eni australia

PO Box 6862 East Perth Western Australia 6892
Eni House, 226 Adelaide Terrace Perth WA 6000
Tel: +61 8 9320 1111 Fax: +61 8 9320 1100

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via email: market.operator@powerwater.com.au

Generator Forecasting Compliance Procedure
Consultation Submission

Eni Australia Ltd (EAL) makes this submission to Power and Water Corporation (PWC) in response to the consultation process for the draft Generator Forecasting Compliance Procedure (GFCP) document published on 16th April 2020. This forms part of PWC's requirements under clause 3.3.5.17(f) of the new Network Technical Code (NTC).

The Eni group has been present in Australia through its subsidiaries since year 2000. Eni Australia BV is the operator and 100% owner of the Blacktip Gas Project which has supplied domestic gas to the NT since 2009. In January 2019, Eni Australia Limited (EAL) completed the acquisition of a construction-ready solar photovoltaic (PV) project near Katherine, from Katherine Solar Pty Ltd, a joint venture between Australia's Epuron and the UK-based Island Green Power. In October 2019, EAL completed the acquisition of two further construction-ready solar photovoltaic (PV) projects at Batchelor and Manton Dam, from NT Solar Investments Pty Ltd, a wholly owned subsidiary of Australia's Tetris Energy. These projects are currently under construction.

1. Background

- EAL notes that many of the points made in these submissions were previously made in its submissions to the NT Utilities Commission (UC) in response to the draft GPS dated 29 January 2020. EAL would also like to confirm its position that it firmly remains of the view that the forecasting provisions of the new NTC are onerous and will cause significant detriment to new renewable generators such as EAL and will, in practice, work contrary to the publically stated NT renewable energy targets.
- Despite EAL's prior submissions on the same topic, the issues EAL has raised have not been addressed in the final GPS nor in the draft GFCP and no response has been provided by either PWC or the UC, despite the very high cost these provisions impose on new generators such as EAL.
- EAL remains disappointed by the lack of grandfathering for existing investment decisions and the lack of adequate justification as to how grandfathering would have impacted power system reliability.
- EAL's likely cost of compliance with NTC Clause 3.3.5.17 is in excess of AUD25 million, due to the potential 100% curtailment inherent in these provisions, in contrast to the maximum 80% curtailment previously advised in the Final Decision of the Utilities Commission (end page 76).

- In the entire consultation process with respect to the GPS and again with the draft GFCP, PWC has lacked transparency on technical studies, models and algorithms to support its claims of impaired system security or reliability from variable solar farm output. It has also lacked transparency with respect to any potential conflicts of interest regarding benefits it receives from gas sales by curtailing renewable electricity generation.
- The draft GFCP has failed to take into account the recent announcement by the NT government of the installation of a centralised battery in Darwin, which would be able to manage aggregated solar variability from existing projects on its own, if utilised correctly.

2. Response to draft GFCP

EAL has a number of significant concerns with the operation of NTC Clause 3.3.5.17 and the draft GFCP, as set out below.

(a) Indirect Technology Discrimination

The draft GFCP describes two potential types of non-compliance, with vastly different implications for generators, as follows:

- *Type 1 non-compliance – Asset Failure*: this is the failure mode that will most often apply to conventional generators and results in an accelerated return to service with no ongoing curtailment obligations, regardless of how often it occurs or how big the impact on the power system at the time.
- *Type 2 non-compliance – Forecasting Algorithm Failure*: while not specifically stated, practically this type of failure can only apply to solar farms and results in a lengthy return to service process with very significant discretion from PWC as to the acceptability of different forecasting algorithm changes, which gives no clarity for making investment decisions.

The provisions appear to have been specifically designed to be particularly onerous for solar farms to achieve (at PWC's complete discretion), while having no impact on conventional generators. No justification has been provided for this distinction, either within or outside of the draft GFCP. The potential impact on the power system appears to be much more moderate for a Type 2 non-compliance than the complete trip that typically occurs in a Type 1 non-compliance.

Quantum of forecast error

Under this proposal, a 25 MW conventional generator can potentially trip every day, or multiple times per day, from full load, without ongoing curtailment. However EAL's 25 MW Katherine solar farm must not vary from its forecast by more than 1 MW or it will suffer ongoing curtailment and a very lengthy return to service process to relieve constraints if PWC accept any changes to forecasting algorithms, which it is under no obligation to do. In EAL's experience with similar issues, this is likely to take months, at a minimum, as it is not time constrained on PWC's behalf and it is not clear what generators need to do in order for a forecasting algorithm to be approved.

