3 November 2022

Dear Sir/Madam,

Australian Energy Market Commission (AEMC) Review into Consumer Energy Resources Technical Standards Consultation Paper

SA Power Networks is South Australia's sole electricity distributor, providing electricity to approximately 900,000 of our State's homes and businesses.

South Australia is at the forefront of the consumer-led energy transition, particularly in terms of rooftop solar uptake, with around 35% of SA homes generating renewable electricity. Since 2018 approximately 30,000 of these have been coupled with energy storage systems and about one-third are enrolled in over 10 active Virtual Power Plants (VPPs). The installed capacity of large renewables has doubled in the last 18 months. Electric Vehicles (EVs) are also forecast to significantly increase in the next 10 years. Our future network planning forecasts that EV uptake will result in over 800 GWh of additional energy flowing through our network annually by 2030 - an increase of almost 10%. By 2050, EVs will have increased energy throughput on our network by 50% and our network will be the primary distribution system for transport fuel for the State.

Over the long term, the energy transition will deliver abundant social, environmental, and economic benefits, but there are commensurate risks for the electricity system and in turn, consumers and the broader economy, particularly in the short term. These risks are exacerbated by CER compliance issues and result in system stability risks and network hosting capacity constraints.

South Australia's progress has demanded early action from SA Power Networks in terms of providing whole-of-system leadership and guidance on CER compliance, which has given insights into the issues discussed in the Consultation Paper. Specifically, we have been involved in the development of emergency CER backstop mechanisms, implementation of Dynamic Operating Envelopes, and consultation with industry on the development of our DER Compliance Program. These views have been presented, discussed, and refined in various industry forums, including the Clean Energy Council's DER Compliance forum, directly with AEMO, the AEMC, and DNSP peers.

Given our experience with the above, our responses to questions posed by the AEMC are as follows:

- We believe the assessment framework is appropriate for assessing our, and other recommendations for addressing CER compliance.
- We have detected high levels of CER non-compliance, which has required the implementation of emergency management mechanisms and a DER Compliance Program.
- CER non-compliance creates system security risks and reduced hosting capacity. Both result in higher network investment levels to maintain stability and service levels.

Further, SA Power Networks considers the Commission should seek to:

- Ensure CER standards have appropriate governance and performance management.
- More formally establish the DNSP role in detecting and actioning non-compliance with connection agreements.
- Establish consumer protections for non-compliant equipment.

These recommendations seek to address two broad issues:

1. **System stability:** Poor CER compliance leads to unpredictable inverter behaviour, which exacerbates Minimum System Demand (MSD) issues. SA Power Networks has worked with AEMO and the State Government to introduce mechanisms for managing these scenarios (Enhanced Voltage Management, Smarter Homes Relevant Agent, and Flexible/Dynamic Exports). AEMO has also established operational procedures to minimise the risk during MSD events by placing constraints on market operation. Additionally, because AEMO is not confident on the response of inverters (due to non-compliance) they are required to maintain a minimum level of synchronous generation in SA and, at times, limit SA-VIC interconnector flows. Specific information on the size, scale, impact of these can be discussed with AEMO.

2. **Reduced network hosting capacity:** Incorrect commissioning and operation of inverters significantly limits network hosting capacity. Modelling SA Power Networks has undertaken indicates hosting capacity can double with compliant inverter power quality settings. Additionally, a 2022 analysis revealed only 30% of newly installed inverters were compliant to AS4777.2:2020 Region A. Impact of non-compliance will result in SAPN needing to; invest additionally into the network, introduce lower fixed export limits earlier, and/or provide lower flexible export limits because of reduced network hosting capacity.

In considering issues of compliance in South Australia, SA Power Networks has developed a working model, which is presented in the attachments to this document and can be summarised as:

- Compliance challenges in each phase of the DER lifecycle *(attachment 1)*
- The industry roles, responsibilities and actions to address those challenges *(attachment 2)*
- The associated DER Compliance Program for SA Power Networks *(attachment 3)*

We consider the working model could provide a basis for a national approach and make the following recommendations to the Commission:

1. **Ensure the AEMC's roles established are enduring**

   SA Power Networks supports the Commission's March 2022 determination of its five distinct roles and associated work plan. It is important that these are enduring to manage the CER standards transition. The AEMC should use its position to:
   - Develop a national CER roadmap for considering and initiating standard reviews and projects based on techno-economic & social impacts.
   - Review and track the implementation and performance of CER technical standards.

