"(i) reducing its *active power* output, within 5 minutes, to or below the level required to manage *network* flows that is specified in a verbal instruction issued by the *control centre*;

(ii) limiting its *active power* output to or below the level specified in subparagraph (i);

(iii) subject to energy source availability, ensuring that the change of *active power* output in a 5 minute period does not exceed a value specified in a verbal instruction issued by the *control centre*; and

(iv) being upgraded to receive electronic instructions from the *control centre* and fully implement them within 5 minutes."

Note that the phrase "subject to energy availability" is a specific reference to intermittent sources of non-scheduled generation.

[15] National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No.2

Where NEMMCO determines that the number or frequency of verbal dispatch instructions issued to a generating unit operator becomes too difficult for the control centre to manage, under Clause S5.2.5.14(c) the negotiated access standard for Active Power Control system requirements further allows NEMMCO to require a Non-Scheduled Generator to upgrade its generating unit dispatch control system to receive dispatch instructions from NEMMCO electronically and act within five minutes of those instructions.

5.1.2 Remote Monitoring

Under Clause S5.2.6.1 the minimum access standard requires that a non-scheduled generating system with a combined nameplate rating ≥ 30 MW must have remote monitoring equipment to transmit to NEMMCO's control centres in real time the quantities that NEMMCO reasonably requires to discharge its market and power system security functions set out in Chapters 3 and 4.

These real-time quantities may include, under Clauses S5.2.6.1(c)(4) and (c)(5):

> "(4) the *active power* output of the *generating unit*, *scheduled generating system* or *non-scheduled generating system* (as applicable);
>
> (5) if *connected* to a *transmission system*, the *reactive power* output of the *generating unit*, *scheduled generating system* or *non-scheduled generating system* (as applicable); "

...and under Clause S5.2.6.1(c)(6), in respect of each wind farm, must provide wind speed, wind direction and the number of units operating.

The mandatory provision of such operational data will support the proposed Semi-Dispatch Rule Changes in both the forecasting of generation from *semi-scheduled generating units* and in the auditing of their response to dispatch instructions issued by NEMMCO.

5.2 Changes to FCAS Regulation Causer Pays Procedures

As noted in the preface to this Rule Change proposal the issue of controlling network flows within operational limits is somewhat exacerbated where the generation involved is of an intermittent nature.

This is the case as the output from intermittent generation has relatively greater short-term variability than non-intermittent generation, and hence there is a greater risk of short-term violation of network limits that are binding or close to binding.

Market non-scheduled generating units are not currently contributing towards the recovery of FCAS Regulation costs however those of an intermittent nature may potentially cause a greater use of FCAS Regulation services owing to the short-term unpredictability of their output.

NEMMCO recently conducted a consultation on changes to the FCAS Regulation Causer Pays procedures. The changes essentially clarify that all Market Participants (including non-scheduled market generating units) are required to contribute towards the recovery the FCAS Regulation costs where a Market Participant has contributed to the need for FCAS Regulation services, as stated under Clause 3.15.6(k)(1) of the Rules and based on deviations around an actual generation line-of-best-fit reference trajectory.

The revised FCAS Regulation Causer Pays procedures will bring market non-scheduled generating units under the FCAS Regulation cost recovery regime and hence provide market signals to encourage those generators to reduce the sub 5-minute variability of their generating output.

In December 2006 NEMMCO issued a Final Determination on the changes to the FCAS Regulation Causer Pays procedures and is planning to implement the modified procedures from March 2007.

Note that there may be further changes to the FCAS Regulation Causer Pays procedures to accommodate the proposed Semi-Dispatch Rule Changes.

5.3 Future Australian Wind Energy Forecasting System

A fundamental strategy to deal with the variability of wind generation across all market timeframes is to employ techniques to ensure accurate forecasting of wind energy inputs and equivalent generation outputs.

The need to have such forecasting techniques arises because the output of wind generation varies over time and affects the efficiency of the market and the security of the power system.

The Australian Government has provided funding to develop a national Australian Wind Energy Forecasting System (AWEFS).

A key element of the proposed Semi-Dispatch Rule Changes is the use of wind generation forecasts (such as may be provided by AWEFS) as inputs to both the Central Dispatch and PASA processes. In particular, the wind generation forecasts would be used to determine an upper dispatch limit for *semi-scheduled generating units*.

6 Assessment of the Proposal against the NEM Objective

In the absence of the proposed Semi-Dispatch Rules, the long-term implications of maintaining the status quo are that there would be growing volumes of uncontrolled generation with firm network access and dispatch priority over traditional scheduled generation. The consequences of this are likely to be:

- Increased risk of violating secure network limits;
- Increase in network operating margins to offset this increased risk, with higher market costs associated with these more conservative operating margins;
- Increased incidence of constraining-off scheduled generation or inter-regional power transfers, or both, to avoid network security violations, with the associated higher market costs and prices; and
- Increased use of directions and Clause 4.8.9 instructions to Non-Scheduled Generators in a (potentially ineffective) attempt to address these security violations and their attendant non-market costs and operational overheads.

NEMMCO has made every effort to develop proposals that are effective in mitigating or eliminating each of these undesirable outcomes.

These undesirable outcomes can be largely corrected by creating more effective and efficient signalling mechanisms for significant sources of intermittent generation. The signalling mechanisms inherent in the Semi-Dispatch Rule proposal provide information that is currently absent from the NEM with respect to the opportunity cost of intermittent generation, thus allowing more equal treatment of all sources of significant generation. Incorporating such information within the NEM dispatch process will promote improved efficiency in both the investment in, and use of, electricity services for the long term benefit of consumers of electricity.

Notwithstanding that the implementation of the proposed Semi-Dispatch Rule:

- may impose additional costs on some market participants (as described in Section 8) through the need to install control mechanisms to facilitate effective response to dispatch instructions; and
- will require NEMMCO to incur minor expense in having to modify its systems (as described under “Other Changes” under Section 3, and in Section 9) to facilitate the issue and monitoring of dispatch instructions to *semi-scheduled generating units*,

the long-term benefits arising from the Semi-Dispatch proposal (in terms of more efficient investment in, and operational efficiency of, all generation plant and network services in the NEM) will more than outweigh these additional costs. Moreover, these benefits (as described below) will be delivered in a manner that is consistent with good regulatory practice.

Under the Semi-Dispatch proposal the integration of significant intermittent generation into the NEM dispatch process will lead to the long-term benefits associated with:

- reduced risk of operating the power system in an insecure state and breaching the power system security standards;
- reduced risk associated with investment in, and operation of, generating plant that might otherwise be subject to a direction or Clause 4.8.9 instruction from NEMMCO to maintain power system security;
- more efficient investment in, and use of, network services through reductions in network constraint operating margins, and avoidance of otherwise premature augmentation of networks to overcome congestion resulting from giving effective dispatch priority to non-priced significant intermittent generation;
- more effective use of interconnector capability that will improve the firmness of the settlement residue contracts as a hedging instrument and hence reduce an element of risk in inter-regional trading that might otherwise impede investment in, an operation of, remotely-located generation;
- more efficient investment in, and use of, all forms of generation with respect to the decisions to install and operate plant at specific network locations, given that investment and operating costs will better reflect network congestion impacts – the ultimate effect of which will be lower overall dispatch costs; and
- more efficient investment in all forms of generation arising from greater confidence in market outcomes and greater regulatory certainty through the rationalisation of various approaches in managing significant intermittent generation and reduced reliance on market intervention.

Further details with respect to the above identified benefits and costs are outlined in Section 7 below.

On balance, the proposed Rule Changes will promote the efficient investment in, and the efficient use of, electricity services for the long term interests of consumers of electricity with respect to the price and security of electricity supply without any identifiable detriment to the reliability of either the electricity supply or the national electricity system.

In conclusion, NEMMCO maintains that the proposals herein advance the NEM objective.

7 Detailed Assessment of the Benefits and Costs of the Proposal

7.1 Power System Security

Under the current arrangements for maintaining network flows within secure operating limits where both significant non-scheduled and scheduled generation is involved, the uncontrolled output from non-scheduled generation can only be accommodated by adjusting the dispatch target of scheduled generation. This adjustment is achieved over successive dispatch intervals through the Central Dispatch process, and within a dispatch interval through Regulation FCAS.

As noted in previous Sections, these secure operating limits typically include an operating margin (also called safety margin) to allow for unexpected variations in non-scheduled generation and thus avoid post-contingent violation of the network limit. The setting of these operating margins reflect a trade-off between maximising the utilisation of network capability (smaller margins) versus avoiding post-contingent network limit violations arising from non-scheduled generation variations (larger margins).

Hence the operating margin adjustment to a post-contingent network limit (to derive its secure network limit) may at times still be inadequate to avoid violating that network limit.

In such cases, where the secure network limit is binding and scheduled generation is unable to accommodate any further variations in non-scheduled generation within that limit, NEMMCO would need to control the output from the non-scheduled generation to prevent violation of the network limit and hence to maintain power system security.

