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System Strength Impact Assessment Guidelines

Generator and Load Model Guidelines and Model Change Management Requirements

Consultation Submission

Eni Australia Limited (EAL) makes this submission to Power and Water Corporation (PWC) for the 'System Strength Impact Assessment Guidelines (SSIAG)' and 'Generator and Load Model Guidelines and Model Change Management Requirements (Model Guidelines)'.

1. Background

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, 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. This project is in the compliance testing phase. In October 2019, EAL completed the acquisition of two further construction-ready 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.

2. Core considerations

The core considerations for this submission are:

a) It is not clear how the grandfathering arrangements for the Network Technical Code (NTC) overlap with the proposed methodologies in these guidelines. Electromagnetic Transient (EMT) models do not appear to be required from legacy / grand-fathered plant. In order to properly conduct the proposed modelling for adjacent new plant, how will they be sourced?

b) PWC has not disclosed where on their networks the lack of system strength is a current issue and the mechanism by which it will pay for rectification, in that event. If non-network solutions to existing system strength problems are to be accommodated, the mechanism by which PWC will pay for these services should be specified.

c) The use of metrics and methods adopted in the NEM, while defensible, run the risk of lagging the energy transition as the technical issues faced on the DKIS often pre-empt and bear moderate resemblance to those faced on the NEM. In our view, PWC should be

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proposing methodologies that are fit for purpose and "leading" the NEM, rather than what appears to be the other way around.

d) Clarity should be provided around how these guidelines will be applied to rooftop generators in the event the relevant minimum Short Circuit Ratio (SCR) threshold is breached by aggregate rooftop solar generation at a particular substation. This is particularly relevant as they are, in aggregate, the largest source of inverter based generation on the Darwin to Katherine Interconnected System (DKIS).

e) PWC should acknowledge that EMT modelling of both networks and generators is very time consuming and expensive to conduct and will be of limited use and accuracy until the models of all relevant system elements are accurate, which may potentially take many years to achieve. They should only be used when reasonable alternative methods have been exhausted, such as simply ensuring the control system tuning of neighbouring inverter based generators are complimentary, to ensure positive feedback effects on voltage levels do not occur. Or changing protection settings to accommodate a reduction in fault levels on parts of the power system.

f) Given the costly methods being proposed in a Final Impact Assessment (FIA), there needs to be robust controls on the ceiling cost to proponents of the various studies involved. At present, these appear to be completely absent. There is also a conflict of interest in the FIA approach being put forward by consultants who may financially benefit from conducting these detailed studies for PWC, presumably at the proponent's expense. If PWC will bear the cost of Preliminary Impact Assessment (PIA) and FIA studies, as well as the lost revenue to proponents of any delays in them being conducted (particularly for plants that are already constructed), then this risk to proponents can be managed.

g) Related to the above point, it is unacceptable for PWC to be the only entity who can conduct a FIA, particularly when this modelling seems unlikely to take place in-house. Confidential network and generator models should be available to any third party consultant (under the same confidentiality obligations as would apply to PWC's own consultant) employed by proponents for the verification of any studies. This does not require any particular generator, proponent or competing Original Equipment Manufacturer (OEM) to have access to confidential information. Significant errors have been made on this modelling in the past and it is therefore impossible to have confidence in any particular consultant's determination.

h) In the event that disputes arise with PWC around core assumptions or methodologies to be used in PIA or FIA studies, the appropriate dispute resolution procedures should be specified and/or clarified in terms of the relevant clause of the NTC.

i) In particular, the base for the PIA calculation of SCR should be the declared sent-out capacity of the plant as specified in the GUA and not the sum of the inverter capacity of all on-site equipment. Otherwise, for those generators who cannot meet capacity forecasting requirements without matching half hour battery capacity of the same magnitude as their solar capacity, they will appear to have double the effect on system strength using this metric than their actual output can physically provide.

j) There should be some acknowledgement that electrical grids are able to operate using up to 100% inverter based generation and that transitioning to this (desirable) future outcome will require assessments that are more elegant and sophisticated than currently contemplated. For example, rather than using synchronous condensers or out-of-merit generation to increase fault levels, there may be economic merit in modifying protection systems for lower fault levels instead. A reduction in fault levels across the power system

will lead to an overall reduction in cost for consumers and this should be welcomed, pursued and accommodated to the maximum possible extent.