This procedure has the effect of allowing conventional generators to call on C-FCAS to accommodate the impact of their trips but not solar generators. Technical studies have never been provided to justify why solar generators are not able to do this for their forecast errors. A properly conducted unserved energy analysis would quantify this impact and also quantify the level of aggregated battery capacity required for greater solar production to have no

impact on power system security and reliability in the DKIS. However, this has still not been provided by PWC as at the date of this submission. It is highly unusual for changes of this nature to have been approved in a regulated electricity market in the absence of such studies.

Frequency of forecast error

In previous consultations, as referenced at the bottom of page 79 of the UC Final Decision, PWC argued these provisions are required because existing generators on the power system are very unreliable (tripping approximately 100 times per year). However, these provisions do nothing to ameliorate this unreliability and prevent it occurring in future, as they just maintain the current treatment of forced outages from conventional generators. So there is no requirement or incentive for either existing or new conventional generators to improve either their own reliability or overall power system security. In light of the curtailment or battery costs that will be experienced by solar generators such as EAL, this is unacceptable.

Under the draft GFCP, conventional generators are able to frequently completely trip and still be compliant with NTC Clause 3.3.5.17, and therefore return to service promptly with no ongoing curtailment. This is an unjustified interpretation of the clause and effectively exempts conventional generators from complying with it. It has the practical effect of removing the need for conventional generators to provide forecasts at all, as they can choose to completely miss them at their own discretion. It is also an incentive for solar generators to just trip in the event of an unexpected cloud event, in order to take advantage of the Type 1 non-compliance provisions. It is difficult to see how this would yield a more secure power system.

In addition, PWC previously argued that the frequency of solar farm variability justified the need for these provisions, using study results referenced on page 79 of the UC Final Decision. While the referenced studies are still unpublished and unavailable for external review (with no justification ever provided for this decision), they contain clearly unrealistic assumptions, such as the assumption of no governor response from conventional generators. If the conventional generators on a power system do not respond to loading variations, it is especially difficult to see how it can be controlled, particularly in light of the NTC requirements for all generators to respond to frequency variations.

In any case, the draft GFCP does not take into account the frequency of non-compliance for either Type 1 or Type 2 events. As Type 1 non-compliance events have such a large impact and are occurring 100 times per year, it stands to reason that they should receive much more onerous consideration than Type 2 events. Instead, every time a Type 2 forecasting error occurs, constraints are enacted regardless of the frequency with which it occurs, or whether it actually offsets concurrent forecast errors from other solar farms, i.e. effectively with no impact on the DKIS. This is arbitrary and unjustified as it is very clear that, for example, a 1 MW forecast error (K_M) would have no impact on power system security at all, in comparison to continuous 25 MW trips from conventional generators, for which there is no effective sanction. If it did have a significant impact, then the trip of a 1 MW conventional generator should be treated in the same way as a 1MW forecast error from a solar farm, but it is not.

Only one type of power system impact

In EAL's view, the only way the proposed approach can be non-discriminatory on a technology basis is for there to be only one type of forecasting non-compliance. As the two proposed types of non-compliance have the same impact on the power system, they should be treated

equally. There is no justification for separating them in this manner, other than to have the practical effect of favouring conventional forms of gas powered generation, thus creating an effective barrier to entry for renewable generators. All generators should have to comply with either a non-compliance to forecasts in the same way, regardless of whether they are solar or conventional, or whether they trip or have an algorithm error.

(b) Inadequate Detail for Investment Decisions

In any regulatory environment, regulations should allow stakeholders to reasonably forecast a level of economic return before taking an investment decision. Without prejudice to EAL's view that any additional investment required as a result of changes in regulations after a final investment decision is unacceptable, the current structure of the GFCP does not provide any confidence of the level of further investment required to achieve compliance.

The UC Final Decision (bottom of page 76) indicated the maximum BESS capacity required to achieve full compliance in relation to the forecasting provisions was 80% of rated capacity, for 30 minutes. The draft GFCP does not align with that philosophy, as it allows for curtailment of up to 100% of output, which would not be sufficiently covered by a BESS of 80% of output. A reasonable minimum production / curtailment threshold must therefore be applied, as per the stated intent of the UC Final Decision, which would imply a maximum curtailment of 80% of solar farm capacity.