In the absence of dispatch control systems on significant non-scheduled generating units[16], NEMMCO would have little choice but to resort to issuing a series of verbal directions (to Market and Scheduled Generators) or Clause 4.8.9 instructions (to Non-Market, Non-Scheduled Generators) to restore power system security.

Any delays in this manual intervention process, either in:

- NEMMCO detecting the violation condition and issuing the appropriate direction or Clause 4.8.9 instruction; or
- the unit output responding to the appropriate direction or Clause 4.8.9 instruction;

would further extend the period that the power system remains insecure and would raise the possibility a breach of the power system security principles[17].

In the absence of automatic remote dispatch control facilities, there is some uncertainty that non-scheduled generators would be able to respond to a direction or Clause 4.8.9 instruction issued by NEMMCO within the required time-frame.

[16] As required under Clause S5.2.5.14 of the proposed Semi-Dispatch Arrangements.

[17] As outlined in Clause 4.2.6(b)(1) of the National Electricity Rules.

Directions and Clause 4.8.9 instructions should only be viewed as a measure of last resort, rather than them becoming part of day-to-day operations that (in the absence of automatic controls on the increasing volumes of intermittent generation) is becoming a real possibility.

Under proposed Semi-Dispatch Arrangements, significant non-scheduled generators would be required to respond in real-time to dispatch instructions from Central Dispatch so that its output does not cause a violation of secure network flow limits. These arrangements enhance NEMMCO's ability to maintain power system security and reduce administrative overheads compared with the current practices.

7.2 Power System Reliability

The proposed Semi-Dispatch Arrangements do not aim to address any potential issues of supply reliability that may arise where significant amounts of intermittent generation are withdrawn without appropriate notification through the Central Dispatch process.

Matters of this nature would be managed through the existing "rebidding in good faith" provisions of Clause 3.8.22A of the Rules.

7.3 Economic Efficiency of Dispatch

As discussed in Section 7.1, wherever there is any element of uncontrolled non-scheduled generation (or load) variability in a power system, some allowance needs to be applied to the operating limits used in controlling power systems to cater for this variability. Those operating margins detract from absolutely efficient dispatch outcomes.

In the case of increasing levels of non-scheduled generation from intermittent sources, such allowances could be in the form of increased operating margins on network limits (typically) or increased requirements for Regulation FCAS, each of which can add to the cost of optimally dispatching the market.

7.3.1 Impact on Network Operating Margins

Operating margins are established within network constraint equations to cater for unanticipated or uncontrollable changes in plant operation that might otherwise lead to breach of secure network limits.

The growth in non-scheduled intermittent generation has a localised impact on network operating margins, and this impact cannot be dispersed through the NEM, unlike FCAS requirements which can be globally-sourced. Options to address issues of emerging network congestion have to be sourced locally, and by increasing network operating margins there is likely to be a need to replace:

- Low cost generation that is competing with intermittent generation on the "wrong" side of the relevant network constraint equation,

  with

- Higher cost generation on the "right" side of that network constraint equation.

By subjecting intermittent generating units to dispatch instructions from Central Dispatch to control their output at times when network flows have reached secure limits, the operating margins associated with those network limits are able to be reduced. Reduced operating margins introduce greater degrees of freedom to enable NEMDE to find a more economically efficient dispatch outcome.

Additionally, the reductions in network operating margins will help avoid otherwise premature augmentation of networks and the attendant costs of such augmentation.

7.3.2 Impact on FCAS Requirements

Although the potential for inefficiency arising from increased FCAS requirements should not be ignored, the extent of dispatch inefficiency created is likely to be limited for the following reasons:

- Short-term variability of total generation from all intermittent generating plant diminishes with the increasing geographic spread of intermittent generating plant. Geographic separation translates into lower probability of coincident changes in the intensity of the primary energy source (such as wind intensity for wind farms, or cloud cover for solar panels). As a consequence, FCAS requirements arising from increasing amounts of installed intermittent capacity are likely to reach a saturation level beyond a certain level of intermittent capacity penetration.

- The provision of FCAS can be shared throughout the interconnected power system, thus ensuring costs are not skewed by local service supply shortages.

7.4 Pricing Outcomes

Economic efficiency of dispatch is closely related to the distortion in spot market pricing that would arise from an inefficient, out of merit order dispatch.

Under the current arrangements, non-scheduled intermittent generation effectively has priority over scheduled generation in both dispatch and network access. Where scheduled generating units face the prospect of being constrained-off before non-scheduled generating units, there is an incentive for the Scheduled Generator to bid in a manner that does not reflect the marginal costs of their output in order to maintain dispatch volumes, further distorting market price signals and reducing the efficiency of dispatch.

Subjecting relevant intermittent generation to a degree of centrally coordinated dispatch control via the Semi-Dispatch Arrangements creates more efficient and accurate pricing signals for the following reasons:

- All other things being equal, reduced network operating margins facilitate an overall reduction in the cost of dispatch by making more effective use of the lowest cost plant, which is likely to be accompanied lower market spot prices set by the lower cost marginally dispatched unit.

- Intermittent generation would be participating in the Central Dispatch process and competing with scheduled units on an equal basis, with marginal offers from both intermittent generation and traditionally scheduled generation each impacting on market price outcomes, creating more accurate pricing signals.

7.5 Inter-Regional Trading

Any reduction in operating margins that come about as a result of increased control over previously non-scheduled intermittent generation (see Section 7.3.1) can raise security limits on interconnectors and hence increase inter-regional transfer capability. A higher level of inter-regional transfer capability offers the prospect of improved firmness of inter-regional settlement residues, thus encouraging inter-regional trading[18].

7.6 Good Regulatory Practice

Good regulatory design and practice promotes confidence in markets, benefits consumers and provides greater predictability and regulatory certainty for investors in electricity services.

An environment of regulatory certainty is a major consideration to power project developers, particularly those involved in new and emerging generation technologies, and it is important that the appropriate market and regulatory signals be sent to developers to ensure that they will bring forward the most efficient investments.

Good regulatory practice should therefore strike a balance between flexibility and certainty of outcome, and should minimise the exercise of discretion and standardise its methodology so as to reduce discrepancies between jurisdictions and to reduce inconsistencies between classes of participants. This would ultimately reduce market uncertainty and lower compliance costs.

There are several characteristics of the proposed Semi-Dispatch Arrangements that are consistent with the promotion of good regulatory practice, that in turn lead to an environment more conducive to investment certainty.

7.6.1 Consistent Treatment of Alternative Technologies

The proposed Semi-Dispatch Arrangements improve the consistency of treatment of alternative technologies, by removing an existing advantage held by intermittent generation to the extent that they currently enjoy an effective priority in the dispatch order – traditional generation would no longer have to 'give way' to uncontrolled intermittent generation. Fully scheduled generators are less likely to be constrained in their operation and access to limited network capacity would be more equitably and consistently shared between all forms of generation.

Furthermore, the proposed arrangements advance the transparency of market outcomes (through improved and extended price signalling) by requiring intermittent Generators to actively participate in the Central Dispatch process (at the appropriate times) on an equitable basis with other Generators.

[18] NEMMCO recently examined the impact of intermittent wind generation in South Australia on inter-regional flows between Victoria and South Australia over a six-month period from 1st March to 31st August 2006. These studies, summarised in Appendix B, demonstrate that South Australian wind farm generation continues to have a material impact on inter-regional trade, with the V-SA interconnector flow binding on limits for around 9% of the time.

7.6.2 Appropriate Management of Intervention

The frequent use of directions and Clause 4.8.9 instructions as a proxy for a centrally co-ordinated optimal dispatch may also create confusion in the market with respect to:

- The signalling of appropriate dispatch priorities for scheduled versus non-scheduled plant.
- The risk of inconsistency between NEMMCO and its various agents in the exercise of their discretionary powers of market intervention.
- The lack of transparency in the various approaches to market intervention.
- The amount of compensation that is appropriate for maintaining power system security and the market transparency of such costs.

As noted in the above discussions of Power System Security, directions and Clause 4.8.9 instructions should be seen as a measure of last resort, rather than risk having them becoming part of NEMMCO's day-to-day operational tools with the extra overheads associated in administering such an "off-market" compensation process.

The proposed Semi-Dispatch Arrangements reduce reliance by NEMMCO on discretionary market intervention in the form of directions and Clause 4.8.9 instructions.

Discretionary intervention by either NEMMCO or its agents is reduced, and dispatch priorities clarified, through automatically and consistently applying dispatch limits to relevant intermittent generation through the Central Dispatch process when network constraint equations are binding or violated.

Currently Non-Market Non-Scheduled Generators may only be given a Clause 4.8.9 instruction, for which NEMMCO provides no compensation, and hence those costs are hidden. Under proposed the Semi-Dispatch Arrangements many of those generating units would be *semi-scheduled* and, therefore, the owners/operators would be issued directions (when appropriate) for which compensation is payable.

7.6.3 Consistent Treatment across Jurisdictions

The proposed Semi-Dispatch Arrangements reduce regulatory uncertainties by eliminating the need for decentralised decision-making by the various jurisdictions. The proposed arrangements centralise the process for maintaining power system security within a single, transparent, NEM-wide central dispatch framework administered by NEMMCO.