2. **Clarify the roles and responsibilities of DNSPs**

   It is generally understood that DNSP connection agreements are the right mechanism for placing obligations on owners/operators of CER to conform to standards and connection requirements. However, DNSPs have a limited remit and resources (and therefore, capacity) to detect and action non-compliance. DNSPs can prevent energisation or connection of incorrectly commissioned equipment during initial witnessing, but do not have the capacity or remit to undertake comprehensive witnessing programs (outside the Victorian government's Solar Homes program, or in lower-installation regions, like Tasmania). Where auditing does take place, DNSPs do not have a clear mandate to disconnect violating equipment unless it is of an immediate electrical safety concern or can be proven to affect the quality of supply of neighbouring customers.

Clear roles and responsibilities would enable DNSPs to invest in systems to automatically detect non-compliance and to disconnect until remediated. There should be greater clarity about the obligation on DNSPs to prevent approval of network applications from applicants (retailer or installing) if previous approvals were grossly non-compliant or compromised safety.

3. **Establish consumer protections for non-compliant equipment**

CER retailers and/or OEMs should have a responsibility to consumers for remediating issues where equipment is non-compliant. This may arise from incorrect commissioning or from changes in device firmware over the equipment's life. These protections would be analogous to warranty claims for regular household goods where retailers have responsibilities to consumers, and OEMs are available as a last resort.

4. **Encourage Digital Commissioning**

CER should have 'plug-and-play' functionality, allowing device configurations to be remotely read and updated through standard interfaces. This functionality is critical to the scalability of DOE devices. At a minimum this would require the expansion of CSIP-AUS, or the base IEEE 2030.5 standard. An extension of this would require devices to digitally register even if they were not participating in active flexible arrangements. National adoption of CSIP-AUS as proposed in the ESB's *Interoperability Policy Directions Paper* would accelerate this capability and ensure it is developed by OEMs in a nationally consistent manner.

5. **Establish a national testing and certification ecosystem for Dynamic Operating Envelopes**

This would include type-testing ecosystems of equipment to ensure end-to-end compliance. It would also include the establishment of national Public Key Infrastructure (PKI) and a supporting ecosystem to govern the generation of digital certificates that support cyber secure communications. Further details of this will be explored in SA Power Networks' response to the ESB's *Interoperability Policy Directions Paper*.

6. **Ensure DNSP access to smart meter data**

The AEMC's Metering Services Review must deliver a workable framework for DNSP access to power-quality data. This will be essential for monitoring, detecting, and responding to levels of CER non-compliance.

7. **Address the disconnect between the testing and certification of equipment and the behaviour of installed equipment**

Current requirements around firmware and settings mean that OEMs only need to re-test/re-certify when they self-proclaim material changes in equipment behaviour. Additionally, most OEM equipment is developed for an international market so default/one-click region settings are not foolproof. Medium-term resolution involves mandatory reporting requirements for OEMs to industry bodies (for example DNSPs and AEMO) on inverter settings. Longer-term solutions would need to address testing, certification, and listing based on firmware versions.

8. **Ensure EV inclusion in the CER framework**

EV charging presents a significant opportunity to improve the utilisation of electricity assets, reducing costs for consumers. Nationally consistent smart charging standards and flexible connection arrangements are critical to this. This may mean requirements for fast residential chargers (larger than a regular power point), supporting home energy management or dynamic operating envelopes to enable the balance of behind-the-meter CER to minimise load during peak network events.

9. **Establish rules and standards to address the growing role of CER aggregators**

CER aggregators who have significant resources under their control can have material impact on system security, quality of supply, and the market but have no formal responsibilities in relation to how they operate. Requirements should be placed on aggregators to ensure safe and appropriate operation. These should include aggregator registration, mandatory reporting, and standards requirements addressing major risks (for example cyber security). We believe jurisdictional regulators (for example, ESCOSA in South Australia) could perform this role since they assume a similar role for large generators.

