



AEMC Directed review.
Technical Standards Compliance

The Australian Wind Energy Association welcomes the opportunity to comment on this review of compliance with technical standards.

The timing of this review however is impractical and premature. The process for setting the existing technical standards has been an extremely difficult and many generators are still working to achieve the registration of technical standards for existing plant.

As acknowledged by the review NECA intended that generators register the current performance of existing plant as a standard.

“The standards determined or negotiated for each plant should be publicly deposited with NEMMCO as registered performance standards. Existing plant should be able to treat its current performance as its registered performance standard.”

Wind farm generators have worked with NEMMCO to achieve performance standards for their existing plant, but experience shows that it has not always been possible to register the current performance for existing plant.

With regard to technical standards, it is important to note that a standard is not set as the actual performance of the machine but as the limit of performance that a generating unit should perform within. This identifies a tolerance in the system and to comply within that tolerance is important. However it does not document the performance tuning of a generator, nor does it measure how far the unit has drifted from its original or planned settings within the tolerance.

Overview

For the power system to continue to operate reliably and for problems to be resolved effectively, good co-ordination and co-operation between system operators and generators is essential. It is evident that the compliance and enforcement direction creates a penalty system that is reactive and focuses on identifying generator culpability rather than strategic system inadequacies.

In the past, regional groups of power system engineers were responsible for co-ordination of the system response, tuning of settings and pro-active analysis of new technologies and control philosophies. It now appears that system management of this kind is too risky and/or expensive, that all engineering is undertaken at arms length, and that TNSPs no longer provide the same services that they once did to generators prior to market start. (An example of this is the announcement that Vencorp is no longer performing generator testing or providing harmonics expertise to DNSPs.)

A preventative approach to system performance is highly preferred and strongly recommended.

This would include an independent group of power system engineers who would jointly

- be dedicated to system dynamics, control, testing and analysis
- provide system support to the generators and TNSPs,
- ensure that protection, design and control setting decisions do not conflict with the system response but rather improve it,
- test the generators (physically) and the system to ensure that the mathematical models are accurate and that the generator performance is at the expected level or work out how it could be improved.

The benefits of this approach are

- an efficient identification of errors or failures,
- early identification of type faults, consistent testing, analysis and modelling methods,
- a pro-active and supportive environment with which to maintain system performance,
- development of integration strategies for new technology.

The current method of each company performing its own 'due diligence' on setting and design is inefficient, expensive and prone to error.

New technologies require new control philosophies and research. The current mis-information over the performance of wind turbines and their affect on the system is an illustration of the reactive nature of system planning in the market environment.

Review Question Responses:

1. Are there other technical standards that the Commission should consider as part of this review?

S5.1a affects the application of S5.2, it should be included in this review as it is used in the setting of a technical standard for generators. S5.1a.4 in its current wording is vague and most likely immeasurable.

2. Is the process for establishing new performance standards effective in achieving desired outcomes for the power system. Is NEMMCO's role in the process effective or does it need to be more clearly defined?

The process cannot be decided on unless the desired outcome is clearly understood. Which institution decides what the desired outcomes for the power system are? The Rules contain a market objective, however there is no stated power system objective.

A stable secure power system, which meets a reliability standard is desirable however, different market participants may prefer different outcomes in different areas, for example; inter-regional transfer limits, altered region boundaries, increased transmission capacity or reactive power support in loads centres..

Unless this is clearly stated at the start of any review of standards, there is little chance of reaching consensus or support for the outcomes.

Technology is evolving and control philosophies need to develop also. Power system experts must be provided to propose reliability standard changes, study and provide advice on the power system, its response and performance.

The technical standards reference group (TSRG) took a full day debating the process for connection and its relationship to the setting of performance standards for new plant. Trying to identify when and where in the process NEMMCO was involved the group (which included participants with many years of market experience and NEC knowledge) to a day to agree. Although agreement was reached, the NER process is still unclear, even to the initiated.

3. Are performance standards for existing plant, which were defined with reference to a derogation, an accurate representation of the capability of the plant? Are there events that should trigger a review?

There are no derogations that apply to wind farms, and as such there is reason to comment on the accuracy of plant under a derogation.

However, the question of whether accuracy and capability has been addressed in technical standards is misplaced. The standards have all been set with respect to the limits that the plant was meant to perform within, not with respect to what they actually do, or what they are capable of. A simple example is that of protection clearing time, i.e. the longest time in which a fault must be cleared to meet a network requirement, not the time in which the fault is designed to clear.