The proposed arrangements allow the removal of the existing South Australian restrictions on the licensing of new wind farm generation, which requires new wind farm generation to register as scheduled generators in the NEM. With the introduction of the Semi-Dispatch Arrangements, existing wind farms that have classified as scheduled generating units can potentially re-classify as *semi-scheduled generating units* in order to come under a less onerous dispatch compliance regime.

8 Impact on Wind Farm Development and Operating Costs

The costs incurred by wind farm developers to comply with the proposed Semi-Dispatch Arrangements would largely depend on the level of sophistication of the required systems. Actual costs would vary between each project and NEMMCO is not in a position to provide a generic estimate of these costs.

It is understood that the state-of-the-art wind farm designs currently available on the market have the capability for integration with remote monitoring and continuous control systems, and it could be reasonably expected that future wind farm developers would factor in the provision of such facilities in their project feasibility and planning stages.

Having said this, it is quite conceivable that operation under the proposed Semi-Dispatch Arrangements would require additional capital works and incur both upfront and ongoing operating and maintenance expenditure in making the following facilities available on a 24/7 basis:

- Market bidding and trading systems and related NEMMCO interfaces;
- Remote generation dispatch control systems and related NEMMCO interfaces; and
- Voice and operational data communication links to NEMMCO and NSP supporting the above.

Owners of *semi-scheduled generating units* are likely to continue to behave as "price-takers" in the market and essentially generate whenever their energy source is available. In such circumstances their dispatch offer is unlikely to regularly change in response to competitive market pressures. If that is the case, market bidding systems for *semi-scheduled generating units* need not be as sophisticated as those required for scheduled generators.

9 Implementation Issues

There are a number of implications for Market Participants, regulatory and planning bodies and NEMMCO that are associated with the implementation of the proposed Semi-Dispatch Rule changes:

Implications for Market Participants

- Additional Semi-Dispatch Rules compliance requirements;
- A pre-requisite of operating under the proposed Semi-Dispatch Arrangements is that where significant intermittent generating units are required to reduce their output at a uniform rate to control network flows, the technical ability to provide continuous output control should be included as part of their design; and
- Communication and generation control facilities may need to be installed and operated to ensure that generating units can comply with dispatch instructions issued by NEMMCO.

Implications for Regulatory or Planning Bodies

- Additional Semi-Dispatch Rules compliance requirements to administer; and
- Where non-scheduled generating units are re-classified as *semi-scheduled generating units* after the commencement of the Semi-Dispatch Arrangements, those generating units would thereafter be included in the definition of "scheduled demand" for the purposes of the various jurisdictional generation and network planning instruments, including the Annual National Transmission Statement (**ANTS**) and the Statement of Opportunities (**SOO**).

Implications for NEMMCO

Should the Semi Dispatch Rule proposal be accepted, it would take a number of months to implement the changes in NEMMCO's market systems.

Typically, the market systems development cycle takes around 9 months, including 3 months to develop functional requirements, and 6 months to develop, test and implement the software.

The earliest NEMMCO would generally be prepared to commit to development of a modification to the market systems would be at the time of issue of the draft Rule determination by the AEMC. Although this carries a risk of a change to the requirements once the final Rule determination is made, NEMMCO uses this approach for some of the more urgent changes to the National Electricity Rules to minimise the implementation lead-time time required.

Other implications for NEMMCO are:

- Additional Semi-Dispatch Rules compliance requirements;
- Changes and additional administrative requirements in relation to the Registration process;
- Changes to the process for determination of FCAS Regulation Causer Pays factors and the ensuing FCAS Regulation cost recovery process; and
- Where non-scheduled generating units are re-classified as *semi-scheduled generating units* after the commencement of the Semi-Dispatch Arrangements there would be additional administrative requirements on the maintenance of NEMMCO's historical demand databases, as this previously non-scheduled generation would thereafter be included in the NEMDE "scheduled" demand definition.

10 Possible Alternatives to NEMMCO's Proposal

While the proposed Semi-Dispatch Arrangements represent NEMMCO's preferred approach towards managing significant intermittent generation in the NEM, a number of alternative approaches (described below) were also considered.

The first two alternative approaches are based on an extension of existing arrangements in South Australia for managing significant wind farm operation.

The last two alternatives only relate to the extent to which the proposed Semi-Dispatch Rules should retrospectively apply to existing Generators at the commencement of the Semi-Dispatch Rules. When compared to the proposed transitional arrangements in Section 3.8, the first of these alternatives is more onerous and the second alternative is less onerous.

As state-based bodies would continue to administer these arrangements there is a risk that the various arrangements may diverge over time and across different regions unless sufficiently co-ordinated. This may increase regulatory risk and present greater uncertainty to investors in intermittent generation.

10.1 Alternatives to the Semi-Dispatch Proposal

10.1.1 Classify Intermittent Generators as Scheduled

This alternative would require all significant intermittent generating units to be classified with NEMMCO as scheduled as a condition of the generation licence issued by the relevant jurisdiction.

This is the approach adopted by the South Australian jurisdiction under Licensing Principle#3 of ESCOSA's "Wind Generation Licensing - Statement of Principles".

While it may be possible to extend these special licensing provisions to other jurisdictions, this is not considered as a viable long term solution to the problem, as it is technically difficult for an intermittent generating unit to operate as scheduled and comply with fixed point targets, given their inability to increase and maintain output "on demand" at all times.

These technical limitations were acknowledged in a number of submissions to the consultation culminating in the ESCOSA report, with ESCOSA acknowledging that the special wind farm licensing arrangements were intended to only be stop-gap measures pending the implementation of Semi-Dispatch Arrangements.

10.1.2 Decentralised Dispatch Control under Connection Agreement

This alternative would require all new significant intermittent generation to comply with special generation control provisions contained within their connection agreement with the relevant NSP in order to manage their impact on local network operation.

These provisions are currently in place for a number of existing wind farms in South Australia as an interim measure, and have been subsequently extended by licensing requirements for new wind farms to register with NEMMCO as scheduled (as described in Section 10.1.1).

While it may be possible to extend these provisions to other NSPs, this is not viewed as a viable long-term alternative to the common, NEM-wide Semi-Dispatch Arrangements, for the following reasons:

- The special generation control provisions only deliver a limited, non-market based ability for the relevant NSP to manage network flows in order to avoid power system security violations. The arrangements are not co-ordinated through the Central Dispatch process and, therefore, not reflected in the market forecasting processes managed by NEMMCO.

- Under the connection agreement, if a Generator does not respond to the control signals from the NSP, the NSP must act to disconnect the entire wind farm rapidly in order to restore network security. This is a relatively coarse form of control compared with the finer control that would be available by participating in Central Dispatch. Such blunt action may also result in extended periods of foregone generation, an obviously undesirable outcome for the wind farm owner.

- The NEM jurisdictions generally acknowledge that the current interim arrangements are a stop-gap measure pending the implementation of the market-based, NEM-wide Semi-Dispatch Arrangements.

- Wind power developers may face an increased regulatory risk and greater investment uncertainty if each NSP were to introduce different approaches in its network connection agreements for network control. Again it is highly desirable to have common arrangements across the NEM for the dispatch of plant, rather than different arrangements being possible at different locations.

10.1.3 Classify Intermittent Generators as Non-Scheduled Subject to Clause 2.2.3(c) Scheduled Generator Obligations

Under this alternative, NEMMCO would exercise its powers under Clause 2.2.3(c) of the Rules to impose certain specified Scheduled Generator obligations as a condition of approving a non-scheduled generating unit classification.

To date, however, NEMMCO has only exercised Clause 2.2.3(c) in a limited sense by requiring wind farms to provide generating unit MW Availability data to assist NEMMCO in providing accurate demand forecasts for the Pre-dispatch and PASA processes.

Clause 2.2.3(c) has not been used to create obligations on a Non-Scheduled Generator to submit dispatch offers or participate in the Central Dispatch process.

This is not considered to be a viable long term solution to the problem, as:

- The enforceability of any Clause 2.2.3(c) Scheduled Generator obligations created outside of the National Electricity Rules may be untested.
- There is a risk that Clause 2.2.3(c) Scheduled Generator obligations may be inconsistently applied across different non-scheduled generating unit classifications.
- The process followed by NEMMCO for determining what Clause 2.2.3(c) Scheduled Generator obligations should be imposed is not transparent to the market.
- The Clause 2.2.3(c) Scheduled Generator obligations that are imposed on a Non-Scheduled Generator are not as transparent to the market as they would be if simply enshrined in the National Electricity Rules.
- All of the above factors would contribute to increased regulatory risk and greater investment uncertainty.

10.2 Alternative Semi-Dispatch Transitional Arrangements

10.2.1 Automatic Re-Classification, NEMMCO May Exempt Existing Gen

Under this alternative transitional approach NEMMCO would review all generating units that are "existing" (as defined in Section 3.8.1) at the "Semi-Dispatch Rules Effective Date" and notify those assessed as meeting the *semi-scheduled* criteria that they would be automatically re-classified within six months of the "Semi-Dispatch Rules Effective Date" as a *semi-scheduled generating unit*.