10. **Implement a dispute resolution/clarification process for the interpretation of standards**

Standards and rules which will have significant time or governance requirements in order to be updated, need to have an interim process to assist with interpretation. An interim process/mechanism would need to govern how original authoring bodies are referenced when clarifying and publishing an interpretation.

11. **Ensure integration of data between state & national bodies and DNSPs**

Integration between these bodies would streamline installations and improve data quality and consistency. For example, in South Australia there should be integration between the Office of the Technical Regulator's (OTR's) Electronic Certificate of Compliance (eCoC) and SAPN's embedded generation process.

Thank you for the opportunity to make a submission to this consultation paper. We look forward to participating in the initiatives which flow and playing a critical role in delivering the range of benefits to Australian energy consumers. If you wish to discuss this submission, please contact Travis Kauschke, Strategy Lead, on 0400 80 32 80 or travis.kauschke@sapowernetworks.com.au.
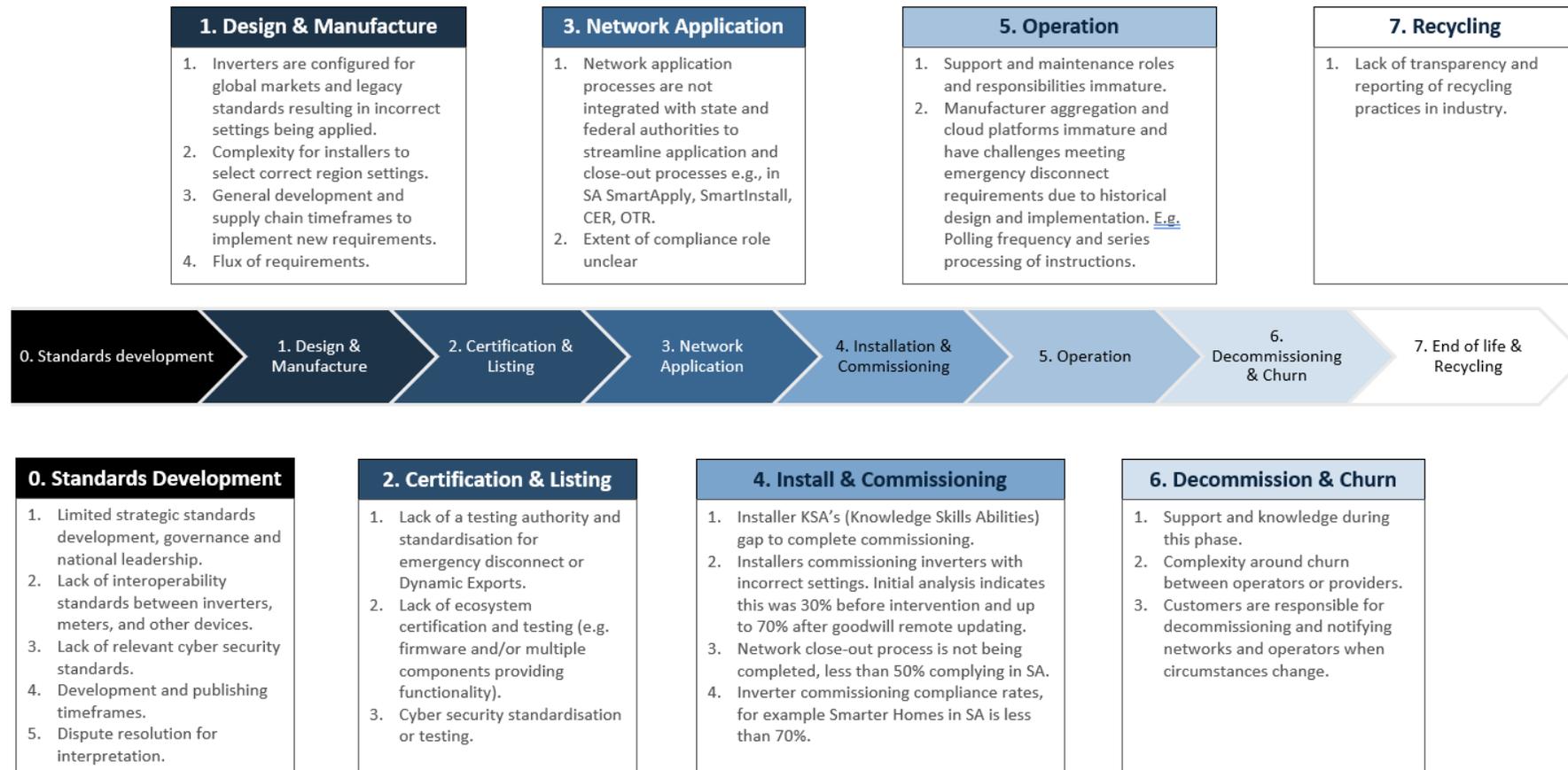
Yours sincerely

