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Response to Round Two: Review of the Generator Performance Standards and Network Technical Code

Northern Territory Solar Futures Developments Limited (NTSFDL) welcomes the opportunity to provide further comment on the proposed changes to the Generator Performance Standards (GPS) for the Northern Territory. NSTFDL are proposing a 50MW Livingstone Solar Farm near Berry Springs and has other renewable projects in the pipeline. Our input is therefore from the perspective of a Renewable Energy Developer.

The NT government is committed to a target of 50% renewable energy (RE) by 2030. Our input is therefore also based on achieving this target. Our constructive input on the GPS and the Norther Territory Electricity Market (NTEM) is provided below (collectively referred to as the Codes). This input is additional to feedback previously provided to the Market Operator and Utilities Commission, however where it is felt by NTSFDL that a previous issue raised has not been adequately addressed, it is raised again.

General comments – Least cost for NT electricity consumers

Whist the NT government is committed to a 50% RE target by energy, its focus is also on secure, reliable and least-cost energy supply for Territorians. In our view several of the proposed changes such as the removal of the semi-scheduled generator classification from the Network Technical Code, the proposed Capacity Forecasting regime, the exclusion of synthetic inertia, etc (as commented on below) do not supporting a renewable future at least cost. Alternatives are provided below.

General comment - Strategic System Planning

This was commented on previously but not addressed in the GPS Review and Consultation process. This is critical to achieving a renewable future at least cost and should be considered. It is noted that AEMO are now tasked with producing an Integrated System Plan[1] and a similar whole of system planning process is underway in WA[2].

The proposed Codes have been written, in our view for 2030 and beyond with such measures as making all generators scheduled and the proposed Capacity Forecasting Mechanism. Whilst it is admirable of Power and Water Corporation (PWC) to be forward looking, this approach will put unnecessary cost and risk impediments in the way of any progress in the near term (5 years). As PWC recognise, there are a number of large solar generators who have signed Connection Agreements that require certainty as to the technical requirements of connection now. There are also several large solar generators with connection

[1] https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Integrated-System-Plan
[2] https://www.treasury.wa.gov.au/Energy-Transformation/Whole-of-System-Planning/

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applications currently being processed. The focus should be providing least cost options for these new generators to connect safely, securely and with reliability.

In the years ahead as RE and enabling technologies such as solar forecasting and control battery storage continue to develop and improve, the Codes may be reviewed and updated at the appropriate time with contemporary information. This also allows the NT to benefit from experience in other jurisdictions, as they also increase their RE penetration. The current Code reviews would put the NT at a technologically theoretical position, well in advance of the proven approaches of other jurisdictions including the NEM and WEM. NTSFDL understands the drivers for the approach to the current Code drafts, insofar as it attempts to limit the risk, cost, obligation and capability requirements placed on PWC. However, the consequence is the NT will be pioneering a unique and technically questionable approach, contrary to the approach of large power systems globally. There is no current precedent for the proposed approach and creates a risk that the electricity system costs in the NT are higher and with lower renewables penetration. The unique and potentially onerous requirements in the Codes are also likely to be an impediment to investors and financiers to fund RE projects. NTSF would strongly encourage PWC to design a code for the near future and schedule in further updates over time, providing certainty for the industry and investors (noting the requirement in the Codes for a review no greater than 5 years).

General comment – lack of DKIS system model

PWC are currently developing a static and dynamic model of the DKIS system which is anticipated to be completed by the end of 2019. This is long overdue for PWC to be able to model and operate the system efficiently. Without such a model, it is not possible to look in detail at potential network, generation and load scenarios for what the system will look like in the future. Once a model is available then these future scenarios can be modelled, such as to assess the effect increasing penetration of large-scale Solar PV, and how best to deal with this increase. Without such engineering modelling evidence, it is very difficult to plan for the future and set the Codes appropriately. This is further weight to set the Codes for the near term and to further develop the Codes in the future based on engineering and modelling evidence.