Potential Battery Size and Cost

In the case of EAL's solar farms, achieving 80% of output cover for 30 minutes as advised in the UC Final Decision, represents a potential cost of over AUD 20 million, plus additional operating and maintenance costs, including the round-trip inefficiency of the required batteries. The draft GFCP does not align with that philosophy, as there is nothing within it to prevent a generator who has made such a significant additional investment from still being curtailed due to non-compliances with the various factors in the forecasting algorithm. Considerable extra costs may be incurred in practice once these algorithms are applied in real operations. PWC's previous assurances have not been supported by appropriate guarantees in this regard. All the risk of whether the available technologies are actually able to meet these provisions rests with EAL.

Under the draft GFCP, it is indeed likely that, having made such a significant additional investment, considerable curtailment of solar output will still be incurred, at the very least because of the need to make very conservative forecasts so as to not incur curtailment by exceeding the various thresholds. This represents significant additional lost production from our solar farms, likely to exceed 10% of available solar energy, even after spending such a large amount to prevent curtailment.

PWC Discretion

In the draft GFCP, there is very considerable discretion given to PWC in the Type 2 non-compliance process to review and reject proposed forecasting changes made by generators. This is a considerable and unprecedented over-reach on the part of PWC. The original justification for these forecasting provisions was that it was a performance standard with built-in curtailment, so how a generator meets that standard should not be of concern to PWC. This is contradicted by the discretion that the draft GFCP would give to PWC to approve forecasting. It makes it appear that PWC wishes to implement a performance standard while

still retaining complete control of how generators achieve that standard, in which case there is no justification for the implementation of performance standards in the first place.

PWC's rights to review and approve generator's proposed forecasting methodologies means that PWC is no longer implementing a performance standard but instead mandating and approving forecasting methods. If such is the case, then the GFCP should clearly indicate the forecasting methods, algorithms and associated technologies that will be accepted as adequate to prevent curtailment, rather than leave generators so exposed to both forecasting inaccuracy risk and PWC's future discretion to approve forecasting algorithms. At least this would give generators some certainty that if they implement a particular forecasting solution, they will be able to operate on an un-constrained basis, which is completely lacking at present.

The UC has previously argued (page 77 of the Final Decision) that generators can rely on PWC using its discretion to negotiate sensible outcomes using negotiated access standards. EAL's experience is that this discretion is a very considerable risk to investments and this has been amply demonstrated by the introduction of these unprecedented forecasting requirements and PWC's refusal to consider reasonable alternatives that have been shown to be much more cost effective.

In all cases, the considerable ability for PWC to impact EAL's investments should be constrained as much as possible. At the very least, if a forecasting regime is to be applied, the GFCP should specify up-front what PWC deems to be a compliant suite of algorithms and technologies for the *automatic access standard* for NTC Clause 3.3.5.17.

Unacceptable Uncertainty
In summary, and without prejudice to EAL's view that any additional investment required as a result of changes in regulations after a final investment decision is unacceptable, the level of detail in the draft GFCP is completely inadequate for any investment decision to achieve compliance. As PWC has taken a globally unique (as well as unjustified) approach to forecasting, there are no precedents from which EAL can have confidence in achieving reasonable outcomes. At present, EAL is being forced to choose between incurring an additional cost of over AUD 25 million for battery storage, likely with remaining output constraints, or curtailment of up to 100% of the output from our existing facilities. This is unacceptable and would be unpalatable for anyone who wishes to invest in the NT.

For all the other provisions of the NTC, EAL can assess its compliance in advance and accordingly make decisions on additional measures required. The discretion and inherent uncertainty in the draft GFCP makes it impossible for EAL to have confidence in any curtailment outcome for any level of investment, on top of its existing, considerable investments in the Northern Territory.

(c) Unable to determine compliance
In accordance with the provisions of Clause 12.3(b) of Version 4 of the NTC, generators are required to provide to PWC a statement on compliance with the provisions of the NTC. As currently proposed, it is impossible to determine compliance with the *automatic access standard* in Clause 3.3.5.17(b), regardless of the level of acquired battery support, without testing any system on a physical plant over many years.

Any constraint resulting from the draft GFCP would result in a breach of the *automatic access standard* and could arise at any time and for any reason, which is impossible for a generator to predict in advance. This is contrary to the other clauses in the NTC, for which it is possible to confirm or deny in advance our compliance with the *automatic access standards* with some degree of confidence.

