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Submission to SA Energy and Mines: Proposed New Low Voltage Ride-Through Requirements for Smart Inverters in South Australia

The technical challenge of maintaining the electricity grid stability with the steady increase in Distributed Energy Resources feeding into this network is becoming more apparent. Loss of this generation may lead to dramatic disturbances. The proposed solution based on the assumption that all Smart Inverters are feeding energy does not recognise the diversity of Smart Inverters being connected. In particular, the increasing installation of Multi Mode Smart Inverters with Storage into the domestic market in conjunction with PV and the positive impacts such devices provide.

Multi Mode Smart inverters with energy storage allow rooftop PV to feed on site load directly and be captured and stored for later use. The result provides a positive impact, day and night by consuming excess PV production and reducing demand by drawing from stored energy.

Multi Mode Smart inverters incorporating Uninterruptable Power Supply (UPS) functionality provide additional benefits from both SAPN and domestic customer perspective. During a disturbance, the site is islanded from the LV network whilst the site remains powered from its own rooftop PV and stored energy. SAPN is not impacted through any net loss in supply and the domestic customer is protected from any interruption to supply.

A solution which recognises three classes of Smart Inverters and the advantages for SAPN has been proposed to AEMO – Submission to AEMO attached (Appendix I). This solution allows for each class to be treated independently within the proposed test framework, allowing for multiple solutions to maintaining grid stability and reliability plus allowing further penetration of rooftop PV.

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Appendix I – Submission to AEMO: Short Duration Undervoltage Disturbance Ride Through

The introduction of distributed generation and particularly rooftop PV into the national energy mix has slowly but steadily increased to the point whereby loss of this generation has the potential to have a significant impact on the stability of the network as a whole. A solution that purely looks at resolving the stability assuming that all distributed PV flows into the network without consideration of the increasing update of distributed storage is unrepresentative of the sector and capabilities.

Distributed storage on the ground is allowing DPV to be captured and stored on site and not flow into the network. Such systems have a positive impact on the network at all times regardless of grid conditions by removing load from the network, reducing continuous demand at all hours of the day and night. In times of disturbance, by immediately having these customers disconnect and supply their own power from a combination of PV and stored energy, would have zero or minimal impact as only PV which is unable to be consumed or being stored would be detected as loss of generation, no additional impact from offset loads. Additionally, from a customer perspective, the uninterruptable functionality (UPS) that is included with storage systems will operate seamlessly, maintaining voltage continuously through the disturbance. Any storage system directed to remain connected through the disturbance will be degraded in performance such that lights flicker, clocks reset, computers and other equipment restarts or faults.

The solution is to divide inverters into three classes of equipment;

Class A: Grid Tie String inverters – no energy storage
Class B: Multi Mode inverters
Class C: Multi-Mode inverters with energy storage and UPS functionality

Class C Multi-mode inverters are ones that are capable of islanding from the network during a disturbance and providing a continuous supply through to the connected loads from stored energy.

Specifically, addressing the criteria for acceptance (A1.6), point 2 and 3 shall be split into;

a. Class A and B inverters – acceptance remains as proposed.
b. Class C inverters – acceptance, the unit may disconnect during this test;
    i. If unit disconnects, normal reconnection times apply.
    ii. If the unit remains connected, the test criteria as per Grid Tie inverters applies.

The above recommendation provides for the continual expansion of the distributed PV and stored battery energy with suitable multi-mode inverters enabling two methods of providing grid stability during short disturbances plus enabling the customer to move towards self-sufficiency and enhancing the reliability of their supply.