Mark Vincent, Executive General Manager Strategy & Transformation

SA Power Networks

Attachment 1: Compliance Challenges in the DER lifecycle

1. Design & Manufacture
1. Inverters are configured for global markets and legacy standards resulting in incorrect settings being applied.
2. Complexity for installers to select correct region settings.
3. General development and supply chain timeframes to implement new requirements.
4. Flux of requirements.

3. Network Application
1. Network application processes are not integrated with state and federal authorities to streamline application and close-out processes e.g., in SA SmartApply, SmartInstall, CER, OTR.
2. Extent of compliance role unclear

5. Operation
1. Support and maintenance roles and responsibilities immature.
2. Manufacturer aggregation and cloud platforms immature and have challenges meeting emergency disconnect requirements due to historical design and implementation. E.g. Polling frequency and series processing of instructions.

7. Recycling
1. Lack of transparency and reporting of recycling practices in industry.

Lifecycle flow: 0. Standards development → 1. Design & Manufacture → 2. Certification & Listing → 3. Network Application → 4. Installation & Commissioning → 5. Operation → 6. Decommissioning & Churn → 7. End of life & Recycling

0. Standards Development
1. Limited strategic standards development, governance and national leadership.
2. Lack of interoperability standards between inverters, meters, and other devices.
3. Lack of relevant cyber security standards.
4. Development and publishing timeframes.
5. Dispute resolution for interpretation.

2. Certification & Listing
1. Lack of a testing authority and standardisation for emergency disconnect or Dynamic Exports.
2. Lack of ecosystem certification and testing (e.g. firmware and/or multiple components providing functionality).
3. Cyber security standardisation or testing.

4. Install & Commissioning
1. Installer KSA's (Knowledge Skills Abilities) gap to complete commissioning.
2. Installers commissioning inverters with incorrect settings. Initial analysis indicates this was 30% before intervention and up to 70% after goodwill remote updating.
3. Network close-out process is not being completed, less than 50% complying in SA.
4. Inverter commissioning compliance rates, for example Smarter Homes in SA is less than 70%.

6. Decommission & Churn
1. Support and knowledge during this phase.
2. Complexity around churn between operators or providers.
3. Customers are responsible for decommissioning and notifying networks and operators when circumstances change.

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Attachment 2: Roles, responsibilities, actions

Products

OEMs

- Original Equipment Manufacturers design and manufacture equipment to applicable industry standards.
- Provide installation and commissioning instructions and tools.
- Provide customers with information and tools to understand device operation and control.
- Maintain control capabilities i.e. cloud platforms and software.
- Maintain security certificates and protocols.

Customers

- Comply with connection agreements.
- Appropriately recycle and dispose of equipment. Returning to OEMs or recycling authorities.
- Notify new owners of responsibilities.

Services

Solar Retailers

- Develop compliant solution options for customers.
- Manage network connection on behalf of the customer.
- Engage installers to complete the installation and commissioning of the selected solution.
- Ensure systems are commissioned in a compliant manner.
- Ensure close-out process is completed.

Installers

- Install equipment compliant to electrical and network standards
- Commission equipment.
- Close-out connections process.
- Safety reporting to relevant authorities.

Operators/Relevant Agents

- Respond to direction by authorised parties.
- Respond to market and system signals.
- Maintain system functionality and capabilities.
- Satisfy reporting obligations.