The core problem is that these requirements are being imposed on generators in the absence of any evidence that an adequate forecasting system is available, at any cost. It has never been tried before, nevertheless very significant constraints would be applied under the draft GFCP for failure to perform. PWC's previous assurances during consultation workshops that lower levels of battery storage should be adequate to meet the requirements of Clause 3.3.5.17 of the NTC have not been backed up with guarantees to that effect in the draft GFCP. Therefore, they have no value to EAL or other renewable generators. The entire risk of whether the available technologies will be compliant with the draft GFCP sits with generators; PWC takes no risk at all, while imposing an *automatic access standard* that it has not demonstrated is capable of being complied with.

(d) Treatment of Combined Generators

The UC Final Decision (page 77) stated that "the NTC does not prevent alternative arrangements such as the use of a central battery", following PWC advice to that effect. Aligned with our previous submissions on this topic, it remains our view that this is incorrect. Generators are clearly not able to combine their forecasts or share battery services from alternative providers at other sites under either the NTC or draft GFCP. All generators (including batteries) must comply with the NTC, including the forecasting requirements of 3.3.5.17 and the GFCP. The methodology for achieving such an outcome is completely absent from the draft GFCP in any case. This should not be left to negotiated access standards to fix, as it would result in a complete lack of transparency, or a complete disregard of the NTC.

In any case, if the intent is still to allow alternative arrangements and the NTC / GFCP is modified to allow this, then EAL has a number of questions, including:

- can multiple solar farms owned by the same entity at different sites combine their forecasts, dispatch and other factors under the GFCP algorithms? If so, how will this be implemented in practice, given the site specific dispatch systems currently in place? How will the relevant factors be shared across the sites?
- can multiple solar farms owned by different entities at different sites combine their forecasts, regardless of whether these solar farms are "behind the meter" or not? If so, again how is this implemented in practice, in terms of dispatch, the GFCP factors and the constraints applied to each entity / site?
- can solar farms combine with conventional generators to provide their forecasts, whether those generators are grandfathered or not, either individually or in aggregate?
- will this require knowledge of the commercial arrangements between the various parties in order for PWC to implement? Please provide the rationale for this choice.
- does sharing of forecasting from different sites require a commercial agreement between the entities involved, with a single forecast being provided to PWC?
- can PWC implement the forecast sharing methodology itself so that if one generator's under-forecast coincides with another generator's over-forecast, then no penalty is imposed, regardless of whether a commercial agreement exists?

- if a commercial agreement must exist between the entities, then why is it required, given that the system impact is the same in both cases?
- can solar farms, either jointly or separately, share their forecast error with the rooftop solar forecasts that PWC makes? For example, if PWC under-predicts rooftop solar production at the same time as a single generator, or multiple generators, over-predict their production, will a curtailment penalty still apply and why?
- what constraints will apply to rooftop solar production and solar / load forecast error on the part of PWC and what penalties will apply to them? If none, why is there no incentive for PWC to improve rooftop solar / load forecasts as the technologies involved are the same that it is asking generators to implement? If this occurred, then would some of the GFCP factors be able to be relaxed on large scale generators?
- will the various factors in the draft GFCP be added together when multiple solar farms or conventional generators share a combined forecast? If so, will this be done on a site or entity or other basis and why?
- for example, if the estimated take-up of large scale solar farms ever meets PWC's previous assumption of 120 MW and they all combined their forecasts, then will PWC retain the requirement for the K_M factor (as well as the others) in the draft GFCP to still be below 1 MW? If so, why?
- if not, what size of combined solar farm forecast would justify lifting the K_M threshold above 1 MW and to what extent would it be lifted? The same question also applies to all the other factors in the draft GFCP.

It would appear particularly excessive for a 100 MW combined generator to be held to a forecast accuracy requirement of 1 MW, but that appears to be the case in the draft GFCP. EAL also notes that the UC's intent for requiring a GFCP was to provide greater certainty to generators but it currently appears to generate more questions than answers.

(e) Treatment of Conventional Generators

In the NTC, the forecasting provisions of Clause 3.3.5.17 apply to all new conventional generators. So once all existing, grandfathered generators have been retired, all generators will have to comply with their own forecasts, leaving them unable to provide C-FCAS or FCAS services, or even follow system load variations within a half hour period, in the absence of a significant frequency variation. It therefore appears that load-following services cannot be provided by new generators, as they must instead meet their own forecast to prevent a Type 2 non-compliance.

