

## Questions taken on notice at the Generator Performance Standards Industry Workshop – 26 June 2019

The table below outlines the questions that were taken on notice at the Power and Water industry workshop held on 26 June 2019. Responses have been provided to assist stakeholders in their consideration of the proposed Generator Performance Standard code amendments.

Category	Stakeholder Question / Comment	PWC Response
Reactive Power	The testing to demonstrate reactive power capability will be difficult to achieve on-line.	We agree that this will be challenging at times as testing requirements to demonstrate this capability need to fit around the system conditions to accommodate impacts including the reactive power swings on the system. This testing has been conducted in the past by including system requirements into the test plans and system risk notifications issued to highlight operational constraints around testing.
Reactive Power	Is a generator expected to be capable of absorbing or supplying reactive power when operating at maximum active power?	A generating system is expected to be capable of absorbing or supplying reactive power under all normal operating conditions. More specifically, as per NTC 3.3.5.1 the generating system must be capable of absorbing or supplying reactive power at minimum or maximum active power output for the full range of the normal voltage range (+/- 0.1 p.u.) at the connection point.  Note that there are also dynamic reactive current support requirements under the low/high voltage conditions in addition to the above steady state requirements that are outlined in NTC 3.3.5.5.
Capacity Forecasting	How will capacity forecasting at the connection point work for behind the meter large PV that is coupled with variable load? (i.e. vs just for the PV generator). This forces the customer to forecast the load as well.	The automatic access standard is for a capacity forecast from a generating system. The definition of a generating system (NTC glossary - page 182) is  “A system comprising of one or more <i>Generation Units</i> and that includes auxiliary or <i>reactive plant</i> that is located on the <i>Generator’s</i> side of the <i>connection point</i> and is necessary for the <i>Generating System</i> to meet its <i>performance standards</i> ”.  By definition, unless the load behind the connection point is factored into the generating systems capability, it is not part of the forecast.  Some examples below: <ul style="list-style-type: none"> <li>It is expected that a battery that forms part of the generating system would operate coupled with the generating units to provide a generating system forecast (capacity is always equal to or greater than zero). If there is a requirement to</li> </ul>



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		<p>charge the battery while the generating units are not producing, arrangements to manage this operation of the generating system would need to be coordinated as a load connection.</p> <ul style="list-style-type: none"> <li>• A generating system connecting within the same connection point as a load would not be required to factor in the load if the system does not use the load to achieve any of the performance standards. It may choose to do so, but this would be a negotiated access standard that would not necessarily align directly with the automatic access standard.</li> </ul>
Capacity Forecasting	Why is the offer for capacity separated from the price offer? (i.e. normally included in a single offer in the NEM)	<p>The physical capacity forecast is a capability required to enable connection in order to facilitate secure dispatch in the regulated systems. It is not a market operation mechanism.</p> <p>We highlight that under the existing I-NTEM arrangements, offers at up to a 30 minutely resolution can be provided prior to gate closure the day before.</p> <p>Should the price/quantity provided in an offer sheet have a LOWER quantity than that provided in the capacity forecasts, we would dispatch to the lower quantity provided in the Offer Sheet.</p> <p>Should a market be developed that requires information in this format, it will be an operational requirement rather than a connection requirement.</p>
Capacity Forecasting	Will there be any codified obligations on System Control on requirements for demand forecasts in dispatch timeframes? (i.e. that includes embedded PV)	<p>Power and Water do not propose to codify such obligations in this round of changes which are focused on generator performance requirements for connection.</p> <p>However, rule changes or procedures with these requirements may be appropriate for market reform. Specific proposals for rule changes may be made to PWC or the UC.</p> <p>Separate to the code requirements, Power and Water is investigating options to provide further demand information to system participants.</p>
Capacity Forecasting	Are others (outside the NT) looking at a model of capacity forecasting or is the NT doing something different?	As per David Swift's response at the workshop, internationally there are moves to focus on active power management in order to manage system frequency. We note that some PV generators in the NEM that are now self-forecasting on an energy basis.