During that period the affected Generator could choose to either:

- Upgrade systems in preparation for operating as a *semi-scheduled generating unit*; or
- Seek an exemption from NEMMCO from the automatic re-classification of its generating unit as *semi-scheduled* on the grounds of technical infeasibility. The onus of proof would lie with the relevant Generator.

Proponents of this approach argued the following:

- Providing a blanket exemption from the proposed Semi-Dispatch Rules to all "existing" generating units (under the proposed transitional approach) would be overly protective, heavy-handed regulation that could potentially undermine secure network operation.
- The manner and extent to which the proposed Rule Changes are applied should be separately determined for each proposed Rule based on relative merits, rather than presuming that a standard blanket exemption applies.

  While the AEMC's recent Final Determination on the Technical Standards Rules indicates a strong preference for zero retrospectivity, the Rule Changes associated with that Determination were significantly different to the proposed Semi-Dispatch Rule Changes in terms of having a much wider application and involving somewhat more contentious issues.

It therefore follows that a more conservative blanket exemption would be appropriate for those Rule Changes, whereas these proposed Semi-Dispatch Rules should allow for exemptions on a case-by-case assessment of technical feasibility and economically practicability.

Under the terms of their connection agreement a number of existing significant wind farms in South Australia are expected to follow automatically any generation dispatch limitation instructions issued by the TNSP, and to meet this requirement those wind farms already have (or are in the process of acquiring) the necessary communications and control systems.

These wind farms face little or no sovereign risk and would be unable to argue for an exemption as the dispatch control systems already in place to meet their connection agreement obligations would also be suitable (at minimal or no upgrade cost) for operating as a *semi-scheduled generating unit* under the proposed Semi-Dispatch Rules.

- Exempting existing intermittent generation under the proposed transitional approach means that some generators will not be included while others are included, and eventually results in inter-generational inequities and an uneven playing field favouring incumbent generation. This is not an optimal market outcome in terms of economic efficiency, price signals and hence investment incentives.
- Operational issues may arise owing to the complexity of co-ordinating network constraint equations on semi-scheduled generating units and existing non-scheduled generating units where both are contributing to flow across a network limitation.

Opponents to this approach argued that:

- The regulatory uncertainties faced leading up to the proposed Semi-Dispatch Rules were not “bankable” costs, and such risks would drive away future investment in renewable technologies and potentially a wider range of technologies that were intermittent in nature.
- While it may be technically feasible for existing wind farms to comply with the proposed Semi-Dispatch Rules as their control systems already allow for it, the issue is whether it is economically practicable to force them to comply, given the other costs for communications upgrades or backup support (with people on call 24/7 in case the systems fail).

10.2.2 Voluntary Classification, Exempt Existing (Connection Enquiry)

This transitional approach is basically the same as the preferred approach in Section 3.8.1, except that the "existing" generating unit criteria are met as soon as network connection negotiations have commenced with the relevant NSP (by the project proponent formally lodging an initial Connection Enquiry) rather than at the conclusion of the network connection negotiations (as evidenced by the executed connection agreement).

There is evidence indicating that network connection negotiations (from the initial connection enquiry until when the connection agreement is executed) may take anywhere up to 3 years.

Proponents of this approach argued the following:

- Grandfathering is a general concept that should be preserved and existing generators that don't have this capability currently should not be forced to obtain it.
- The transitional arrangements should encourage owners of significant intermittent generation to voluntarily choose to classify their generating units as *semi-scheduled*.
- The transitional arrangements should be simple and not open up registration issues, such as the ability to apply to NEMMCO for exemptions.

Opponents to this approach argued that:

- The response to an initial connection enquiry may not result in the proponent making a timely application to connect to the network.

  This transitional approach may inadvertently encourage proponents to "lock in" a future Semi-Dispatch Rules exemption for a particular project at various network locations without having made any commensurate major financial commitment to that project, as would be evidenced by an executed connection agreement under the preferred transitional approach.
- There could potentially be a much higher number of prospective generating units assessed by NEMMCO as "existing" at the "Semi-Dispatch Rules Effective Date" and therefore exempted from the Semi-Dispatch Rules.
- This transitional approach would introduce further delays (up to three years) before all new significant intermittent generation is covered by the proposed Semi-Dispatch Rules. Such delays would prolong and possibly exacerbate existing issues of network security, excessive directions and over-conservative network operating margins, with these delays translating to additional industry costs.

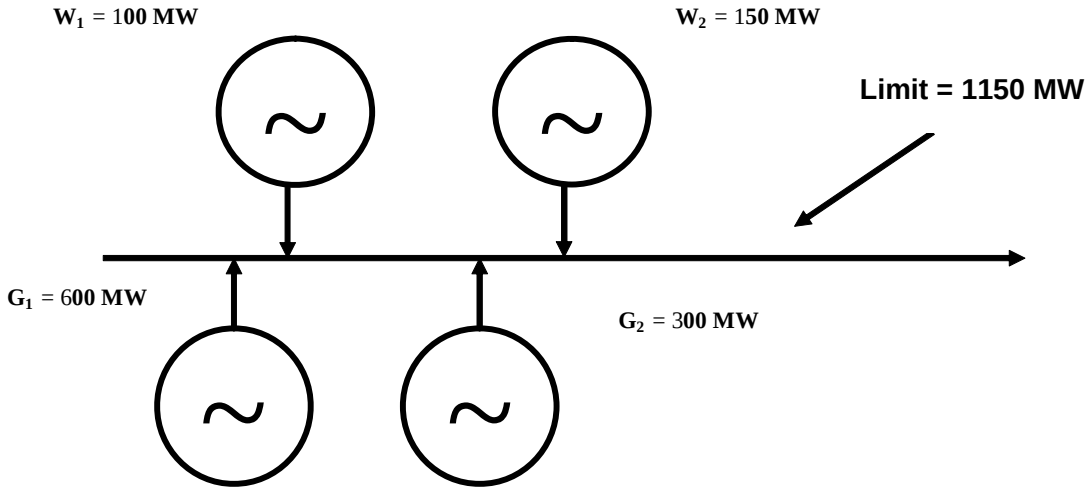
Appendix A: Simplified Example of Network Management Issue

The following simplified example demonstrates the issue of network flow management that may arise when significant non-scheduled generation is not centrally controlled by NEMDE.

Under Normal Operation Conditions

Assume W1 and W2 are non-scheduled generators and G1 and G2 are scheduled generators, with a combined generation of 1150 MW. Also assume all generation flows through network element with a flow limit of 1150 MW.

In this case the full network transfer capability of 1150 MW is being used, and the network flow is binding on but not violating that transfer limit.

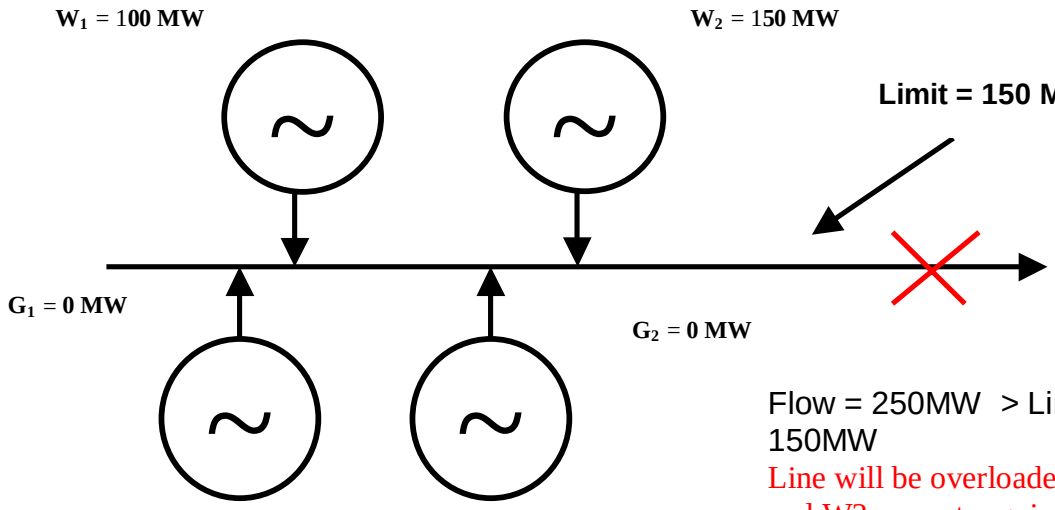


Under Outage Conditions

Now assume only partial network transfer capability is available, with the limit reduced to 150 MW.

Assume that the non-scheduled generation was not controlled and matched the 'system normal' case above (250 MW). In this case even after reducing the total generation from scheduled generators to zero MW the network element would still be overloaded with a flow of 250 MW, which would violate the 150 MW limit by 100 MW.