k) Likewise, PWC should note that inverter based resources can also be used as a solution to system strength issues, for example through the potential use of grid-forming inverters either setting the frequency / voltage or in droop frequency / voltage control at particular connection points. Traditional solutions to these issues are not the only solutions now available.

l) Reasonable time limits must be imposed on PWC for providing core information to project owners and proponents on technical information and agreed assumptions for the various studies. PWC's agreement on basic information such as the assumed fault levels at a connection point should be provided before signing a Generator User Agreement (GUA), at a minimum. At present it appears this type of information has not been specified or provided by PWC for projects that have already been constructed.

m) There is considerable overlap between these guidelines and policies being implemented by System Control for "must run" plant in order to provide perceived levels of inertia. Noting that power systems operate in a very stable manner with much lower inertia than currently on the DKIS (including 100% inverter based power systems), PWC's efforts should be focussed on speeding up control systems (e.g. for frequency control), rather than mandating the status quo for inertia at considerable expense and cost to system security from what appear to be relatively slow control systems. PWC must ensure it does not contaminate system strength issues with requirements such as arbitrary and ill-defined levels of inertia.

3. Response to Consultation Questions

Are the draft SSIAG and Model Guidelines aligned with the obligations outlined in the NTC?

EAL has no comment on this issue, other than to note that it is not clear how the grandfathering arrangements for the NTC overlap with the proposed requirements and methodologies in these guidelines. If EMT models are required from legacy / grand-fathered plant in order to conduct the proposed modelling, how will they be sourced? If existing plant is non-compliant with these guidelines, how will this be resolved?

In our view, a more appropriate question could be whether they are fit for purpose and economically efficient. The complexity, cost and time required to gather the data for and conduct the proposed EMT modelling does not appear to have been given sufficient consideration in these documents.

Do the draft SSIAG provide sufficient detail to enable Users to understand how system strength impact assessments will be conducted and the data and models required for each assessment?

While the process appears reasonably clear, there is no clarity on when PWC will provide the relevant assumptions, information and models available to third party consultants in order for proponents to form their own view of the risks to their investments.

The idea that only PWC can have access to the information necessary to conduct the studies for a FIA is not acceptable. Subject to the same confidentiality obligations, any consultant

should be able to gain access to the core data to conduct the same studies in order to verity the results. In addition, guidelines such as these should not be developed by consultants who may derive a financial benefit from conducting the modelling they are proposing to effectively make mandatory.

Do the draft Model Guidelines provide sufficient detail regarding model validation and accuracy requirements?

Yes.

The draft SSIAG requires an EMT model to be provided by generators to enable a full impact assessment. The Model Guidelines explain the accuracy requirements for such models. Two approaches are being considered by Power and Water regarding the development of EMT models: a) The first requires the adoption of PSCAD as the preferred EMT modelling software for Power and Water's regulated networks. This approach would require that any User required to provide an EMT model for their plant and equipment provide a PSCAD EMT model. b) The second requires the adoption of DIgSILENT Powerfactory as the preferred EMT modelling software for Power and Water's regulated networks. This approach would require that any User required to provide an EMT model for their plant and equipment provide a DIgSILENT Powerfactory EMT model. User feedback is sought regarding whether there is a clear preference for either of the above approaches. In expressing a preference PWC would value understanding User feedback on the advantages and disadvantages of each approach? Would requiring either a PSCAD or DIgSILENT Powerfactory EMT model meeting the accuracy requirements specified in the Model Guidelines present materially different costs or risks for Users?

EAL would like to better understand how valid EMT modelling of a particular generator's behaviour can be properly conducted in the absence of verified EMT models of existing and neighbouring generators and related network elements. While assumptions can be made about the EMT behaviour of neighbouring plant, without valid models it is impossible to verify those assumptions, compromising the whole process.

Otherwise, EAL has no preference for modelling software format, other than to suggest PWC consult on this issue with relevant inverter OEMs.

If you have any questions about this correspondence, please don't hesitate to contact Antony Piccinini on +61 400 345 455.

Yours sincerely,

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