Any negotiated access standard to exempt new generators (including batteries, which are also generators under the NTC definitions) from the requirements of Clause 3.3.5.17, in order to allow them to firm up solar generation, follow their respective loads or provide FCAS/C-FCAS, would require the complete removal / derogation of the forecasting requirement / Clause 3.3.5.17. PWC does not appear to have (or should not have) the discretion to completely remove this requirement using derogations or negotiated access standards. If this approach was taken, it would also raise the question of why the same consideration could not be applied for other generators, including solar generators, if technology agnostic Generator Performance Standards are being applied. In this respect, the NTC would appear to become unworkable to implement as grandfathered generators retire from service.

It also appears to have the effect of preventing new conventional generators from providing firming services for solar generators. This is not consistent with the UC's Final Decision (page 77) on alternative arrangements.

In essence, the problem is that if all generators must comply with the new NTC and meet their own half hour production forecasts, then who is following the load? If a single generator or group of generators is nominated for regulating FCAS or C-FCAS, how can they be made exempt from the requirements of Clause 3.3.5.17, while others are not exempt?

(f) Treatment of Batteries

The press release for the new centralised battery issued by the NT Government states that it may potentially be available for forecasting purposes. However, in the same manner as applies for other generators, no information is provided in the draft GFCP as to how this could be implemented under the NTC among different entities owning different solar farms and/or batteries. EAL is unable to compare its potential compliance options without this information. EAL's additional questions on this matter include:

- How is it possible, in the case of a battery, for the same connection point to be both an entry point and an exit point under the NTC, having to apply the technical requirements for both *Generator Users* and *Network Users* concurrently? This appears to be a similar regulatory issue to that currently preventing the connection of batteries in Western Australia.
- More broadly, why don't specific provisions for batteries exist in the NTC?
- As a stand-alone battery is both a *Generator User* and a *Network User* under the NTC, then what prevents it from also having to comply with its own forecasting requirements under Clause 3.3.5.17, as applies to every other *Generator User*?
- If it must comply with its own half hour forecasts, how can it then be available to firm up forecast inaccuracy from other generators, as this would mean non-compliance with its own forecasts? If PWC believe a stand-alone battery is not a *Generator User* or otherwise does not need to comply with the requirements of NTC Clause 3.3.5.17, then please specify the relevant clauses of the NTC that allow for this exemption.
- As we see no ability in the NTC for batteries to be exempt from the provisions of Clause 3.3.5.17 (as they are a generator), then how is it possible for any new stand-alone battery to provide FCAS or C-FCAS services (in the absence of a frequency excursion) as outlined in the recent press release on the battery that T-Gen is procuring? Please note that this is different to the frequency response provisions of clause 3.3.5.17(b), as no frequency deviation would eventuate in normal operation.
- If PWC intend to interpret any C-FCAS or FCAS from a battery as being in response to a frequency event in order to void the requirements of Clause 3.3.5.17(b) (absent a material deviation of system frequency), then why can't solar farms be given the same consideration?
- As a result, doesn't this mean that all battery capacity must be placed behind the connection point of each solar farm for which it provides firming services, up to the nameplate rating of that solar farm?
- This would contradict the UC Final Decision (page 77), as well as the spirit of prior GPS consultation documentation and multiple statements from PWC and the UC on this matter, which specified that there was nothing to prevent the implementation of shared batteries, at potentially different locations. How can this be the case?

- EAL has continually provided this feedback in all the consultations to date but has never received a response, other than the above mentioned statements, which still appear to be inaccurate under the NTC. We still cannot see how a central battery for solar firming can connect without having to provide its own output forecast, as it is a *Generator User,* unless it is behind the connection point of another *Generator User,* who must comply.
- This means that shared or stand-alone batteries cannot be used and each solar farm has to supply its own batteries at its own site for forecast support at very high cost and likely 100% coverage under the draft GFCP if it wants some confidence of avoiding constraints. Is this the intention? If not, how can this be otherwise achieved in compliance with the NTC?
- Would this also prohibit the benefits of centralised batteries to provide network support or other services, as per EAL's previous submissions?
- Part of the UC's reasons for approving the current NTC appear to be because it was led to believe that shared / stand-alone batteries were possible and could also provide valuable network support services. If this is not the case, will the UC be informed?
- If it was possible in some way (that we cannot see) under the NTC for different entities across different sites to share forecasts and battery support services from a third party, then how will any constraints from the resulting forecast errors be shared among the various entities?
- In the above scenario, will any constraints apply to the battery service provider, or just to the solar farms and why?
- If the same battery is also being used for FCAS / C-FCAS services (by T-Gen), then how will its capacity (both in MW and MWh) be credited among multiple additional forecasting and FCAS / C-FCAS users? While the draft GFCP describes an algorithm for individual constraints, it doesn't describe any overlap with FCAS / C-FCAS services or between entities sharing a battery for forecast firming services. To comply with the expectations laid down in the UC's Final Decision, it must do so.
- If additional network support services are provided by a battery (e.g. black start, firming services for rooftop solar / loads, static or dynamic voltage support to address existing network issues or providing synthetic inertia), then how will these services be compensated, outside of the existing monopoly arrangement for FCAS / C-FCAS enjoyed by T-Gen?