Under such circumstances, NEMMCO would normally have to resort to its power to direct the relevant non-scheduled generators to reduce their outputs to avoid network limits being exceeded, an outcome which is not deemed ideal.



Flow = 250MW > Limit = 150MW

Line will be overloaded if W1 and W2 are not required to reduce their outputs

Appendix B: Study into Materiality of Network Management Issue

NEMMCO recently examined the incidence of binding network constraint equations involving significant intermittent generation for the six month period from 1st March 2006 to 31st August 2006.

Diagram 1 below illustrates (by vertical bars) the incidence of binding network constraint equations reported by the Dispatch process that involve the output from the Lake Bonney Stage 1 and Canunda wind farms in the south-east area of South Australia.

As can be observed, the overall incidence of binding V-SA interconnector flow constraints involving southeast SA wind farm generation was around 9% of all dispatch intervals, with around 6.3% of all dispatch intervals involving the system normal 'V:S_NIL' constraint.

The 'V:S_NIL' constraint equation represents a post-contingency voltage stability/recovery limit designed to prevent overload on the V-SA interconnector into South Australia in the case of wind farm under-voltage tripping.

The 'V:S_NIL' constraint is currently defined as follows:

V-SA flow + 0.1 (Ladbroke 1 + Ladbroke 2) + 0.18 (Snuggery) ≤

263 MW
+ 1.47 * SE Summated Load
+0.36 * SESS SVC Reserve
-0.97 * Canunda MW
-0.55 * Lake Bonney MW

In terms of the continuous periods where this particular network constraint equation bound within the relevant six month period, there were 224 occasions where it bound for more than 15 minutes, of which 151 of those occasions it bound for more than 30 minutes and 21 occasions where it bound for more than 4 hours.

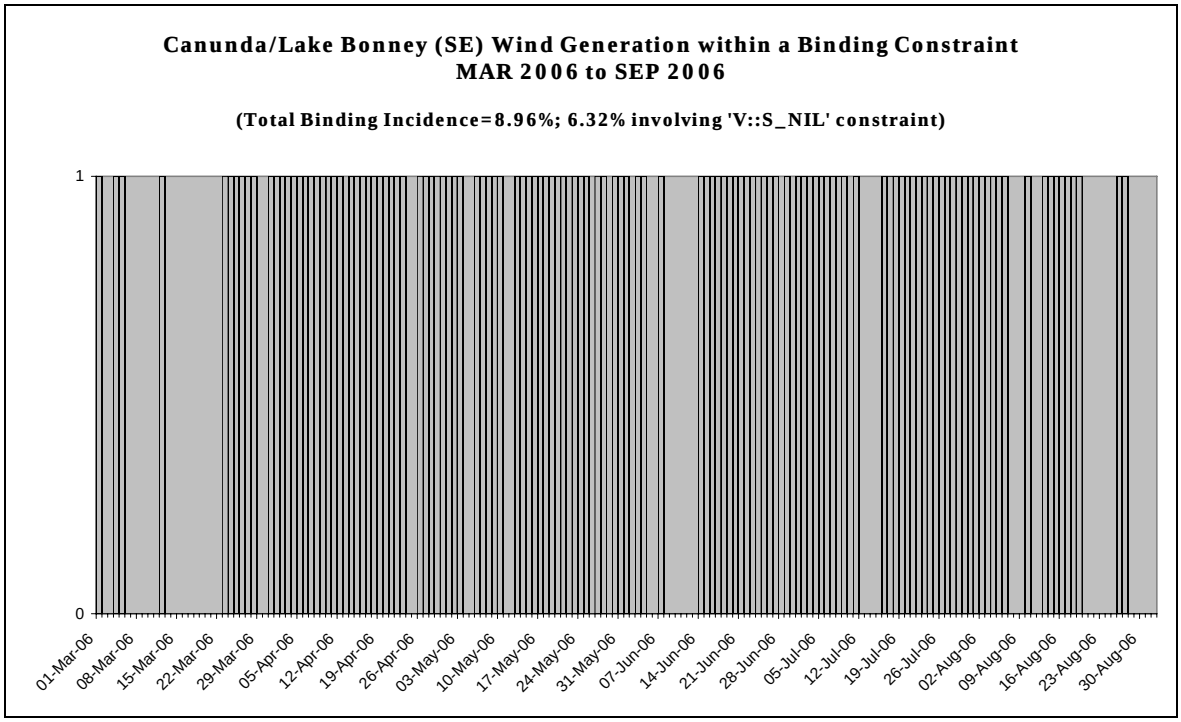
On the 15th April 2006 the 'V:S_NIL' constraint equation bound for almost 12 hours, over which period the Ladbroke 2 scheduled generating unit and the Canunda/Lake Bonney wind farms were generating. On this occasion the average V-SA interconnector flow was around 415 MW and estimated to have been constrained-off by an average of around 45 MW below its unconstrained import limit of 460 MW.

In conclusion, over the six month period studied it is apparent that significant intermittent wind farm generation located in the southeast area of South Australia has materially contributed toward the MW amount of network congestion in that area, resulting in constraining off V-SA interconnector flows into South Australia and (to a lesser extent) constraining off local scheduled generation involved in those constraints.

Note that the marginal dispatch costs associated with such network congestion over the study period are not presented here, as they do not include other costs, such as the ongoing cost to the market in maintaining higher than necessary network operating margins that could only be assessed by doing a more extensive 'what-if' analysis.

Diagram 1:

Involvement of Southeast SA Wind Farms in Binding Network Constraints



Appendix C: Current Dispatch Conformance Monitoring Procedures

The following briefly describes the current Dispatch Conformance Monitoring procedures administered by NEMMCO that apply to each scheduled unit.

These procedures are described in more detail in NEMMCO's Dispatch System Operating Procedure SO_OP3705 published on the NEMMCO website.

1. At the end of each dispatch interval the deviation of each unit's actual generating output away from its dispatch target is calculated, allowing for any enabled FCAS Regulation service. This called the dispatch error.

2. If a unit's dispatch error exceeds its Large (Small) MW Error Trigger then the unit is deemed as not responding to its dispatch target.

3. If a unit does not respond to its dispatch target for more than three (six) consecutive dispatch intervals AND these deviations do not cause any power system security issue then the relevant Registered Participant is contacted by NEMMCO and requested to either re-bid or to respond to their issued dispatch target.

4. If a unit is unable to re-bid or to respond to its dispatch target, then that unit is declared as non-conforming to both the market and to the AER for further, possibly punitive, action.

   NEMMCO also applies a non-conformance constraint to the calculation of that unit's dispatch target. This action attempts to minimise the market impact of the target non-conformance by setting the unit's dispatch target equal to its actual metered generation at the start of each dispatch interval.

5. Note that if at any time the unit's dispatch error causes a power system security issue then NEMMCO may take accelerated action and immediately declare the unit non-conforming, rather than allowing the dispatch error to persist for the required number of consecutive dispatch intervals before declaring non-conforming.

Appendix D: Semi-Dispatch Working Groups

Table 1 : WETAG Membership

Name	Company	Industry sector
John Thompson	ElectraNet SA	TNSP / JPB
Stephen Clark	Transend	
Craig Oakeshott	ESIPC	
David Trethewey	TransGrid	
Colin Hackney	Country Energy	DNSP
Paul Driver	ETSA Utilities	
John Arneaud	Hydro Tasmania	Generators (nominated via NGF)
Mark Frewin	TXU	
David Parris	AGL	Retailers (nominated via ERAA)
Andrew Jones	Origin Energy	
Sami Aoude	Norske Skog	End Users (nominated via EUAA)
Nic Buckley	Tarong Energy	Wind Generation Developers (nominated via AUSWind)
Kate Summers	Pacific Hydro	
Rob Jackson	Southern Hydro	Renewable Energy Generators (nominated via REGA)
Sarea Coates	Australian Greenhouse Office	Government
Murray Chapman Bruce Cameron Jennifer Crisp Ian Arnott Paul Ravalli Charlie Macaulay	NEMMCO	NEMMCO Observer

Table 2 : WEIRG Membership

(current members indicated in **bold**)

Name	Company	Industry Sector
David Waterson **Ross Gillett** Bruce Cameron Tom Wang	NEMMCO	NEMMCO
James Hetherington John Jende	Australian Greenhouse Office	Government
Kate Summers	Pacific Hydro	Wind Generation Developers (nominated via AUSWind)
Michael Vawser	Wind Prospect	Wind Generation Developers (nominated via AUSWind)
John Thompson	ElectraNet SA	NSP
Bob Davenport Jim Gallagher Con Hristodoulidis	EUAA	End Users
Keith Latty	Origin Energy	Retailers (nominated via ERAA)
Chrys Chandraraj Maria Androutsopoulos	AGL AGL	Retailers (nominated via ERAA)
Craig Oakeshott	ESIPC	JPB
Jonathon Dyson	Loy Yang Marketing	Generators (nominated via NGF)
Carlo Zabotto John Arneaud	Stanwell Corporation Hydro Tasmania	Generators (nominated via NGF)
Simon Appleby	Flinders Power	Generators (nominated via NGF)
Rob Jackson	REGA	Renewable Energy Generators

Appendix E: Summary of Semi-Dispatch Rule Changes

The following Tables summarise the proposed Semi-Dispatch Rule Changes in the areas of:

1. Registration and Classification of Intermittent Generation;
2. Participation in Central Dispatch and PASA; and
3. Requirements for Dispatch Cap Compliance.

