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NATIONAL GENERATORS FORUM

GENERATOR PERFORMANCE STANDARDS

COMPLIANCE FRAMEWORK

COMPLIANCE PRINCIPLES

PREPARED BY: **National Generator Forum**

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1 Preamble

The Generator Performance Standards arose out of a process to review the technical standards in the then National Electricity Market (NEM) Code, with the objective of both clarifying and providing greater flexibility in the connection standards to be applied between market participants and Network Service Provider (NSP) assets. With the ability to negotiate standards, there also arose (on the one hand) the requirement to capture the agreed arrangements in a form which would provide certainty for the parties as the Rules evolve, and on the other hand provide key technical parameters to the NSP and NEMMCO enabling them to confidently predict and manage overall power system performance and system security. Inherent in this latter requirement is also the necessity for assurance that the power system will continue to perform as expected.

The introduction of the generator performance standards was an endeavour to quantify actual performance capability levels in accordance with the various technical standards and other technical requirements. The intent of this arrangement was to ensure that NEMMCO was fully informed about plant capability that was less than the automatic standard and was therefore able to take that capability into account when operating the system. The performance standards also provide a set of measurable performance obligations for which generators are accountable for on an ongoing basis. The defined performance standards also form the basis for ongoing compliance assessment by the Australian Energy Regulator (AER).

Some performance standard requirements such as “stability” and other “fixed parameter” type performance deliverables are typically the outcomes of power system design studies for which the NSP and/or NEMMCO would bear most accountability, with the generator’s obligation limited to delivering the defined outcome. This raises a general overarching principle that a generator can only be held accountable for performance against NSP and/or NEMMCO approved parameters, and cannot be held accountable where these parameters are flawed or missing.

The Generator’s primary obligation is to satisfy the requirements of an agreed compliance program to ensure a high level of assurance that the generating unit will perform as required during a system disturbance.

It is impossible to test the generating unit capability against all conceivable combinations of system event outcomes and plant configurations and as such there is a risk of residual issues that may only become evident over time and as a result of actual system events. The Jurisdictions therefore amended the National Electricity Law (NEL) to include a provision requiring the AER and the Court to take into account a generators compliance with its compliance plan in assessing penalties.

This provision in the NEL was to ensure that the compliance obligations of a generator are essentially met where the generator has diligently established and applied an appropriate compliance program**.** This does not remove the generator’s responsibility to provide compliant plant; instead this recognises that even with best endeavours it is impossible to be certain that some residual issues do not exist, and the generator’s liability should be judged on the basis of the diligence with which he has pursued a process to (so far as reasonably practicable) attain a high probability of compliance.

2 Compliance Principles

It is clear from the above discussion that some principles should be adopted to provide a framework within which effective and equitable accountability allocation and compliance management processes can be developed. Listed below are a number of principles which address the issues discussed above and which have the potential to add substantial value in delivering the desired outcomes, i.e. participative ongoing performance improvement and fair and equitable administration.

Principle #1
Where plant system performance may be variable with time, as for example with plant protection, control and alarm (PCA) systems, Generators are accountable for managing the functionality and integrity of systems and settings in accordance with the approved performance standards compliance program.

This would require that the Generator adopts a prudent risk management approach to performing appropriate testing and monitoring of the various controls, alarms and protection systems and that the generator addresses any non-compliance issues as required by the Rules (5.7.3). Implicit in this approach is that where operational performance differs from expectation, the Generator's liability extends only to demonstrating diligence in respect of the compliance program obligations and to rectifying the performance issue identified.

Principle #2
The corollary of the Principle #1 is that where plant parameters are not subject to variability with time, the compliance regime should be restricted to confirmation that the plant does perform as intended with repeat testing when there are reasonable grounds to believe that the plant performance may have changed.

This principle would establish a regime of initial benchmark testing to confirm plant characteristics, followed by repeat testing as necessary. This could arise as a result of plant faults (for example generator rotor faults), plant modifications, and the like. The performance requirements subject to this regime will need to be determined.

Principle #3
The materiality of the issue must be considered when contemplating a compliance testing regime.

This principle flows directly from Principle #1, which adopts essentially a risk-based approach to compliance management. The principal determinants of a risk management program are the probability of an occurrence and the magnitude of its impact (its materiality). Where materiality is very small, this should be reflected in the prudent risk management regime adopted – if one is adopted at all.

