PacificHydro

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AEMO
Level 22 Collins Street
Melbourne 3000

To Whom It May Concern,

System Strength Guidelines

Pacific Hydro, as one of Australia's leading clean energy companies, is committed to maximising Australia's renewable energy opportunities while supporting regional growth and the reduction of Australia's greenhouse gas emissions. To date, Pacific Hydro has invested around $650 million in the Australian renewable energy market, $560 million of this in wind farm developments and now multiple solar farm developments.

Being an owner of distribution and transmission connected wind farms and now developing solar farms, Pacific Hydro has significant experience in the development, operation and management of wind farms and maintains strong working relationships with the NSPs, to whom the renewable energy projects are connected. Each connection brings different challenges and frequently requires careful consideration of local network issues.

As a company who recognises Australia's incredible wind and solar resources and the opportunity they create for our energy future, Pacific Hydro welcomes the opportunity to comment on the System Strength Impact Assessment Guidelines.

General Comments on draft

In both these system strength assessment guidelines and the generator modelling guidelines there is a drafting approach that places an imperative on the connecting party to provide solutions that solve all possible problems. This has the effect of making it the generators task and responsibility to solve all risks and unidentified problems. Any assumption that presumes that all risks and problems can be solved is highly problematic. Power systems are complex machines, and there is an extremely high or an infinite number of problems that could occur in a system.

Tackling a system problem in a manner that expects perfection will lead to a situation in which nothing can be solved. Engineering requires refining extremely complex problems down to the fundamental issue/s and then addressing those through first principles and dealing with the worst cases that can be reasonably expected.

This set of guidelines often uses all-encompassing language which grossly increases the burden of proof onto the connecting party who may or may not have access to any of the information that would enable these studies. An example of this language is given below:

> *"Power system modelling and simulation studies are required to demonstrate that the application of all proposed system strength remediation schemes can mitigate all identified adverse system strength impacts." (page 22, emphasis added)*

Furthermore, the language refers to "proposed" remediation schemes, not committed remediation schemes. Given the volume and number of connecting projects this has created an almost impossible set of constantly changing parameters.

Power system studies and engineering calls for narrowing the size of the problem to whittle it down to identify a range of worst cases that are still reasonable operating scenarios and to study the responses of control systems and the physics to achieve stability and manage the system. The inclusion of multiple contingency responses triggers further complications and creates criteria that sets the scene for all possible problems in the future grid to be placed on generators. This approach is unacceptable and unworkable as a power system is highly non-linear and requires co-ordination of generation, network and operation management to ensure it works. It is always possible to operate the system beyond reasonable limits, it is unreasonable to think that all connected plant will keep operating in all circumstances.

Define Short Circuit Ratio (SCR)

More clarity is required on the methodology used to calculate SCR, and the application of the calculation at the time of the enquiry and the connection application. A single methodology must be provided for consistency. Adequate justification also needs to be provided for the chosen methodology. The guideline does not provide sufficient justification and the assumptions adopted can lead in some cases to unsolvable problems where the source impedance can become infinite. The methodology should never result in a grid fault contribution of zero.

It would also provide more clarity if the methodology used in the system strength impact assessment was required to be provided to applicants. Not all participants have access to CIGRE papers.

Secondly, the methods used for estimating SCRs appear to be overly conservative, leading to unnecessary costs for mitigation methods. The obligation on a connecting party should be limited to ensuring that the inverters within their plant are stable, and they ought not be obligated to resolve a legacy issue caused by existing plant without mitigation measures or correctly tuned inverters for low SCR conditions. It should be a requirement that all plant can be retuned when the power system changes.

In the draft guidelines, the absolute worst case scenarios are taken into account when calculating the SCR. Modelling is performed in a network with the minimum number of synchronous generators online under the most severe contingency, likely a two phase to ground fault in the most onerous network location. The guidelines also state that in some parts of the network multiple contingency events can also be temporarily assessed as credible contingency events (multiple line trips due to lightning being the example given).

Not only this, but protected events, which are considered non-credible contingences (according to 4.2.3 (f) of the NER), may also be included in the assessment. More clarity is needed as to what these "protected events" are and the justification for their inclusion. The requirement to study an unknown number of multiple contingencies including "protected events", greatly increases the volume, the cost and time associated with achieving a set of performance standards, and leaves open the possibility to find an event that has not been covered. This is neither practical nor efficient, it fails to achieve the NEO and will lead to an unacceptable arrangement in which any failure of generation on the power system will be blamed on generators, regardless of the network conditions. This guideline and the proposed approach is creating a potentially impossible situation, in which connecting parties may never be able to pin down the requirement for connection. Such situations are unworkable and a more pragmatic approach is required.

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Of further concern is the additional 10% deduction from the SCR outcome obtained from the preliminary assessment. Being too conservative with these SCR values will ultimately result in greatly increased costs for mitigation methods which may in fact not be needed. FACTs devices are also not included in the preliminary assessment modelling, yet at the same time these devices are given as an option for mitigation while being at risk of underperforming in extreme low SCR conditions.

Another factor to consider is NSPs not yet having the required (EMT) models which are needed for the full assessment. The guideline, the rules and the requirement for detailed EMT models is already a problem and transitional arrangements regarding the lack of EMT full models must be considered. This leads to enormous risks and unacceptable delays for the connection of plant while waiting for the models to be developed.

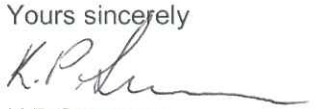
Agreed Grid Contribution

Once the NSP has provided the agreed fault level contribution from the grid to the point of connection it should not change. Given the 10% deduction, the conservative assumptions and the assumed allocation of existing fault level to connected AG plant, there is existing margin in these conservative assumptions. The inclusion of committed plant only brings with it the risk that another connecting party can become "committed" in between the completion of studies and the signing of a connection agreement, which has the potential to create an endless loop for connecting parties.

The NSP must accept a small amount of risk and accept that there may be a need for some network support if there are projects that have parallel time frames. It is inevitable that something will be under or overestimated and that generators cannot always carry the cost of what ultimately becomes a network problem. Studies must be agreed and limited, they cannot become open ended and endless as discussed at the start of this submission.

The obligation for applicants to pay for system strength connection works is likely to lead to other stability issues as each project will wind up with small synchronous condensers. Larger centralised properly located units would be more efficient and cost effective. A network based solution is really what is needed with appropriate planning studies to identify the location.

Yours sincerely



K P Summers
Manager, Electrical Engineering

Pacific Hydro