Note that the column titled "Type" in the following Tables refers to whether the proposed Rule change deals with:

- the primary issue of control of intermittent generation with network limits and the Rule change only affects Semi-Scheduled Generators (column is blank)
- a secondary issue where the Rule change affects both Scheduled and Semi-Scheduled Generators (column = S)
- a minor issue of spelling or grammar (column = M)

These issues are described in Section 1 "Statement of the Issues".

Table 1: Registration and Classification of Intermittent Generation

Rule Clause	Heading	Change	Type
2.2.1(e)(1)	Registration as a Generator	Add *semi-scheduled* reference	
2.2.2(a)	Scheduled Generator	Add *semi-scheduled* reference	
2.2.2(b)	Scheduled Generator	Minor typo : replace "and/or" with "or"	M
2.2.2A	Semi-Scheduled Generator	**New Clause 2.2.2A** Covers the new classification of *semi-scheduled generating unit*	
2.2.3(a),(b),(c)	Non-Scheduled Generator	Add *semi-scheduled* references	
2.12(b)(1),(b)(2), (b)(8)(i)	Interpretation of References to Various Registered Participants	Add *semi-scheduled* references	
3.8.3(a),(b),(c),(f), (g),(i),(j)	Bid and Offer Aggregation Guidelines	Add *semi-scheduled* references	
3.8.3(b)(3),(b)(4), (b)(5)	Bid and Offer Aggregation Guidelines	**Delete (b)(3) & (b)(4)**, as already covered in Schedule 5.2. **Delete (b)(5),** as special metering equipment is not needed to meter an aggregated unit.	S

Rule Clause	Heading	Change	Type
3.8.3(d)	Bid and Offer Aggregation Guidelines	**Amend (d)**, to clarify that if a group of classified *scheduled generating unit* or *semi-scheduled generating units* are aggregated, then all Chapter 3 & clause 4.9 requirements that refer to a *scheduled generating unit* or a *semi-scheduled generating unit* only apply at its aggregated level, unless the context otherwise suggests.	S
S3.1	Registered Bid and Offer Data	Add *semi-scheduled* references	
S3.1	Registered Bid and Offer Data - Semi-Scheduled Generating Unit Data Table	**New Table**, similar to that for *scheduled generating units*	
S3.1	Registered Bid and Offer Data - Aggregation Data	Add *semi-scheduled* references	
S3.1	Registered Bid and Offer Data - Aggregation Data	Add "as approved by NEMMCO under clause 3.8.3" when referring to aggregated units.	
4.11.1(a)	Remote control and monitoring devices	Add *semi-scheduled* reference, to apply the requirements to install & maintain all remote control, operational metering & monitoring devices & local circuits as described in schedule 5.2, as for scheduled generating units.	
5.7.7(d)	Inter-network power system tests	Add *semi-scheduled* reference, to allow TNSPs to recover their costs incurred for developments or activities listed in Chart 1, as for scheduled generating units.	
S5.2.5.11(a)(5), (a)(6)	Frequency control	**New Clauses (a)(5) & (a)(6),** to define the "maximum operating level" & "minimum operating level" for *semi-scheduled generating units* & *semi-scheduled generating systems*	
S5.2.5.11	Frequency control - pre-disturbance level	Minor typo : un-italicize "system frequency", as not a defined term	M
S5.2.5.11(a)(4)	Frequency control - maximum operating level	Minor typo : reverse "combined" & "maximum, consistent with (a)(3)	M
S5.2.5.11(a)(4)	Frequency control – minimum operating level	Minor typo : reverse "combined" & "minimum, consistent with (a)(3)	M
S5.2.5.11(e)	Frequency control	Minor typo : replace "and the values" with "such that those values"	M
S5.2.5.14(a)(1), (b)(1)	Active Power control	Minor typo : add "aggregated" before "scheduled generating system"	M

Rule Clause	Heading	Change	Type
S5.2.5.14(a)(2)	Active Power control	Minor typo : delete "the" before "energy source availability"	M
S5.2.5.14(a)(3)	Active Power control - Automatic Access Standard	**New Clause (a)(3)** The automatic access standard for Active Power control systems for *semi-scheduled generating units* or *systems* are the same as the minimum access standard in (b)(3) below, plus a requirement for linear ramping similar to that for scheduled generating units under Clause (a)(1)(ii)	
S5.2.5.14(b)(3)	Active Power control - Minimum Access Standard	**New Clause (b)(3)** The minimum access standard for Active Power control systems for *semi-scheduled generating units* or *systems* are the same as those specified under the automatic access standard for non-scheduled generating units in Clause (a)(2)(i)-(iii)	
S5.2.5.14(c)	Active Power control	Minor typo : delete redundant "of those instructions"	M
S5.2.6.1(a)(4),(a)(5)	Remote Monitoring - Automatic Access Standard	**New Clauses (a)(4) & (a)(5),** to also include *semi-scheduled generating units* & aggregated *generating systems*.	S
S5.2.6.1(b)(1)	Remote Monitoring - Automatic Access Standard	**Amend (b)(1),** so that the following requirements also apply to any non-aggregated scheduled or *semi-scheduled generating unit*.	S
S5.2.6.1(b)(1)(iii)	Remote Monitoring - Automatic Access Standard	**Delete (b)(1)(iii)**, as (b)(1) does not cover aggregated units, but (b)(2) does	
S5.2.6.1(b)(1)(ii)	Remote Monitoring - Automatic Access Standard	Minor typo : Split (ii) into two, so that "*tap-changing transformer* tap position" becomes (iii)	M
S5.2.6.1(b)(2)	Remote Monitoring - Automatic Access Standard	**Amend (b)(2),** so that the following requirements also apply to any aggregated scheduled or *semi-scheduled generating system*.	S
S5.2.6.1(b)(2)(iv)	Remote Monitoring - Automatic Access Standard	**New Clause (b)(2)(iv)**, to cover active & reactive power from aggregated generating systems	S
S5.2.6.1(c)(2)	Remote Monitoring - Minimum Access Standard	**Amend (c)(2)**, to refer generically to an aggregated *generating system*, so that it covers both scheduled & *semi-scheduled generating systems*.	S
S5.2.6.1(c)(4)	Remote Monitoring - Minimum Access Standard	**New Clause (c)(4)**, to also cover *semi-scheduled generating units*.	

Rule Clause	Heading	Change	Type
S5.2.6.1(c)(4), (c)(5) Renumber to (c)(5), (c)(6)	Remote Monitoring - Minimum Access Standard	**Amend (c)(4) & (c)(5)**, to also apply those requirements to *semi-scheduled generating units* & aggregated *generating systems.*	S
S5.2.6.1(a),(c)	Remote Monitoring	Minor typos : replace "rule 4.11" with "clause 4.11"	M
8.2.1(h)(2A)	Dispute Resolution - Application and guiding principles	**New Clause (h)(2A),** to exempt disputes on NEMMCO decisions to not approve the classification of a generating unit as *semi-scheduled*	
Chapter 10	*registered bid and offer data*	Add *semi-scheduled* reference	
Chapter 10	*semi-scheduled generating system*	**New**	
Chapter 10	*semi-scheduled generating unit*	**New**	
Chapter 10	*Semi-Scheduled Generator*	**New**	
Chapter 11 (11.11)	Savings and Transitional Rules - Rules consequent on making the National Electricity Amendment (Semi-Dispatch of Significant Intermittent Generation) Rule	Refer Section 3.8.1 for details	

Table 2: Participation in Central Dispatch and PASA

Rule Clause	Heading	Change	Type
2.11.3(b)(8)	Budgeted revenue requirements	Add *semi-scheduled* reference	
3.7.1(b),(c),(d)	Administration of PASA	Add *semi-scheduled* references	
3.7.2(b),(d),(g)	Medium term PASA	Add *semi-scheduled* references	
3.7.2(c)(4)	Medium term PASA	**New Clause (c)(4)** NEMMCO prepares daily unit UIGF for input to MTPASA.	
3.7.2 (f)(3)(iii), (f)(3)(iv)	Medium term PASA	**New Clauses (f)(3)(iii) & (iv)** Separately mention the capacity of *semi-scheduled generating units*	
3.7.3(c),(e), (h)(4)(i), (h)(4)(ii), (j)	Short term PASA	Add *semi-scheduled* references	
3.7.3(d)(4)	Short term PASA	**New Clause (d)(4)** NEMMCO prepares HH unit UIGF for input to STPASA.	
3.7.3(e)(2)	Short term PASA	**Amend (e)(2),** to qualify that synchronisation & de-synchronisation times are only required from Scheduled Generators & Semi-Scheduled Generators for slow start generating units with a nameplate rating ≥ 30 MW	S
3.7.3(e)(4)	Short term PASA	**Delete (e)(4)** Unit self-dispatch level is no longer used in STPASA	S
3.7.3(h)(4)(iii), (h)(4)(iv)	Short term PASA	**New Clauses (h)(4)(iii) & (iv)** Separately mention the capacity of *semi-scheduled generating units*	
3.8.1(a),(e)	Central Dispatch	Add *semi-scheduled* references	
3.8.1(b)(12)	Central Dispatch	**New Clause (b)(12)** Central Dispatch is also subject to constraints due to unconstrained intermittent generation forecasts applied to *semi-scheduled generating units*	
3.8.2(a),(b)	Participation in central dispatch	Add *semi-scheduled* references	
3.8.4(a),(c),(e)	Notification of scheduled capacity	Add *semi-scheduled* references	