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		The specific requirements in the NT take into account the nature of the NT industry, and also the current developments regarding the NTEM and system technical requirements more broadly.
Capacity Forecasting	Were other factors that could arise in a real PV installation (other than pure insolation accuracy modelling) taken into account?	Our technical verifier Entura, advised that other variables were assessed, but were not considered material to the accuracy impact, when compared to the variations in cloud event variability. Note that in any case, these other variables would have to be accommodated by the generator in any forecast issued to ensure it meets the accuracy requirement
Capacity Forecasting	What systems are going to be used to provide capacity forecast data to the System Controller?	The 24hr hour ahead 5 minute rolling forecasts are to be provided via SCADA. The 7 day ahead and 30 day ahead forecasts are to be provided via email.
Capacity Forecasting	How will time synchronisation of these systems work?	Time synchronisation remains the responsibility of the generator. If required by the connecting party, System Control and the Network Operator will assist in any System Control SCADA side interactions required (handshakes etc) to ensure facilities are synchronised.
Capacity Forecasting	What about meeting this requirement across multiple sources rather than the connection point?	Yes this may be possible. As per the NTC 3.3.5 there is the provision to propose a negotiated access standard. This clause provides flexibility for connection applicants to explore innovative solutions as long as the principles outlined in NTC 3.3.5 are followed.
Capacity Forecasting	Do I need to have a firming contract to meet the capacity forecasting obligation?	No. There are many ways of achieving the capacity forecasting obligation and the firming contract arrangements would have to be negotiated under 3.3.5. It is expected that for solar PV, there are a number of ways forecasting requirements could be achieved: <ul style="list-style-type: none"> <li>• Derating insolation forecasts to provide a capacity forecast</li> <li>• Co-located storage and/or insolation forecasting: <ul style="list-style-type: none"> <li>○ AC/DC coupled</li> <li>○ E.g. Batteries or flywheel/supercapacitor</li> </ul> </li> <li>• Commercial out of market balancing arrangement via negotiation under 3.3.5, which requires meeting considerations such as (not an exhaustive list): <ul style="list-style-type: none"> <li>○ Network augmentation impacts</li> <li>○ Generator control arrangements</li> </ul> </li> </ul>

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		<ul style="list-style-type: none"> <li>○ Separation of balancing plant</li> <li>○ Capability reserved for balancing services cannot be double counted towards ancillary service contributions.</li> <li>○ Connecting generator retains full responsibility for this connection requirement.</li> </ul>
Capacity Forecasting	What happens if multiple generators don't comply (i.e. to force a review of the standard)	<p>We will be closely monitoring the compliance to the proposed standard and will review if there are any further changes needed as more experience is gained and the aggregate level of PV penetration increases.</p> <p>Operationally, the approach to manage inaccurate forecasts may require derating the forecast (constraint). Where derating is applied it will be done with the objective of seeing the accuracy target to be achieved, and is not intended to be applied punitively.</p> <p>In the future, there may be market reforms that could develop a causer pays mechanism to place the cost of additional ancillary services held to accommodate the inaccuracy on the causing generator. Even if market arrangements are developed, it should be noted that a balance of physical constraint and cost allocation may be required.</p>
Capacity Forecasting	Are the standard capacity forecasts for the week and month ahead still considered capacity forecasts or should they be referred to as energy forecasts?	The reference to a 'daily capacity forecast' for the month ahead forecast in the SCTC requires a wording adjustment to reflect the time variant capacity of a solar site over a period of 24 hours. This will be rectified in the final amendments. These forecasts when amended will not include any accuracy requirements.
Capacity Forecasting	How will SPRINT capacity offers be managed in dispatch?	<p>SPRINT is a particular instance of the use of water injection to increase power output from gas turbines. It is typically only used for short periods. Offers to move to operating turbines in this mode would be required to provide an additional forecast as they are an incrementally dispatched quantity of capacity.</p> <p>Any additional capacity that requires additional plant online (such as evaporative cooling, or SPRINT) would be subject to additional forecast offer requirements.</p>
System strength	NT NER is not picking up NER system strength clauses 5.20 so how is system strength going to be addressed?	The proposed GPS is including the NER system strength assessment clauses that are included in the connection process and incorporated as NTC 3.3.5.16. to assess the impact a new generator has on the power system consistent with the NEM process.

