

Anna Collyer
Chair
Energy Security Board
Submission by email to info@esb.org.au

17 November 2022

Dear Ms Collyer,

Subject: Energy Security Board (ESB) Interoperability policy consultation paper

SA Power Networks welcomes the opportunity to provide feedback in response to the above consultation paper.

South Australia is at the forefront of the transition to distributed energy, and SA Power Networks is committed to playing our part in enabling and accelerating this transition. We have set a public goal to double the amount of rooftop PV we can accommodate on our network by 2025 and we are working with the solar industry and other stakeholders on a range of initiatives to enable this.

SA Power Networks has been a strong advocate for national open standards for DER interoperability because we consider that such standards will be key to continuing to grow a rich, competitive market for DER, smart appliances, aggregators, VPPs and energy service providers.

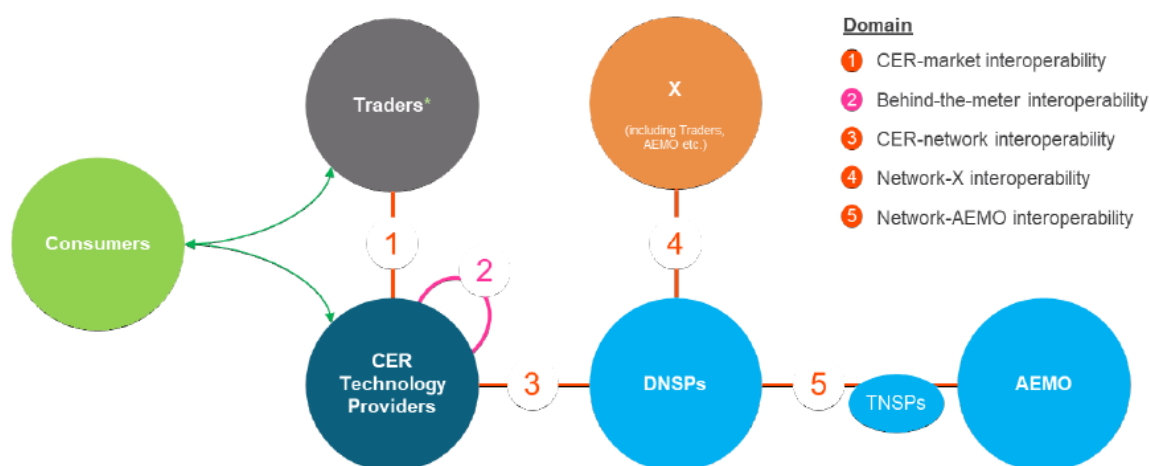
SA Power Networks was a founder member of the industry Working Group within ARENA's Distributed Energy Integration Program (DEIP) that has developed the CSIP-AUS, and we have led efforts to progress the use of this standard to enable flexible export limits (also referred to as Dynamic Operating Envelopes or DOEs) for small customers as a means to overcome emerging issues of local distribution network congestion in high-solar areas. With funding support from ARENA, we have worked with the solar industry to help bring the first CSIP-AUS compliant products to market in mid-2021 and launch the first flexible network connection options for residential solar customers in the NEM. After more than a year of experience in offering flexible connection offers, we have demonstrated the customer and network benefit and have gathered significant learnings that are informing our rollout into Business as Usual (BAU).

In addition to this, SA Power Networks have been closely collaborating with the SA Government and industry on the introduction of Dynamic Export regulations that require all new systems installed in SA from 1 July 2023 to be dynamic exports capable. These regulations have greatly accelerated product compliance with CSIP-AUS and most major manufacturers will be ready to comply with the 1 July 2023 mandate.

The details of this model have been developed in close collaboration with industry through the SA Government-run Dynamic Exports committee and this represents a model that we believe could be rolled out nation-wide. To that end, we have based our recommendations on how the approach taken in South Australia could be adopted to support a "Flexible Exports Capable" mandate for Australia. Our feedback and recommendations are as follows:

1. SA Power Networks support the ESB’s prioritisation of the CER to DNSP communication domain as the first priority

As outlined in section 2.3 of the paper, there are many different interoperability “domains” to which interoperability policy could apply. Since South Australia and Queensland are implementing DOE and flexible export programs, and the majority of DNSPs in other jurisdictions are planning to introduce DOE offers using CSIP-AUS prior to 2025¹, we support the ESB’s focus on the CER to DNSP domain as the first priority (Domain 3 in the diagram below).



We also recognise the importance the role of open, standards-based CER to CER (behind-the-meter) interoperability in preventing customer lockin and to enable churn between providers. Progressing work on the DNSP to CER domain does not preclude work on CER to CER interoperability concurrently or in the future.

It is also important to note that the DNSP to CER communications using CSIP-AUS could be mediated through, or complemented by, aggregator/trader to CER communications.

2. SA Power Networks strongly supports a national Flexible Export Capable Mandate

We are strongly supportive of a national mandate for “Flexible Export Capable” requirements leveraging the CSIP-AUS communications standard. This would provide customers the ability to opt-in to flexible export connection offers when they are offered by DNSPs, promote national consistency and send a clear signal to CER manufacturers to develop capabilities once for the Australian market.

We consider that flexible exports, and more broadly, dynamic operating envelopes, are a foundational element required to enable efficient management of the energy system of the future, ensuring that customers, and parties acting on their behalf, can maximise the value from their smart CER. The incremental cost of such a mandate is very low, and the opportunity to customers large, as demonstrated by trials currently being undertaken by SA Power Networks and AusNet Services.