Broadly speaking, it appears that stand-alone or even shared batteries will be unable to comply with the NTC without substantial changes to both NTC Clause 3.3.5.17 and the draft GFCP. In EAL's view, this type of change cannot be accommodated using *negotiated access standards* without compromising the integrity of that process, as it requires complete removal of the requirement. EAL therefore requests another consultation process to change the NTC to accommodate batteries and/or remove Clause 3.3.5.17. Unless the intention was always for batteries to be located behind the connection point of each solar farm, which is not consistent with the UC's Final Decision, or PWC's prior documentation and assurances.

(g) Amount of batteries – and cost

As above, it appears that stand-alone or shared batteries cannot be accommodated under the NTC for solar forecasting purposes and there is no limit to the constraints that will be applied to solar farms under the draft GFCP. Therefore, to have some hope of compliance, each solar farm must be able to supply up to 100% of its output for half an hour, if we unrealistically assume an otherwise perfectly functioning forecasting and battery control algorithm can be

discovered, for which evidence has not been provided. This increases the cost of batteries above previous estimates, which assumed 80% coverage for the same time period. For EAL's solar farms (45 MW total), this increases the likely cost from $20 million, as previously advised, to $25 million. EAL re-iterates its position that the requirement for batteries installation for 80% of the capacity is by itself sufficient to make any project uneconomic (absent a renegotiation of electricity price); an increase to a 100% battery backup simply worsens an already intolerable condition.

In PWC's previous submissions in support of the new forecasting requirements (see page 33 of the June 2019 GPS Consultation Paper), 120 MW of large scale solar farm capacity was assumed to be installed in the near future. This was based purely on generator connection applications from project developers, rather than any realistic assessment of market demand for large scale solar farms in the DKIS. PWC was also unable to estimate likely forecasting accuracy from solar farms in this document, which should have been a pre-requisite before applying accuracy requirements it did not know could be achieved at any reasonable cost. The system reliability impacts suggested in this document are therefore unrealistic, even if they were modelled correctly, which we are unable to confirm as the model has never been provided for review, even to the UC's consultants, for reasons that have never been explained, despite repeated requests for this to occur in our previous submissions.

Nevertheless, keeping this 120 MW assumption, for solar farm owners to gain at least some degree of confidence in gaining unconstrained access means they must, in aggregate, install batteries of 120 MW and 60 MWh capacity across the DKIS under the draft GFCP. The likely cost of this is over $65 million, using GHD's benchmarks for battery costs. In addition, the NT Government's recent large scale battery announcement for FCAS services (media release of 5 April 2020) represents a $30 million investment, with unspecified capacity / energy characteristics but presumably in the order of 60 MW for over half an hour, based on equivalent cost assumptions. So it is clear that, in these arrangements, PWC and the UC are comfortable with a total likely battery cost across the DKIS in the order of $100 million, for batteries totalling around 180 MW of capacity, for half an hour of continuous operation. These batteries will most often be fighting each other so as to merely ensure compliance with their own forecasts, rather than any power system outcome.

There is no possibility that EAL could have been able to anticipate such an unrealistic, inefficient and expensive requirement would receive approval from an independent regulator before taking investment decisions. There is no rationale that could possibly justify such an expensive outcome for so little return. It should again be noted that all these costs will ultimately be paid for by electricity consumers in the Northern Territory.

(h) Paying twice for batteries

EAL notes that the requirement for all generators to pay FCAS charges to T-Gen has not changed and these funds will now be used to pay for T-Gen's new battery, as recently announced by the Northern Territory Government. So, in addition to being asked to invest in a battery large enough to provide 100% output cover for half an hour for its own solar farms (and therefore not calling on C-FCAS services ourselves), EAL must also provide additional funds so that T-Gen can build a large enough battery to provide output cover for its generators, which PWC and the UC Final Decision (page 79) have previously noted have very low levels of reliability.