With respect to triggering a review of a technical standard on a unit, in some cases the modification of a connection agreement may not be possible based on project financing.

The question of triggering a review of a technical standard in the NER should not be event driven as power system events are typically unique and complicated to analyse. In the March 8 2004 event there were system settings (auto-reclosure) that contributed to a power swing. None of these settings are subject to technical standards as there are no technical standards for networks (other than the management of quality).

To review technical standards following a power system event is reactionary and fails to pro-actively plan for the introduction of new technologies and control strategies. This has been highlighted by the difficulties associated with integrating wind power into the power system.

Reactionary planning will leave the (NEM) power system always running behind technology. The regional system support groups that historically tested and analysed the system, investigated technologies and provided control system settings for generators provided a significantly more strategic and robust management approach..

The wind energy industry was alluding to an exponential increase in wind power well before projects were applying for registration and generation licenses. Momentum in the power industry became reactionary only when large wind projects started to draw the attention of the TNSPs and system operator. The planning for this type of growth should have been undertaken earlier than it has been.

The content of technical standards in the recent wind integration review have been set by consensus and general debate, all of which depend on the understanding and interpretation of the issues by the group involved in the debate.

Lastly if a generator wishes to perform an upgrade on a control system, the generator should not be at risk of having to review all of their technical standards. The review should only be on the particular standard that refers to that control system. Unfortunately, some TNSPs see a plant upgrade as an opportunity to try to force open all standards. This acts as a disincentive to plant upgrades or additions.

4. Should there be a mechanism to modify a performance standard, either at the request of the participant or to take account of changes in the requirements on the power system?

A mechanism is required to enable a participant to advise when there is an error or failure to agree on a standard's wording for existing plant. The performance standard will not alter the way the plant was designed, connected and built.

Changes in power system requirements should be addressed by experts whose sole responsibility it is to study the dynamic performance of the power system or research changes in technology and how such changes will affect the current control philosophy.

Some changes can be implemented through altering control settings whereas others could cause a major refit of equipment. The review of a technical standard or performance requirement should acknowledge what can easily be altered within the system and what causes excessive cost. A process that justifies rule changes against the market objective is now required.

There is an existing case where the wording of the technical standard in the law has changed the intention of the standard. Clause S5.1a.4 now uses "normal" in one place where it should use "nominal" altering the entire measurement of this clause and making it nonsensical. Meanwhile plant may no longer be compliant, due to the use of the word 'normal' in reference voltage.

Another example of this would be to create a requirement that embedded wind farms ride through a fault in a distribution system. The speed of communications and hence fault clearance is extremely slow (up to 1 sec). In this case to create an expectation that secondary clearing times be the standard is almost impossible to achieve or justify the expense. The impact of the loss of the wind farm against the cost of either a) providing excessive reactive support (only for fault ride through), or b) upgrading the communications. These options should be available to the DNSP and the project proponent to agree on with respect to the local system. It should not be dictated by NEMMCO as distribution faults in almost all cases do not affect the transmission system security.

Changes in the power system

The introduction of renewable energy such as wind and distributed generation poses the single largest technology change in power production that the power system has seen in 100 years.

So far the response of the system operator (and regulators) has been a conservative top down approach to control. Very little is being done to prepare for these changes in technology. It is inevitable that renewable energy will become part of the system and methods for management and integration are needed. The current response is to establish working groups which are unable to provide the strategic expert thinking that is required to tune the fundamental power control philosophies. Very little analysis has been done by these working groups, instead hypothesis is debated and points of view are taken. This does not lead to new control philosophies; instead it endeavours to make the new technology fit the way the system works now. No attempt has been made to figure out new system control methodologies. This will lead to non-optimal performance and premature limits being set.

5. Are there any aspects of the content of the various technical standards specified in the Rules that require clarification?

The overall process as discussed in Q.2 should have a flowchart that describes it to all participants and intending participants.

There is a general need to clarify what each standard is trying to achieve on the power system. The Technical Standards Reference Group (TSRG) debated at length that the objective of its review was to achieve standards that reflected outcomes on the power system (at the connection point) rather than be specific about technology. In some cases being technology specific is unavoidable.

An example of a standard that needs clarity is the partial load rejection clause, as it can be interpreted in a number of ways. This is a standard that cannot be tested as the event that would cause it can not be replicated at the terminals of a generator. This clause could be read to include the actions required for trip to house load or to define the limits of response of a generator to power swings in the system.

6. Is the current framework for compliance programs effective in establishing and maintaining compliance with performance standards?