Regulated

AEMO & NSPs

- **AEMO** – manage system operation including security.
- **TNSPs** – coordinate transmission network and pass on emergency instructions from AEMO.
- **DNSPs** – coordinate distribution network and distribution network DER in emergencies.
- Provide device registration
- Set network standards.
- Manage connection policies.
- Manage network connections process.

Certification

- **Standards bodies** (Standards Australia) – develop standards in consultation with industry.
- **Test Houses** – certify products and capabilities to agreed standards.
- **Peak industry bodies** (CEC, SEC) – training and installer certification.
- **Listing authorities** – list certified products and capabilities.
- **Certification body** – Certify devices to standards (Currently CEC for AS4777 and DNSPs for dynamic exports)

Regulatory

Oversight bodies

- **AEMC** – Manage and maintain rules.
- **AER** – Regulates markets and networks under rules.
- **Federal Government** – Set national policies and frameworks.
- **State Governments** – Set jurisdictional requirements through rules and legislation.
- **State commissions** (Essential Services Commissions) – manage and maintain codes.
- **Local regulators** – manage electrical safety and safety compliance.

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Products	Services	Regulated	Regulatory

OEMs

- Design products that are easy to commission through a simple, intuitive, data validated process.
- Remove legacy grid setting standards/firmware from devices.
- Pre-program devices with the right default firmware and grid settings.
- Enhance install and commissioning instructions and tools.
- Provide training and support on how to correctly set up equipment.
- Periodic quality audit of installers (remote).
- Develop and share with oversight bodies implementation plan for new standards.
- Automated firmware update and grid settings defaulting process.
- Provide periodic compliance data to relevant parties e.g. settings, firmware etc. (DNSP, CEC, AEMO).
- Offer 'over the air' update service to installers for non compliant systems.
- Provide ready access to technical support for installers.

Solar Retailers

- Manage the quality of their installers to ensure compliance (using DNSP connection portal for insight).
- Develop support models for equipment and software.

Installers

- KSA's (Knowledge Skills Abilities) improvement to support new technology via training and accreditation.

Operators/Relevant Agents

- Maintain support models for equipment and software.

AEMO & NSPs

DNSPs
- Introduce digital end-end connections process that links applications right the way through to successful commissioning.
- Only list products that have demonstrated compliance credentials i.e. via CEC listing process.
- Introduce compliance management scheme for solar retailers e.g. limiting or blocking new applications until compliance improves.
- Integrate with local regulator, CER and AEMO DER database processes to reduce installer data entry requirements and improve data quality.
- Provide periodic compliance related insights from connections process with relevant parties (OEMs, CEC, AEMO, AEMC, local regulators).
- Engaging with industry to help them understand their roles, responsibilities and obligations.
- Mandate close out of jobs with required information as part of connection process.
- Provide links to OEMs commissioning instructions via connections portal.
- Autonomous data analysis to identify compliance issues.
- On-going performance reporting to relevant parties.
- Action non compliant sites via agreed escalation process.
- Provide simple means to update and remove devices on site as part of digital end-end connections process.
- Establish process and systems to notify customer inheriting systems of options and obligations.

AEMO
- On-going performance reporting on ride through of inverters during system disturbance to relevant parties.
- Performance management system security functions (e.g. EUFR)

Oversight bodies

AEMC (w/DEIP)
- Develop strategic roadmap of required capabilities.
- Engage with the industry to build understanding and support for new standards.
- Representative WGs to develop standards.
- Standards design to consider whole of eco-system operation i.e. how will it work and how can we maximise outcomes?
- Embed standards into the NER by referencing a subordinate instrument that can be updated more readily through an appropriate governance structure.

Local regulators
- Increase site audits.
- Analyse compliance data from DNSP and OEMs.
- Introduce license penalty scheme.
- Integration with DNSP connections process and reduce installer data entry requirements and improve data quality.
- Engaging with industry to help them understand their roles, responsibilities and obligations.

CER
- Integration with DNSP connections process to reduce installer data entry requirements and improve data quality.
- Oversee listing authorities
- Require mandatory periodic compliance training to maintain accreditation.