General comment – Codes and NTEM integration

It was clear from attending the June workshops for both the NTEM and GPS reviews, that there was a general lack of co-ordination between these two important and related areas. Whilst it is challenging, ultimately these two work streams need to come together to create a coherent NT electricity industry. NTSF would strongly encourage co-operation between these two work streams to ensure that this occurs.

System Control Technical Code V5 (SCTC)

Maximising Renewable Energy

Clause 1.7.4 – Obligations of the Power System Controller

This comment was provided previously and is essential to achieving a renewable future at least cost with the inclusion of a semi-scheduled generator classification. System Control will play a key role in achieving the 50% RE target by 2030, and there needs to be obligations within the SCTC.

Clause 1.7.2 - Obligations of the Network Operator

Similar to the above argument and as previously made, there needs to be an obligation to maximise RE in the SCTC.

Clause 3.2.3 Generation components of the power system

The semi-scheduled generator classification retention in the SCTC is welcomed. But given that semi-scheduled generator classification is proposed to be removed from the Network Technical Code, no new large generators will be able to be classified as semi-scheduled. This is further commented on below.

Clause 3.11 Forecasts

Forecasting requirements for generators appear in both the SCTC and NTC, and there are proposed requirements under the NTEM as well. In general, the generator forecasting requirements should be stated in either the NTC or SCTC. Preference would be in the SCTC, as these requirements relate to operation of a generator and not its technical capability. Further comments are provided below on Capacity Forecasting in the NTC.

4.3 Dispatch

As commented previously, within the principles and criteria for dispatch, System Control needs to include the maximising of renewable energy contribution, consistent with the comments at Clause 1.7.4. Without this undertaking, the tendency of System Control will be to focus on system security and reliability to the detriment of renewable energy. It is recognised that this is a paradigm shift but it needs to happen to support a renewable energy future. This criterion should be listed as (2) behind System Security given the Government's commitment to a 50% renewable energy target by 2030.

Network Technical Code (NTC) V4, December 2018

General - Semi-scheduled and Non-scheduled generator classifications

As commented previously, non-scheduled and semi-scheduled are not included in the Code. This places a significant technical and cost burden on intermittent renewable energy to meet the Code. This makes the NT market more onerous than the NEM and WEM and will stifle investment in the NT. This also makes for inconsistencies between the NTC and SCTC where semi-scheduled and non-scheduled generators are still present in the SCTC.

The semi-scheduled generator classification must be retained to facilitate intermittent renewable energy generation. Definition of semi-scheduled should be similar to the NEM and/or the WEM (intermittent generator). Proposed removal of this classification places an unnecessary cost burden on new intermittent generators entering the market. In both the National Electricity Market (NEM) and the Wholesale Electricity Market (WA) (WEM) there are semi-scheduled and non-scheduled classifications that work well to enable intermittent generation. The removal of the semi-scheduled generator classification will make the NT unattractive for investment due to complexity and cost. This is consistent with the Roadmap to Renewables, which suggested that solar generators move towards dispatchability based on market signals (and not have this forced upon them now by the NTC).

The real power balancing requirement for intermittent generation is more efficiently and economically provided centrally at a system level (and therefore provided as a market ancillary service), once the aggregate output of all various intermittent RE generators and variable loads are considered. Spatial diversity of solar farms in the future stretching from Darwin to Katherine will mean that the effects of cloud events will be reduced. System control have historically managed and optimised the network, and the same would the case in the future with intermittent generation. System Control are best placed to manage this risk on behalf of all generators and loads. Placing all the onus onto generators will lead to high cost RE generation and considerable over-build in capacity vs central provision of solutions.

The Entura analysis suggested that solar generators with batteries behind DC—DC converters would be the least cost solutions. At present in the market, NTSFDL is aware of only two OEMs providing reasonable size (500-600kW) DC-DC converters suitable for this purpose. Its deployment in the Australian market is relatively new and therefore scarce.