The framework is adequate; however there is a lack of feedback and response from NEMMCO. This is probably due to the increased requirements and that the management of the process is inadequately resourced to ensure prompt feedback.

7. Is it reasonable to expect a participant to meet an absolute standard of compliance when this cannot be guaranteed through a compliance program?

As there are no absolutes in electricity, it is unreasonable to expect absolute compliance. No matter how well written the standards are, areas will remain uncovered. Even complying with everything in a program, it is still likely that something else will happen, not least of all is human error. There have been numerous events of human error, or component failure in the power system, all of these are beyond the control of a compliance program.

As stated earlier the compliance program should demonstrate a preventative approach, not reactive. Generators do not intend to fail, they do everything possible to avoid failure, however failure cannot be eliminated. Knowledge helps a generator to identify possible causes of failure and to mitigate the problem; without knowledge the problems cannot be identified. There is a fundamental lack of system knowledge and system support available to generators in the current market design. The system support is dwindling every year and the decision by TNSPs to not provide testing services is an example of this.

Machines and their control systems are all inter-related on the power system, minute failures in electronic components can alter the performance of machines and remain undetected until an event. Machine testing may or may not identify the failure.

8. Are there sufficient incentives to ensure that all breaches of performance standards are reported to NEMMCO by participants?

There seem to be no incentives, only penalties. This is a deterrent to co-operative resolution of performance issues.

9. Is the AER the appropriate body to monitor compliance? Is the AER's current approach to its monitoring role appropriate? To what extent should it monitor reactively or proactively? What other approaches to the monitoring role may be cost effective?

The AER is an extremely new body, albeit with some experienced NECA personnel. It has initiated a request for all generators to achieve compliance programs. This has helped in some areas to prompt NEMMCO to finalise standards that they have previously rejected. Draft compliance programs are awaiting NEMMCO's final approval.

The AER is the appropriate body to monitor market compliance, rules and bidding behaviour

With respect to dynamic performance on the power system and compliance with the technical standards (Chapter 5), it is doubtful that an appropriate body exists. This is because the roles of management of system dynamics and co-ordination are fragmented between TNSPs and NEMMCO. There are few resources left to monitor and analyse the system dynamics.

Again, the development of a co-operative environment for problem resolution and the sharing of information for system analysis is more likely to achieve the desired outcomes of the power system. A group of dedicated independent system support engineers is more likely to engender an environment for good technical performance than the current penalty system.

10. Should there be some form of public reporting on the outcome of the AER's monitoring role, including identifying non-compliance instances and what action has been taken to correct those non-compliances?

It is interesting that recommendations following power system incident reports have changed without full explanation. It is unclear which body follows up on recommendations with networks and ensures that they are adequately carried out. Network must also have compliance requirements. Networks can contribute to, and cause power system incidents just as easily as generators can.

11. Is NEMMCO's role in determining the timeframe to rectify the breach appropriate and does NEMMCO have sufficient guidance in making that determination?

NEMMCO are unlikely to appreciate the issues of getting appropriately skilled contract personnel in place to design, purchase and rectify any items of plant, as there is little or no commercial experience within NEMMCO. This could lead to inappropriate timeframes for rectification of a problem. Having said this, provided NEMMCO discuss fairly the issue with the participant and comes to an agreed timeframe, the participant could be held to it.

An illustration of a market participant correcting a major problem in a timely manner without a determination from NEMMCO is Loy Yang's response to the loss of Unit 4.

12. Is the enforcement regime, including the powers of the AER adequate for the effective enforcement of breaches of performance standards?

The enforcement regime appears to be designed for major non-compliance items of large market generators. Consideration must be given to the penalties that it imposes on small generators who don't actively trade in the market and whose impact on the system is minor, yet must comply with major technical standards.

13. Should NEMMCO be required to inform the AER of potential non-compliance earlier than at the end of the rectification period? Should NEMMCO refer the issue to the AER in all cases, or should NEMMCO have some discretion to extend the period for compliance?

NEMMCO should have discretion to extend the period for compliance for the reasons listed above in 11. A participant that is trying to repair a non-compliance is often dealing with the commercial issue in contracts. These may or may not resolve in a timely manner, yet the participant is doing their best. Discretion would depend on the risk associated with the non-compliance and NEMMCO is in a reasonable position to assess the technical matters of the non-compliance.

14. Are there other matters that the Rules should require to be taken into account in proceedings?

The adequacy and evidence in a compliance program needs to be taken into account. As in Q7, there are no absolutes that a compliance program will cover everything.