Certification

Test Houses
- Assess technical implementation approach of new standards/firmware as part of testing process.

Listing Authorities
- Only list products that can demonstrate steps taken to address compliance e.g. OEM actions below.
- List ecosystems of certified devices.

DER Compliance Program Methodology

Guiding principles for compliance management:

- Prevention before intervention
- Remediate the root cause
- Define clear responsibilities and obligations
- Align incentives on the right parties
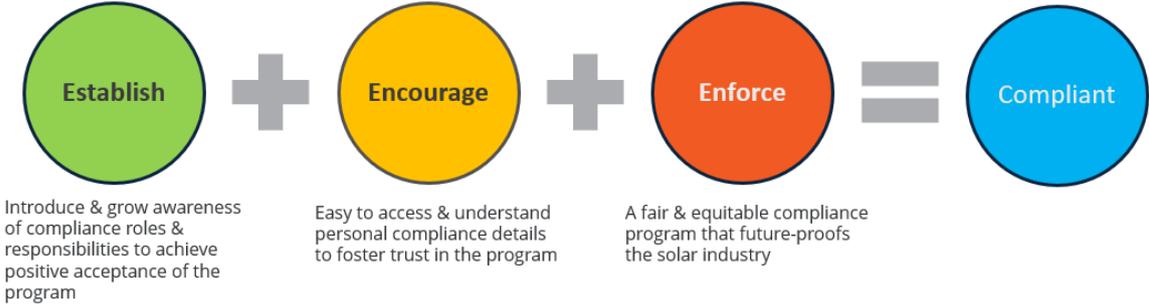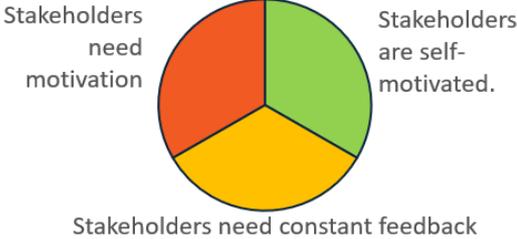- Simplify and automate where possible

Stakeholders need motivation

Stakeholders are self-motivated.

Stakeholders need constant feedback

Establish + **Encourage** + **Enforce** = **Compliant**

Introduce & grow awareness of compliance roles & responsibilities to achieve positive acceptance of the program

Easy to access & understand personal compliance details to foster trust in the program

A fair & equitable compliance program that future-proofs the solar industry

Figure 1 - SA Power Networks DER Compliance Methodology

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The implementation of the program is staged to allow for development of the required capabilities to target specific focus areas. SA Power Networks estimates that the first five stages of the program will take until 2025 to develop, with funding proposed in SAPN's 2025-2030 pricing reset to establish these as ongoing standard functions.

Each phase of the program is accompanied by appropriate industry consultation, communications, training, and systems or reporting to provide relevant parties with information and capabilities to act.

Phase	Focus & capability
1	**Network Application Close-out** This aims to ensure all embedded generation network applications are 'closed-out' so mandatory information is provided to SAPN and other relevant stakeholders. This phase seeks to automate close-out non-compliance detection and prevent applicants from receiving future network approvals if their compliance level falls below a threshold. Appropriate communication of responsibilities, training, and visibility of compliance are established before restriction of future applications.
2	**DOE Device Registration & Capability Test** This phase ensures DOE enrolled devices electronically register and perform automated tests. SAPN currently has limited technical capability (systems) to automatically detect where this occurs.
3	**Export Limits** Automates detection of sites which breach export limits using time-series data. SAPN currently has limited technical capability (systems) and access to meter data to automatically detect where this occurs.
4	**Inverter Region Settings** Automatic detection of non-compliant inverter operation through time-series data. SAPN currently has limited technical capability (systems) and access to meter data to automatically detect where this occurs.
5	**Remote Inverter Configuration Over DOE Interface** Work with the DER Integration API Technical Working Group (DERAPITWG) to update the Australian implementation of IEEE 2030.5 (CSIP-AUS) to include reading and writing of inverter settings.
6	**Future, tba**