Rule Clause	Heading	Change	Type
3.8.4(a)	Notification of scheduled capacity	Minor typo : replace "and/or" with "or"	M
3.8.4(c)(1),(d)	Notification of scheduled capacity	**Amend (c)(1) & (d),** to use the existing defined term *available capacity*	
3.8.6(a),(c),(g),(h),(i),(l)	Generating unit offers for dispatch	Add *semi-scheduled* references	
3.8.8(a),(b),(c),(d)	Validation of dispatch bids and offers	Add *semi-scheduled* references	
3.8.9(a),(b),(d),(e)	Default offers and bids	Add *semi-scheduled* references	
3.8.10(a),(c)	Network constraints	Add *semi-scheduled* references	
3.8.14(a),(b)	Dispatch under conditions of supply scarcity	Add *semi-scheduled* references	
3.8.16	Equal priced dispatch bids and dispatch offers	Add *semi-scheduled* reference	
3.8.19(a)	Dispatch inflexibilities	Minor typo : remove comma before "due to abnormal plant conditions"	M
3.8.19(b),(c),(d),(f)	Dispatch inflexibilities	Add *semi-scheduled* references	
3.8.19(a1)	Dispatch inflexibilities	**New Clause (a1)** If a *semi-scheduled generating unit* is inflexible then a maximum loading level (rather than fixed loading level) must be specified in the dispatch offer.	
3.8.20(c)	Pre-dispatch schedule	**Amend (c)**, so that the Pre-dispatch schedule must also be determined based on NEMMCO's unconstrained intermittent generation forecast for each *semi-scheduled generating unit.*	
3.8.20(g),(i),(j),(k)	Pre-dispatch schedule	Add semi-scheduled references	
3.8.21(d),(e),(j),(l),(m)	On-line dispatch process	Add *semi-scheduled* references	
3.8.22(b),(c),(d)	Rebidding	Add *semi-scheduled* references	
3.12A.1(b)(1),(b)(3),(b)(8),(c)(2)	Mandatory restrictions	Add *semi-scheduled* references	
3.12A.4	Rebid of capacity under restriction offers	Add *semi-scheduled* reference	
3.12A.5(a),(b)	Dispatch of restriction offers	Add *semi-scheduled* references	
3.12A.7(a),(b1)	Determination of funding restriction shortfalls	Add *semi-scheduled* references	

Rule Clause	Heading	Change	Type
3.12A.9(b)(1)(ii)	Review by AEMC	Add *semi-scheduled* reference	
3.13.1(a)	Provision of information	Add *semi-scheduled* reference	
3.13.2(c),(f),(g),(h), (i), (k),(m)	Systems and procedures	Add *semi-scheduled* references	
3.13.3(a),(b),(c),(d), (h),(j),(q)(5),(t)	Standing data	Add *semi-scheduled* references	
3.13.4(o),(p)(1), (p)(2), (p)(6),(q)	Spot market	Add *semi-scheduled* references	
3.13.4(q)	Spot market	**Amend (q),** so that also covers the next-day public reporting of UIGF for each *semi-scheduled generating unit* & as regional totals, after the end of the trading day to which those forecasts apply, as provided to the Dispatch & Pre-dispatch processes	
3.13.4(k1)	Spot market	**New Clause (k1)** Confidential same-day reporting of UIGF for each *semi-scheduled generating unit* during the trading day to which those forecasts apply, as provided to the Pre-dispatch process	
3.13.7(d)(3)	Monitoring of significant variation between forecast and actual prices by AER	Add *semi-scheduled* references	
3.14.6(a),(e)(3)	Compensation due to the application of an administered price, VoLL or market floor price	Add *semi-scheduled* references. Semi-Scheduled Generators may also claim APC compensation.	
3.15.7(c) Table	Payment to Directed Participants	Add *semi-scheduled* reference	
3.15.7A(c)(1)(ii)(A)	Payment to Directed Participants for services other than energy and market ancillary services	Add *semi-scheduled* reference	
3.15.7B(a)(1),(a3)	Claim for additional compensation by Directed Participants	Add *semi-scheduled* references	
3.15.10(a),(b),(c)	Administered price, VoLL or market floor price compensation payments	Add *semi-scheduled* references. Include Semi-Scheduled Generators in recovery of APC compensation payments	
3.15.10B(a),(c)	Restriction contract amounts	Add *semi-scheduled* references	

Rule Clause	Heading	Change	Type
3.16.1(a)	Establishment of Participant compensation fund	**Amend (a),** so that Semi-Scheduled Generators must also contribute to PCF.	
3.16.1(g1)	Establishment of Participant compensation fund	**New Clause (g1)** Semi-Scheduled Generator are also not entitled to a refund from the PCF if no longer a Semi-Scheduled Generator	
3.16.2(d1)	Dispute resolution panel to determine compensation	**New Clause (d1)** Semi-Scheduled Generator may claim under-dispatch compensation for a scheduling error, same as (d) for a Scheduled Generator	
3.16.2(f1)	Dispute resolution panel to determine compensation	**New Clause (f1)** Semi-Scheduled Generator may claim over-dispatch compensation for a scheduling error, same as (f) for a Scheduled Generator	
3.16.2(h)(1)	Dispute resolution panel to determine compensation	Add *semi-scheduled* reference.	
Chapter 10	*available capacity*	Add *semi-scheduled* reference	
Chapter 10	*central dispatch*	Add *semi-scheduled* reference	
Chapter 10	*Directed Participant*	Add *semi-scheduled* reference	
Chapter 10	*dispatch*	Add *semi-scheduled* reference	
Chapter 10	*dispatch inflexibility profile*	Add *semi-scheduled* reference	
Chapter 10	*dispatch offer price*	Add *semi-scheduled* reference	
Chapter 10	*dispatched generating unit*	To specifically refer to only scheduled generating units	
Chapter 10	*energy constrained semi-scheduled generating unit*	**New** Similar to existing definition for *energy constrained scheduled generating unit*, but applies to *semi-scheduled*	
Chapter 10	*generation dispatch offer*	Add *semi-scheduled* reference	
Chapter 10	*inflexible, inflexibility*	**New Clause (b)** for *semi-scheduled generating units*	
Chapter 10	*loading price*	Add *semi-scheduled* reference	
Chapter 10	*off-loading price*	Add *semi-scheduled* reference	
Chapter 10	*PASA availability*	Add *semi-scheduled* reference	

Rule Clause	Heading	Change	Type
Chapter 10	*PASA availability*	Minor typo : italicize “service” in “*scheduled network service*”	M
Chapter 10	*restriction offer*	Add *semi-scheduled* reference	
Chapter 10	*scheduled plant*	Add *semi-scheduled* reference	
Chapter 10	*statement of opportunities*	Add *semi-scheduled* reference	
Chapter 10	*unconstrained intermittent generation forecast*	**New**	

Table 3: Requirements for Dispatch Cap Compliance

Rules Clause	Heading	Change	Type
3.8.17(c),(d),(e),(g),(h)	Self-commitment	Add *semi-scheduled* references	
3.8.17(e)	Self-commitment	**Amend (e)**, so that self-commitment & synchronisation intentions need only be notified to NEMMCO via Pre-dispatch & PASA (by changes to bid *available capacity*) for *scheduled generating units* or *semi-scheduled generating units* with a nameplate rating ≥ 30 MW, unless otherwise agreed with NEMMCO.	S
3.8.17(f)	Self-commitment	**Amend (f)**, so that synchronisation time "may" (rather than "will") be subject to directions from NEMMCO.	S
3.8.17(h)	Self-commitment	**Amend (h)**, to replace *commitment* with *self-commitment*, as this Rule only covers the self-commitment procedures for slow start generating units or those electing to self-commit	S
3.8.18(a),(b),(c),(d)	Self-decommitment	Add *semi-scheduled* references	
3.8.18(b1)	Self-decommitment	**New Clause (b1)** to mirror amended Clause 3.8.17(e) above, so that self-decommitment & de-synchronisation intentions need only be notified to NEMMCO via Pre-dispatch & PASA (by changes to bid *available capacity*) for *scheduled generating units* or *semi-scheduled generating units* with a nameplate rating ≥ 30 MW, unless otherwise agreed with NEMMCO	S
3.8.18(d)	Self-decommitment	**Amend (d)**, to replace *de-commitment* with *self-decommitment*, as this Rule only covers the self-decommitment procedures for generating units electing to self-decommit.	S
3.8.22A(a),(b),(c)	Variation of offer, bid or rebid	Add *semi-scheduled* references	
3.8.23(a),(b),(c),(d),(e)	Failure to conform to dispatch instructions	Add *semi-scheduled* references	
3.8.23(a1)	Failure to conform to dispatch instructions	**New Clause (a1)** to describe how a *semi-scheduled generating unit* complies to a dispatch instruction during semi-dispatch intervals versus non-semi-dispatch intervals	