15. Are there good reasons for having two investigations into power system incidents? Does this dual process assist in resolving issues by separating operational matters from enforcement matters, or does it place an inappropriate burden on participants? Do the AER and NEMMCO have appropriate power to conduct their investigations?

In fact there are more than two investigations done on incidents as there are many different aspects to a power system incident.

NEMMCO undertakes a market report, a system operations report, a system performance report, however these infrequently investigate the system dynamics to a level that would identify system control problems.

The pressure that is currently applied to get out quick answers (for enforcement) means that the deeper systemic problems are unlikely to be uncovered and addressed in the system performance reports.

It is evident that NEMMCO can be delayed in its analysis through lack of data. This may occur because various organisations, both generator and TNSP, want to analyse and understand the event and their risks before handing over the data, or there is a convenient failure to record appropriate data from the event. This is directly related to the enforcement matters.

In reality whoever carries out the system investigation on power system performance needs to have access to their own recording devices and be able to download and commence analysis immediately following the event. This analysis should be aimed at resolving technical problems that require co-ordination across system control elements.

This is a different investigation to resolving the actions of operators, generators and the market dispatch for operational and market behaviour concerns

This level of dynamic investigation is rarely done in the current reports.

NEMMCO has appropriate powers under the current law, however rarely undertakes a dynamic system investigation that would resolve the underlying co-ordination problems.

16. Does the threat of enforcement action by the AER act as a disincentive to provide information to NEMMCO on a co-operative basis, if it is to be shared between the two organisations?

Yes. Organisations frequently delay the delivery of data. It is evident that recording devices manage to fail to record at an alarming rate. The investigator needs access to its own dynamic recording devices. NEMMCO was set up so that it does not own any assets and as such does not own measuring devices. For NEMMCO to continue undertaking system investigations, it will always be dependent on the provision of data from participants who are subject to the threat of non-compliance.

Technical matters generally require a co-ordinated and co-operative investigation to resolve. The investigator is frequently impeded by a lack of appropriate data for an investigation. Yet the investigator is under pressure to provide quick answers to the market and the regulators.

17. Are the penalties for breaches of performance standards adequate?

Penalties do not engender co-operation and knowledge sharing for problem resolution. As the power system becomes more complex, we require a positive environment in which the overall system performance can be improved.

18. Is there a case for determining a technical standards penalty provision which better reflects the potential costs for end users of non-compliance? If so, what should the level of that penalty be?

Assessing the 'potential costs' of non compliance with technical standards to the end user is a very complex and subjective process that could imply an infinite value. There is a natural disincentive to technical non compliance as generators do not deliberately place their plant at risk. Costs to end users are best avoided by a strategic system manager that provides the appropriate knowledge to generators who can then take corrective action.

19. How might an infringement notice approach be applied in ensuring compliance with technical standards? Are there other orders which may assist in ensuring compliance with technical standards?

Again this question depends on technical standards that have been agreed and make sense. Having to comply with a technical standard that has not been set correctly leaves a participant in breach regardless of whether this is fair and reasonable to the plant as it was designed.

20. Should NEMMCO be required to consider the commercial incentives or opportunities provided by its actions in managing the impact on power system security of a breach of performance standards?

NEMMCO should not be put in a position where it may compromise its power system security decisions based on a predicted or possible price outcome. There are numerous ways in which the price outcome may not be what is predicted, a rebid in the next 5 minutes can change any prediction. It is unlikely that NEMMCO would have time to

consider all the possible price outcomes that may occur at a time when they are making a system security decision.

However, if an extended direction is to remain in force, NEMMCO's first action to resolve the security issue may not address the market objectives adequately. NEMMCO should review and develop an appropriate constraint through which the market optimisation can be managed for the given situation.

21. Is clause 5.7.3(e) sufficiently clear to allow NEMMCO to use this clause to manage a power system incident?

This clause is related to managing the direction of generating unit under the circumstances where NEMMCO considers that it is not meeting its technical standards. A power system incident can be much broader and more complex than requiring a number of different actions to be taken on a power system to maintain security. NEMMCO have adequate system security powers under Chapter 4.

22. What other alternatives could be considered to address the issue of a participant gaining financially from a breach of its performance standards?

The possible cost to a participant could be as little as the cost of a relay, the potential cost to the community is a system black. A participant is not going to withhold the cost of a relay if it will prevent a problem. The real problem is the identification that a relay (or other component) has failed and this is a knowledge problem. Making a penalty greater reduces the willingness of a generator to share information on suspected problems. The regulator needs to look for preventative co-operative methods and an open sharing information for problem resolution.