For example, the contribution of plant auxiliary power systems to degradation of quality-of-supply standards is generally very small. Hence there is little material impact on the power system resulting from even quite large changes in auxiliary power standards. The compliance regime adopted should reflect this low materiality.

Another aspect is that that the compliance testing may of itself introduce risk. In this case it is essential that the risk benefit accruing from performing the testing is weighed against the risk involved in the testing itself. This issue is explored further in Principle #7.

Principle #4

A generators reasonable use of a compliance programme that is based on the approved template is *prima facie* evidence of technical standards compliance. The template and programme must therefore represent "good electricity industry practice".

Since the registration of the performance standards allows that NEMMCO and network operators to be sure of the scope and capability of the grid, it follows that the compliance programme has a key role in assuring that the generators are able to fulfil their obligations.

At the same time generators need to be assured that by following the compliance programme their plant is compliant and they have *to the extent reasonably possible* fulfilled their obligations under the Rules.

These issues were recognised when the changes to Rule 4.15 were being developed and the Jurisdictions explicitly changed the National Electricity Law so that investigations [proceedings?] into suspected breaches of technical standards are required to recognise the generators use of compliance programmes based on the approved template.
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It therefore follows that the guidelines and template must be capable of being readily and efficiently applied by all generators irrespective of size, technology and location. This requires a flexibility of approach but a clear focus on the intent of the relevant standard and the requirements for reasonable assurance that a plant will deliver the required capability.

The compliance monitoring program itself will then constitute an agreed application of good electricity industry practice and demonstrated implementation of the compliance monitoring program will provide measurable assurance of technical standards capability.

Principle #5

In some instances generators rely on NEMMCO and/ the TNSP to determine power system related equipment settings. A generator must perform and maintain its systems using, or to meet, the required settings and is not liable for a compliance breach that results from using, or meeting, the required settings.

This principle is particularly significant when considering the "system design" related performance areas such as "stability" and "fault ride through" requirements where NEMMCO and/or the TNSP review and approved settings to be applied to excitation and power system stabiliser systems. This is also relevant where power system protection systems settings (in particular) have been determined and approved by the TNSP.

Principle #6
The compliance testing regime must reflect an equitable balance between risk management and the risk created by the test regime itself, and this balance must not significantly disadvantage any of the parties to the regime.

It is fundamental to risk management that the risk management regime must be tailored to the risks to be managed (both in terms of probability of the events contemplated and the materiality of the outcome of the event). In addition, the risk management regime may of itself introduce risks – for example where intrusive testing is required, with the possibility of plant damage from the test itself. The magnitude of this risk must be weighed against the benefits to be accrued and must be considered in developing the compliance regime.

The compliance testing regime should not require a generator to undertake any test that involves unacceptable risk to either staff or plant.

Principle #7
The agreed compliance regime should specify the objectives and outcomes to be achieved by the testing or monitoring, and an appropriate test interval commensurate with the risks to be managed. Within this framework, the generator should exercise diligence and good electrical industry practice to determine the detailed methods and procedures to be employed for the tests.

This recognises that the generator is in the best position to understand its plant and the details of, and the procedures for, those tests which must be performed to satisfy the higher level compliance regime requirements. Further, as test technology evolves with time, the generator must be free to adopt improved methods consistent with good industry practice as it develops from time to time.

Principle #8
Where a performance standard cannot be directly tested the compliance program should include measurable criteria from which performance can be estimated.

This principle accepts that while the generator is responsible for performance standard compliance, there are various aspects of the Standards which are not directly measurable, either with the plant in service or in a reasonable routine test regime.

This issue arises (in part) from a lack of differentiation in the Rules between those plant characteristics which can essentially be defined as design standards and which are essentially immutable once the plant is constructed, and those which may be subject to change with time.

Ultimately this issue is best addressed with a Rule change, however in the meantime it can be recognised in the structure of the compliance programs. A suggested approach is included in categorisation section.

Another issue is the impracticability or even impossibility of testing for all combinations of circumstances and plant conditions which may arise, raising the probability that some issues will not be detected by any reasonable compliance program.

While this does not absolve the generator of responsibility, the test for liability must be the degree to which the generator exercised reasonable endeavours to ensure that its plant performs to the Standards in accordance with good electricity industry practice.