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		<p>Although NER 5.20 is not being picked up in the 1 July Package, we understand the NER transition is continuing and these provisions are likely to be considered for adoption in the future.</p>
C-FCAS	<p>The definition of inertia in the Codes appears to exclude synthetic inertia that can respond to RoCoF in sub cycle timeframes.</p>	<p>By nature of the system responding to RoCoF, rather than resisting the frequency change and setting the RoCoF “synthetic inertia” provides a subtly different service from inertia from synchronous sources. However, the NTC clause 3.3.5.15 (a) (2) provides room for ‘synthetic’ or ‘emulated’ inertia to be considered:  <i>“Inertia offered or provided from non-synchronous (emulated) sources needs to be assessed and accepted by the Power System Controller and Network Operator”</i></p>
C-FCAS	<p>Is droop response going to apply to both the battery and the PV?</p>	<p>The frequency response capability as provided by the set of equipment considered a generating system must be able to deliver C-FCAS subject to energy availability (as determined by the ‘Firm offer’ in forecasting 3.3.5.17). How this is delivered would be subject to the specific applicant’s plant design.</p> <p>For example: a DC coupled solar PV and battery combination may operate the inverter(s) in droop frequency control. It may require a dynamic limit (that applies to frequency droop) on the active power output that aligns with the firm capacity offer to ensure it can achieve the forecasting requirements by not draining the battery when delivering C-FCAS raise.</p>
Active Power	<p>No good reason has been provided to exclude the adoption of the semi scheduled generator clause from the NER S5.2.5.14 for active power control. Strongly suggest including to enable conversation about outcomes to happen.</p>	<p>The proposed NTC 3.3.5.14 Active Power Control only contains the automatic standard, which requires a generator to operate in a scheduled manner.</p> <p>This feature is a complementary clause to Capacity Forecasting with the intent to address the necessity of firming energy supply. Placing the obligation on the generator with the provision of NTC 3.3.5 provides both a financial incentive and a mechanism to enable a generator to find the most efficient solution to achieve the equivalent outcome.</p> <p>We do not agree with incorporating the NER S5.2.5 (a) (2) and (3) as this would incorrectly give the impression that a non-firm semi scheduled generator would meet the automatic access standard.</p> <p>Should technology advancements or NTEM arrangements significantly impact the technical requirements of the system in the future, then PWC would consider revising this</p>

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		requirement, but under the current operating arrangements, PWC believe this is not technically feasible.'
Active Power	Will large loads be required to be scheduled (ie follow a dispatch target?	Management of loads are not part of the generator performance standards. However, if loads are significant to the extent that they can impact ancillary service management, they require operational protocols by the power system controller to obtain a level of predictability to ensure appropriate reserves can be scheduled online. This is an existing requirement.
Connection Classification	Will the GPS apply to a standalone battery?	If the battery discharges at a rate of over 2MW, the GPS will automatically apply. If the battery discharges at a rate of less than 2MW, PWC will assess on a case by case basis in advising its technical requirements given the potential impacts at different locations in the three regulated power systems.
Connection Classification	How will a battery be registered?	A standalone battery is capable of exporting power and is not automatically exempted under the generator licensing exemption provided by the UC regarding renewable energy primarily for onsite use. Thus it would need to be subject to an application for a generator license (or exemption) with the UC. As a generator, the battery would also need to comply with market registration requirements.
Materiality threshold	How will GPS deal with larger behind the meter PV – given the current classes of PV listed on PWC’s website? e.g. if there is no export ?	The GPS will automatically apply to a “behind the meter” generator or embedded generator larger than the 2MW materiality threshold regardless of whether it is exporting at the connection point or not (refer NTC 3.3.1 (b)). The reason for this is that the effects on the power system are the same as if it was connected as a standalone generator. For generators below 2MW, PWC will advise its technical requirements on a case by case basis in terms of part or all of the GPS subject to the potential impact on the power system at the location of connection.
Grandfathering	Does grandfathering apply to forecasting?	The grandfathering process for generators connected prior to 1 April 2019 will apply as per proposed NTC 12.2. However it is noted that for many generators, real time generator maximum capacities are currently provided via SCADA. Furthermore, existing synchronous generators are required to provide the System Controller with base maximum capacities, which are capacity values that are achievable any time of the year under worst ambient conditions.



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Grandfathering	What should parties between 1 April 2019 and code approval do?	<p>The proposed grandfathering conditions have all generators connecting after 1 April 2019 obligated to meet the generator performance requirements if approved by the UC. We suggest that affected generators individually discuss their projects with us to determine a pathway forward to manage the regulatory risk.</p>
Consultation	4 weeks for consultation is too short given it took PWC 12 weeks to respond after last consultation round closed.	<p>PWC has balanced the varying preferences of stakeholders, including those that seek to have a longer consultation window, and those that would prefer the process finalised as soon as possible to provide certainty.</p> <p>As stakeholders would see by our response paper to the round 1 consultation, there were a significant number of issues that were raised (approximately 200) that required due consideration. As a result we have identified the key issues which were confirmed by stakeholders at our 26 June workshop and provided further detailed information and discussion at the workshop.</p> <p>We are of the view that as a result of this the 4 week window for submissions on a much narrower set of issues is an appropriate timeframe.</p>