EAL also notes from the press release that this T-Gen battery has a simple payback period of under five years on the basis of the revenues that EAL (and others) must fund, making this a very profitable endeavour for T-Gen. Therefore, previous statements that existing FCAS charges were too low to cover T-Gen's costs do not appear to be justified. It is also very likely that an open process to procure FCAS services in the market would have reduced FCAS charges substantially, purely due to the longer payback periods that would have been accepted by private industry for such a secure revenue stream. Yet this option was not pursued and EAL is left with being forced to pay excessive FCAS charges as a result, in addition to very high costs of compliance with Clause 3.3.5.17 of the NTC.

This situation is unacceptable for private capital participants in the DKIS and is only exacerbated by the provisions of the draft GFCP, as already discussed.

(i) Disconnection or continuous constraint

The draft GFCP does not specify the level of non-compliance for disconnection, compared to the application of a constraint as per the worked example. It also doesn't specify the time period over which such a disconnection would be implemented. Presumably, this would occur over at least a half hour period in order to reduce system impacts, as against what appears to be an instantaneous disconnection that is presently envisaged, which would have a much more severe impact on the power system.

PWC should specify the circumstances under which it would choose the complete disconnection option. At present these are not clear, unless a 100% disconnection is applied by the relevant factors, which remains possible.

(j) GOTR Timeframes

The draft GFCP states that the "normal processing time for GOTRs is 10 business days". EAL's experience is that this process usually takes considerably longer and any new revision by PWC of associated documentation and procedures resets this timeframe, regardless of how minor. It also states that "a shorter time period may be arranged under special circumstances" without specifying what those circumstances might be. In EAL's experience, this has been impossible to secure for solar farms, despite repeated attempts in exceptional circumstances.

(k) Return to service time constraint

As per EAL's feedback on GOTR timeframes, all Type 2 non-compliance return to service approvals in the draft GFCP should have reasonable and specific time-bounds on PWC to expedite the return to service and constraint relaxation processes. The draft GFCP places no obligations on PWC with respect to this or any other requirement to act in a timely manner.

(l) Unserved Energy Analysis

As per its previous consultation submissions, EAL again requests quantification of the impact of the provisions of Clause 3.3.5.17 on system reliability and unserved energy. To date, no studies or models have been provided and EAL therefore retains its lack of confidence in the generic statements that have been used by PWC to date to justify these forecasting requirements, as well as our ability to negotiate reasonable access standards.

Of particular interest in the draft GFCP is the impact of increasing the various factors (e.g. K_M, K_P and D) on unserved energy. The thresholds for these factors are extremely low at present and no justification has ever been provided for them. An unserved energy analysis is the only way of discovering whether the cost of compliance with such low thresholds exceeds the system benefit, compared to other costs that could be applied to power system participants for much greater benefit in terms of reducing unserved energy. It is very likely that a substantial increase in these factors would have no real impact on unserved energy but would substantially reduce the cost of compliance for EAL and other solar farm owners in the DKIS.

In terms of the actual factors involved, the following are examples:

- *The half hour time period for provision of forecasts:* the selection of this period appears to be based on the time period required for the slowest conventional generator on the DKIS to start. This is indefensible as, during periods of high solar production, other generators that can start much faster will always be available. Reducing this factor to ten minutes (for example), or less, should be well within the start time of many existing or new DKIS generators and would reduce the cost of compliance by solar users by two thirds, with no impact on power system reliability or unserved energy.
- *The 1 MW threshold for K_M*: again, no justification has ever been provided for such a low threshold, which is well within the variability of loads and rooftop solar production. A significant increase in this threshold would significantly reduce the cost of compliance without any significant impact on power system reliability or unserved energy.
- *The 5% requirement for K_P*: as per the other factors, no justification has been provided and EAL believe a significant relaxation of this constraint can be accommodated with no impact on power system reliability or unserved energy.
- *The aggregation of D over a 24 hour period and only over non-zero forecasts:* as per the above factors, these choices are particularly mystifying as it is impossible to see even an indirect link between these choices and any power system reliability outcome at all.

All the above factors require an unserved energy analysis to quantify properly. In any case, none of this commentary should take away from the fact that generators should be capable of confirming their compliance with Clause 3.3.5.17 of the NTC in advance. This is not the case under the draft GFCP as constraints can potentially be applied at any time, regardless of the level of investment in forecasting or batteries, as forecasting performance against the draft GFCP remains unknown to everyone.