Rules Clause	Heading	Change	Type
3.9.7(a),(b)	Pricing for constrained-on scheduled generating units and semi-scheduled generating units	Add *semi-scheduled* references, including to Heading	
3.9.7(a),(b)	Pricing for constrained-on scheduled generating units and semi-scheduled generating units	Remove hyphen in defined term *constrained on*	M
3.15.6A(k)(4)(c)	Ancillary Service transactions	Italicize '*enabled*' & replace "which" with "that"	M
3.15.6A(k)(5)	Ancillary Service transactions	**New Clause (k)(5)** Similar to (k)(4), except that a *semi-scheduled generating unit* would not be assessed as contributing to a frequency deviation if it ramps its actual sent out generation at a uniform rate: • to its dispatch cap over a semi-dispatch interval, or • to any level over a non-semi-dispatch interval	
4.1.1(a)(3)(iv)	Purpose	Add *semi-scheduled* reference	
4.3.1(i)	Responsibility of NEMMCO for power system security	Add *semi-scheduled* reference	
4.4.2(a)	Operational frequency control requirements	Add *semi-scheduled* reference	
4.8.5(c)(2)	Managing declarations of conditions	Add *semi-scheduled* reference	
4.8.5A(c),(d),(f)	Determination of the latest time for intervention by direction or dispatch of reserve contract	Add *semi-scheduled* references	
4.9.2	Instructions to Generators	**Amend Heading,** as existing Clauses (b) & (c) apply to all Generators, including Non-Scheduled Generators	M
4.9.2(a1)	Instructions to Generators	**New Clause (a1)** Mirrors Clause (a) for scheduled generating units, except that dispatch instruction for a *semi-scheduled generating unit* nominates a maximum level of power, rather than a "level or scheduled of power".	
4.9.2(a),(b)	Instructions to Generators	Delete "any of"	M
4.9.2(a)	Instructions to Generators	Delete quotes around *dispatch instruction*	M

Rules Clause	Heading	Change	Type
4.9.2(a)	Instructions to Generators	Delete "then" before "for the purpose of giving effect to..."	M
4.9.2(a)(1)	Instructions to Generators	Replace "are required to" with "must"	M
4.9.2(d)	Instructions to Generators	Add *semi-scheduled* references	
4.9.2(d)	Instructions to Generators	Replace "which" with "that"	M
4.9.2A(a)	Dispatch instructions to Scheduled Network Service Providers	Delete "then" before "for the purpose of giving effect to..."	M
4.9.2A(a)	Dispatch instructions to Scheduled Network Service Providers	Delete "any of"	M
4.9.2A(a)	Dispatch instructions to Scheduled Network Service Providers	Delete quotes around *dispatch instruction*	M
4.9.2A(a)(1)	Dispatch instructions to Scheduled Network Service Providers	Replace "are required to" with "must"	M
4.9.2A(a)(2)	Dispatch instructions to Scheduled Network Service Providers	Add "*scheduled*" before "*network service*"	M
4.9.2A(a)(2)	Dispatch instructions to Scheduled Network Service Providers	Replace "specified service" with "specified period"	M
4.9.2A(c)	Dispatch instructions to Scheduled Network Service Providers	Replace "which" with "that"	M
4.9.3(d)	Instructions to Registered Participants	Replace "*dispatch offer*" with "*dispatch bid*" as Clause refers to scheduled loads	M
4.9.3(d)	Instructions to Registered Participants	Replace "and/or" with "or"	M
4.9.4	Dispatch related limitations on Scheduled Generators and Semi-Scheduled Generators	**Amend Heading**, to add "Semi-Scheduled Generators"	
4.9.4(a),(b),(c),(d),(e),(f)	Dispatch related limitations on Scheduled Generators and Semi-Scheduled Generators	Add *semi-scheduled* references	
4.9.4(a)(1)	Dispatch related limitations on Scheduled Generators and Semi-Scheduled Generators	**Amend (a)(1)**, to delete "up to the *self-dispatch level*", as Clause 4.9.6 already covers this.	S

Rules Clause	Heading	Change	Type
4.9.4(b)(3)	Dispatch related limitations on Scheduled Generators and Semi-Scheduled Generators	**Amend first paragraph & Clause (b)(3),** to delete "Scheduled", to generically refer to Generators (both Scheduled and Semi-Scheduled)	S
4.9.4(c)	Dispatch related limitations on Scheduled Generators and Semi-Scheduled Generators	Minor re-phrase, to combine two sentences into one.	M
4.9.4(d)	Dispatch related limitations on Scheduled Generators and Semi-Scheduled Generators	**Amend (d)**, so that requirement to obtain NEMMCO approval to synchronise or de-synchronise only applies to *scheduled generating units* or *semi-scheduled generating units* with a nameplate rating ≥ 30 MW, unless otherwise in accordance with a dispatch instruction.	S
4.9.5(a),(a)(1)	Form of dispatch instructions	Add *semi-scheduled* references	
4.9.5(a),(a)(1)	Form of dispatch instructions	Delete extraneous phrases "(including any aggregated...) as this is already implied if the unit is aggregated under Clause 3.8.3.	M
4.9.5(a)(6)	Form of dispatch instructions	**New Clause (a)(6),** to separately describe a dispatch instruction for a *semi-scheduled generating unit*	
4.9.6	Commitment of scheduled generating units and semi-scheduled generating units	**Amend Heading** to add *semi-scheduled generating units*	
4.9.6(a)	Commitment of scheduled generating units and semi-scheduled generating units	Add an initial paragraph to only apply self-commitments procedures under (a)(1) & (a)(2) to *scheduled* or *semi-scheduled generating units* with a nameplate rating ≥ 30 MW	S
4.9.6(a),(b)	Commitment of scheduled generating units and semi-scheduled generating units	Add *semi-scheduled* references	
4.9.6(a)(1)	Commitment of scheduled generating units and semi-scheduled generating units	**Amend (a)(1)**, so that the Scheduled or Semi-Scheduled Generator must confirm synchronisation with NEMMCO in accordance with Clause 3.8.17(e)	S
4.9.6(a)(2)	Commitment of scheduled generating units and semi-scheduled generating units	**Amend (a)(2)**, so that NEMMCO "may require" the Generator to advise (rather than the Generator "must advise") when its generating unit reaches the self-dispatch level.	S

Rules Clause	Heading	Change	Type
4.9.7	Decommitment, or output reduction, by Scheduled Generators and Semi-Scheduled Generators	**Amend Heading** , to add *Semi-Scheduled Generator*s & to remove hyphen in De-commitment	
4.9.7(a)	Decommitment, or output reduction, by Scheduled Generators and Semi-Scheduled Generators	**Amend (a)**, so that the Scheduled or Semi-Scheduled Generator must confirm de-synchronisation with NEMMCO in accordance with new Clause 3.8.18(b1)	S
4.9.7(a),(b)	Decommitment, or output reduction, by Scheduled Generators and Semi-Scheduled Generators	**Amend (a) & (b)** Decommitment requirements only apply to *scheduled* or *semi-scheduled generating units* with a nameplate rating ≥ 30 MW	S
4.9.7(b)	Decommitment, or output reduction, by Scheduled Generators and Semi-Scheduled Generators	Delete hyphen in *de-commit*	M
4.9.8(b2)	General responsibilities of Registered Participants	**New Clause (b2)** for *semi-scheduled generating units*, mirrors Clause (b) for scheduled generating units	
4.9.8(b),(b1),(c)	General responsibilities of Registered Participants	Delete redundant phrase starting with “under Chapter 3 in respect of...”	M
4.9.8(b)	General responsibilities of Registered Participants	Replace “the latest” with “its latest”	M
4.9.8(c)	General responsibilities of Registered Participants	Replace “any relevant” with “its relevant”	M
4.9.9	Scheduled Generator plant changes	Replace “which” with “that”	M
4.9.9A	Scheduled Network Service Provider plant changes	Replace “which” with “that”	M
4.9.9B	Ancillary Service plant changes	Replace “which” with “that”	M
4.9.9C	Semi-Scheduled Generator plant changes	**New Clause 4.9.9C** for Semi-Scheduled Generators, mirrors Clause 4.9.9 for Scheduled Generators	
Chapter 10	*dispatch cap*	**New**	
Chapter 10	*non-semi-dispatch interval*	**New**	
Chapter 10	*semi-dispatch interval*	**New**	