The suggestion by Entura that batteries installed centrally are a higher cost option is false in NTSFDL's view based on our consultation with industry. The Entura analysis only looked at batteries to provide a forecasting service, but central battery inverters can provide a range of grid services including fast frequency response (R-FCAS, C-FACS), reactive power provision, synthetic inertia, real and reactive fault contribution, voltage support, etc. Once all these services are considered, a central battery solution would be the least cost option.

The services from a central solution also has the benefit that their location can be determined by System Control to most benefit the system. This will provide flexibility to System Control to manage the system.

In the future market ancillary services will be competitive under the NTEM and therefore the least cost provision of these services should prevail, whilst still providing for a secure and reliable DKIS. There will be commercial drivers for T-Gen and/or the private sector to invest in battery solutions as standalone ancillary service provision.

General – Battery classification

There is no storage classification under the Code (including batteries). Battery storage systems operate as both a generator and a load. Battery storage systems may be standalone or coupled with other forms of generation (e.g. solar). Battery classification is being considered in the NER, and similarly should also be considered in the NTC (see below). There are a number of lessons learnt on the NEM with large scale standalone and hybrid battery storage coming online within the last 2 years.

AEMO workstream here: https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Initiatives/Emerging-Generation-and-Energy-Storage-in-the-NEM---Grid-Scale

3.3.5.17 Capacity Forecast

The proposed capacity forecasting regime whilst feasible, is onerous on intermittent renewable energy generators. The probability of exceedance values is high and will lead to significant under forecasting of actual renewable production, at times, in order to comply. Also, the consequences of not complying are high with the curtailment regime proposed (3.3.5.17 (e)) where the quantum and time are not determinate (open to full System Control discretion). There is also no precedence for such a capacity forecasting regime anywhere in the World (as far as we are aware) and hence there is no operational experience to draw upon. Hence investors will see this as high risk and want greater returns on their investment. This would

lead to unacceptable investor return and/or higher energy prices to be able to realise a commercial return on solar farms.

The comment that System Control will tune this over time at the consultation workshop of 26/6/19 is appreciated but this does not provide investor certainty, which is needed in a new and establishing RE market in the NT.

There are also concerns with how the proposed arrangement will work in practice such as dynamic ramp rates (set by System Control) which could mean, at minimum 5% ramp rates proposed, that 5-minute dispatch levels may never be reached.

Rather than the above arrangement our strong preference would be for a NEM type arrangement, where System Control takes overall responsibility for solar (and wind) day ahead and 12-hour forecasting for individual generators. Intermittent generators remain responsible for availability forecasting. System Control is best placed to provide this service, particularly when it needs to manage the system with substantial distributed 'roof top' uncontrolled solar. Adding additional discrete renewable energy generator locations into that forecast would be relatively simple. In combination with System Control forecast, individual renewable energy generators could provide 15 minute ahead 1-minute forecasts from onsite solar forecasting systems to fine tune the System Control forecast.

In the NEM, Market Participant 5 min Self-Forecasts were introduced in 2018 and are currently optional. However, given the benefits of solar forecasting, we would consider this a mandatory requirement for better management of the system. Solar forecasting systems are relatively new for commercial solar farms and are reasonably accurate up to 15 minutes (depending on the cloud speed) with decreasing accuracy thereafter. We propose 1-minute forecasts for the next 5-minutes to be provided on a 50% and 90% exceedance basis. This would provide System Control with significant confidence by comparing the 50% and 90% values to manage the power system.

Note: There is no similar requirement for 'large' customers to forecast their load demand on the system. This will become increasingly important (with increasing intermittent generation) for System Control to manage the whole system. Whilst not directly relevant, this should be further considered.

General - Connection Point

NTSFDL appreciates in the latest Code review that there will be flexibility to provide different services at different connection points (where reasonable) for a generator. This will lead to innovative solutions to meet the connection requirements at least cost.