A reasonable approach is for generators to propose measurable criteria, which may be determined from plant performance modelling, from which an estimate of plant performance (within a given tolerance) can be derived.

Principle #9
Compliance programs should be reviewed and updated periodically

This is primarily to ensure that the compliance program remains effective in ensuring delivery of the required plant performance.

This review should occur at two levels – at the compliance template level (what should be monitored and to what standard) and also at the test level (how the plant is tested to ensure compliance).

3 Categorisation of Performance Standards

Schedules S5.2.5 to S5.2.8 contain most of the technical requirements with which the Generator is required to comply and which are intended to deliver the outcomes as per the overall system design. These technical standards have become the basis for performance standards which cover a range of generating unit capability and functionality. For convenience and further deliberation on accountability and compliance program development, these have been grouped as shown in Table 1 below:

Table 1: Performance standards by category

CATEGORY A	
GROUP 1: SECURE OPERATION OF THE POWER SYSTEM	
Clause	**Requirement**
S5.2.5.3	Generating Unit Response to Frequency Disturbances
S5.2.5.4	Generating Unit Response to Voltage Disturbances
S5.2.5.5	Generating Unit response to disturbances following contingency events
S5.2.5.7	Partial Load Rejection
S5.2.5.8	Protection of Generating Units from Power System Disturbances
S5.2.5.9	Protection Systems that impact on Power System Security
S5.2.5.10	Protection to trip plant for unstable operation
GROUP 2: SUPPLY OF SYSTEM SERVICES	
Clause	**Requirement**
S5.2.5.1	Reactive Power Capability
S5.2.5.11	Frequency Control
S5.2.5.14	Active Power Control
GROUP 3: COMPATIBILITY WITH MARKET PROCESSES	
Clause	**Requirement**
S5.2.6.1	Remote Monitoring
S5.2.6.2	Communications Equipment
CATEGORY B	
GROUP 4: COMPATIBILITY WITH THE EXISTING POWER SYSTEM	
Clause	**Requirement**
S5.2.5.12	Impact on network capability
S5.2.5.13	Voltage and Reactive Power Control
S5.2.8	Fault current contribution
GROUP 5: QUALITY OF SUPPLY	
Clause	**Requirement**
S5.2.5.2	Quality of Electricity Generated
S5.2.7	Power Station Auxiliary Supplies

4 Performance Standards Categories

In developing the most appropriate approach to compliance and compliance obligations and accountability, there appears to be merit in categorising the performance standards and within these categories determine the extent of the Generators obligations in respect of performance relative to the expectations of the performance standards. It is suggested that this thinking should then flow through to a review of the performance standards such that there will be greater clarity in terms of actual performance expectations, i.e. qualifications such as "to the extent", "subject to", "in accordance with", i.e. clarity in respect of the extent to which the Generator can give account for the actual "performance".

4.1 Category A Performance Standards

Category "A" performance standards are those where performance outcomes could be affected by the Generator over time due to issues that could include :

1. Genuine poor performance of equipment relative to design expectations
2. Degradation of components due to natural ageing that impact on dynamic performance characteristics (especially true of analogue circuitry)
3. General wear and tear associated with mechanical and hydraulic systems (eg mechanical AVR's or governor systems);
4. Human error, adjustments, unapproved changes
5. Equipment malfunction

4.2 Category B performance Standards

A second category of performance standards is those that could typically be described as follows:

(a) Relate to performance characteristics which have a low probability of changing over time without some type of significant modification or initiating event, e.g.: machine strip down, major local fault exposing generator to extreme short circuit forces etc

(b) Relate to fixed design characteristics already adequately addressed as part of the formal NER connection agreement process, e.g. minimum SCR, impact of inertia constant etc

(c) Could be described as transmission system design issues where the Generator is only involved during the connection process in respect of validating machine data.

4.3 Compliance Programs

With this distinction made between the Category A and Category B performance standards, there also must be a distinction made between the compliance programs applicable to each of the groups.

Category A would require ongoing compliance monitoring or testing to give reasonable assurance that the plant or system does perform as required and to gain reasonable confidence that it will continue to do so until the next test.

On the other hand, Category B will typically require verification that the plant characteristics are as intended (benchmark testing) or when there is some reasonable reason to believe that the parameter may have changed (for example as a result of a plant upgrade or component replacement).