(m) UC oversight

In accordance with the requirements of Clause 3.3.5.17(f) of the NTC, PWC is required to consult with the UC on the draft GFCP. It is difficult to see how the UC can adequately provide its feedback in the absence of this submission and the other submissions being made by other stakeholders. Given the many substantive issues raised in this submission, EAL request the GFCP and accompanying submissions be provided to the UC for approval. At the very least, the UC should have the ability to provide its feedback to PWC in full knowledge of the submissions being made by all stakeholders.

(n) Response to consultation questions

In light of the aforementioned points, EAL provides the following responses to the specific questions raised in PWC's consultation document:

Is the proposed procedure aligned with the obligations outlined in the Network Technical Code?
No, for the reasons already outlined. There is no justification in the NTC or anywhere else for two types of non-compliances with such disparate constraint outcomes.

Does the procedure provide sufficient detail on the constraint setting process?
No, for the reasons already outlined, particularly with respect to the different treatment of the two types of non-compliances. The discretion for PWC to apply its own interpretation to these clauses and approve forecasting algorithms and methods in the constraint lifting / return to service processes is particularly difficult to accept as PWC is both applying a performance standard and giving itself complete discretion over how generators are able to meet it. No constraints can be predicted by generators from any particular level of investment in forecasting or battery services.

Is the procedure suitable for use by the System Controller?
No, for the reasons already outlined. Procedures such as those outlined in NTC Clause 3.3.5.17 and the draft GFCP should not be and have not been used by any power system controller due to their extreme cost and minimal benefit.

Does the proposed approach to under-frequency event and forecast appropriately balance minimising the impact of the initial under-frequency event while limiting the risk that future forecast errors present an unmanageable situation?
No, in order for this to occur PWC must be able to demonstrate that an unmanageable situation is likely to occur under more reasonable forecasting provisions that do not impose a half hour obligation. As per the feedback provided elsewhere in this and our previous submissions, PWC has failed to do this.

3. Conclusion

In conclusion, EAL maintains its significant concerns with Clause 3.3.5.17 of the NTC, as well as the draft GFCP. In summary, these include:

- Indirect technology discrimination through a type of non-compliance that has no impact on conventional generators, despite more severe impacts on the power system from their outages and their likely greater frequency compared to aggregated solar forecasting errors of the same magnitude across the DKIS.
- Inadequate detail for generators to be able to make investment decisions and retain any degree of confidence that they will be able to comply and still not be constrained as these forecasting systems have not been developed or tested yet. If PWC is confident that lower cost forecasting technologies will be fully compliant and result in no constraints, it should provide guarantees to that effect in the GFCP.
- Lack of any information about the treatment of shared generators or batteries and no information about how stand-alone batteries can comply with NTC Clause 3.3.5.17 and still provide forecasting services to other generators, or how the power system will be controlled when grandfathered generators retire and all generators have to comply this clause and the associated GFCP.
- No consideration of the extremely high cost of batteries that will be required across DKIS solar farms, all fighting each other's output in order to meet their own forecasts,

regardless of prevailing power system requirements. This is in addition to those batteries already committed by the NT Government in its recent announcement.

- No consideration of the fact that generators not only have to provide complete output coverage using their own batteries to attempt compliance with NTC Clause 3.3.5.17 but we also have to fund T-Gen's batteries, with no apparent reduction on FCAS charges.
- No specified maximum level of constraint applicable to generators in the absence of batteries, or any quantification of the amount of batteries or other equipment required to guarantee that a constraint will not be applied in normal circumstances. There is no ability for generators to be able assess the level of constraint that is likely to be applied in exchange for their potential investments in batteries and forecasting algorithms and services, as the performance of each option against the GFCP is completely unknown in practice.
- No justification of the arbitrary factors being applied in the draft GFCP algorithm.
- No time limits on PWC for the return to service or GOTR processes.
- Non-disclosure of considerations regarding potential conflicts of interest in the development, approval and implementation of the NTC and the draft GFCP. Constraints on solar generation should not be applied by entities who derive a financial benefit from those constraints.
- Lack of any oversight by the UC for the GFCP, or Clause 3.3.5.17 in the light of this and other submissions.

As outlined herein, many of these issues are in contradiction to public assurances given by PWC during the GPS consultation process and by the UC in its Final Decision. Therefore, EAL requests a complete review of NTC clause 3.3.5.17, together with an unserved energy analysis to quantify the need for aggregated solar forecasting or battery support services in the DKIS. This is requested particularly in light of the NT Government's recent announcement of the provision of its own battery, which is likely to provide sufficient coverage for these issues for the foreseeable future in light of actual market demand for large scale solar farms.

Yours sincerely,

Simone Rizzi
Commercial and Renewables Manager