Clause 3.3.5.1 – Reactive Power Capability

NTSFDL appreciates in the latest Code review the alignment with NEM requirements for reactive power. This is a positive move for new generators. It is noted that a negotiated access standard may be lower than the automatic access standard, which NSTFDL welcomes.

Clause 3.3.5.14 – Active Power Control

These comments were made previously but have not been addressed and is important to new generators. Ramp rates should be set on a MW basis or % of name plate rating per minute basis for semi-scheduled

and/or non-scheduled generation. The present minimum ramp rate of 5% per minute is onerous for intermittent renewable energy generation. Minimum ramp rates will be taken into account when determining the solar farm yield and hence will increase energy prices or decrease financial viability. More appropriate minimum ramp rates should be specified. For example, in WA the requirement is 10MW or 15% of name plate per minute whichever is greater, for non-scheduled generation (e.g. renewables), "except when more rapid changes are necessary due to the strength of the energy source moving outside the power station's design range". This is a more reasonable basis that considers system security whilst recognising the energy source and not unnecessarily restricting generator output. In addition, the actual minimum ramp rate should be assessed by system studies and may be above the minimum stated.

It is understood System Control would like to apply dynamic ramp rates provided by the 'dispatch engine' in the future. In concept, NTSFDL would be fine with this, provided the dynamic ramp rates are above the minimum specified on the NTC or Access Agreement and contingent upon the System Controller being required to maximise renewable energy (as per previous comments).

Active Power Control compliance is currently a grey area and it should be specified that compliance will be reasonably assessed on a per minute basis (provided a generator on average complies with the per minute ramp rate, then they are considered to comply). At present the criteria is not clear and this can lead to disputes over breaches in the future. It also influences how generators setup their control systems to achieve the ramp rates specified, and hence will affect the predicted solar farm yield and electricity cost.

Attachment 1 Glossary of Terms - Inertia

The inertia definitions are restricted to electro-magnetically coupled equipment. These narrow definitions exclude Synthetic Inertia (also known as Virtual or Digital Inertia). The definition should be expanded to include equivalent system services that can be provided by synthetic inertia such as battery inverters. This service has been available and provided by battery inverters for several years now.

Presentations such as this provide great examples and analysis of what synthetic inertia can provide:

http://s2.q4cdn.com/601666628/files/doc_presentations/2017/Everoze-Batteries-Beyond-the-Spin.pdf

Closer to home, another example is the Alinta Energy's 178MW / 220kV Newman Power System, where a 35MW BESS was commissioned in 2018, with one of the key services being to provide synthetic inertia to the system. Dr Gary Bryant from Alinta Energy has been quoted as saying, "There is no real difference when compared to mechanical (rotating mass) systems" and "Until now, the conventional thinking had been that electrical networks needed thermal generators to be online and operating to provide the required inertia to support the network. Thanks to this significant milestone in electrical engineering, that is no longer the case."[3] Further information is contained in the attached presentation on Alinta's experience with synthetic inertia as well as the how the 35MW BESS has performed more generally in a similar size system to the DKIS.

The inclusion of synthetic inertia into the code will enable new generators to meet the grid code requirements more cost effectively.

Attachment 5 – Test Schedule

[3] https://www.energycentral.com/c/iu/alinta-deploys-australias-largest-industrial-lithium-ion-bess

The response to our previous comment is noted regarding the inclusions of a test schedule for inverter coupled solar generation is not justified and the onus is on generators to provide is noted. Our experience in other jurisdictions is that the negotiation of test schedules can be a drawn-out process. It would be far better to have a starting point in the Code to reduce risk and costs to generators. Addressing this issue will remove uncertainty and make it more attractive to investors.

A6.4 Preliminary assessment of Access Application by the Network Operator and A6.6 Access Agreement

The move to NER Chapter 5 and 5A processes is welcomed, and will provide more certainty on time frames for assessment of connection applications.

Yours sincerely,

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Director