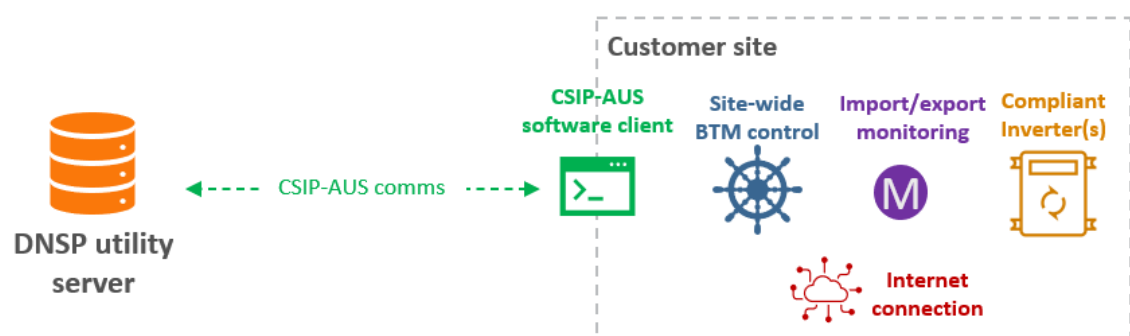
¹ [Review of Dynamic Operating Envelope Adoption by DNSPs \(arena.gov.au\)](https://arena.gov.au/review-of-dynamic-operating-envelope-adoption-by-dnsp/)



3. The ESB should support the development of an interoperability standard the captures the full scope of “Flexible Exports Ready” functionality

Flexible Export limits (and DOEs more generally) are an expression of the limits of a customer’s network connection that vary based on the real-time capacity of the local network. Connection arrangements, including import and export limits, are defined within a customer’s network connection agreement and apply at the customer’s point of network connection. This means, by definition, flexible export limits must apply to the entire customer site, rather than the output of individual devices.

CSIP-AUS is a *communication standard* that enables DNSPs to communicate flexible export signals to CER, CER aggregators or other devices such as Home Energy Management Systems (HEMS). For a site to truly be flexible exports ready and achieve site-wide flexible export limitation, it must contain the following components:



- In the simple single solar inverter case, the software client and BTM control can be contained within the inverter
- When multiple inverters are present on site, an inverter, gateway/HEMS or a cloud platform must manage all exporting devices to achieve a site-wide export limit.
- In the case of an aggregator, the software client would be located in the cloud, and the site control could be managed in the cloud or by a device on site.

CSIP-AUS specifies the behaviour of the CSIP-AUS software client and communication with the utility server, but does not contain requirements for how the site, and devices on that site, physically respond to the upstream communications (e.g. how fast does a site need to respond to export limits, how frequently export measurements must be sampled etc).

This has been achieved in the South Australian Dynamic Export Requirements through the specification of [two guidelines](#) published by the Office of the Technical Regulator (OTR):

- *Remote updating methods guideline*: Outlines the requirement for all installations to support CSIP-AUS communications.
- *Export Limiting Methods guideline*:
 - Contains functional requirements for physical response of a site and devices to CSIP-AUS communications and;
 - Details how installers must configure sites to be compliant with the requirements.

The requirements in both guidelines are tested in the SA Power Networks *Dynamic Exports Test procedure* which informs the whitelisting of compliant systems by the Clean Energy Council (CEC).



To turn this into a nationally applicable approach, we recommend the DEIP Interoperability Steering Committee commence a project to develop part 3 to AS4777 or a new standard that focuses on interoperability. This new document could contain:

- Requirement for sites to support CSIP-AUS communications. This could be expanded to include additional communications protocols as they emerge in future.
- Functional requirements outlining the physical response of individual inverters to be considered *flexible exports capable*.
- Functional requirements for controllers such as gateway devices or aggregators that enact site-wide control in response to upstream flexible export communications.
- Non-functional requirements not captured elsewhere, such as references to Public Key Infrastructure and additional cyber security requirements.

Note this standard could evolve to capture other interoperability domains in the future, including behind-the-meter (CER to CER/HEMS) interoperability.

This would allow the certification of inverter series, communications software clients and site controllers and result in a product listing per the below:

Inverter series	Flexible export capable inverter? (Compliance with AS4777.3 inverter functional requirements and compatibility with a software client and controller*)	Communication software client (Compliance with CSIP-AUS)	Site controller (Compliance with site controller requirements from AS4777.3)
Inverter Series A	Yes	Native inverter capability	Native inverter capability
Inverter Series B	Yes	Gateway/HEMS X	Gateway/HEMS X
Inverter Series C	No		
Inverter Series D	Yes	Aggregator 1	Inverter Series A Gateway/HEMS Y

*The software client and controller may be contained within the inverter in the simple case

4. The ESB should Mandate new installations are “Flexible Exports Capable”, not “Flexible Exports Ready”

SA Power Networks sees two potential approaches for mandating flexible exports requirements for new installations:

1. “Flexible Exports Capable” mandate:

Under this model, all new and upgrade inverters installed from the compliance date must only comprise *flexible exports capable* inverters. This means they meet the required functional requirements and are compatible with a site controller and communications software client, but the site controller, client, export monitoring device and internet connection do not need to be present.

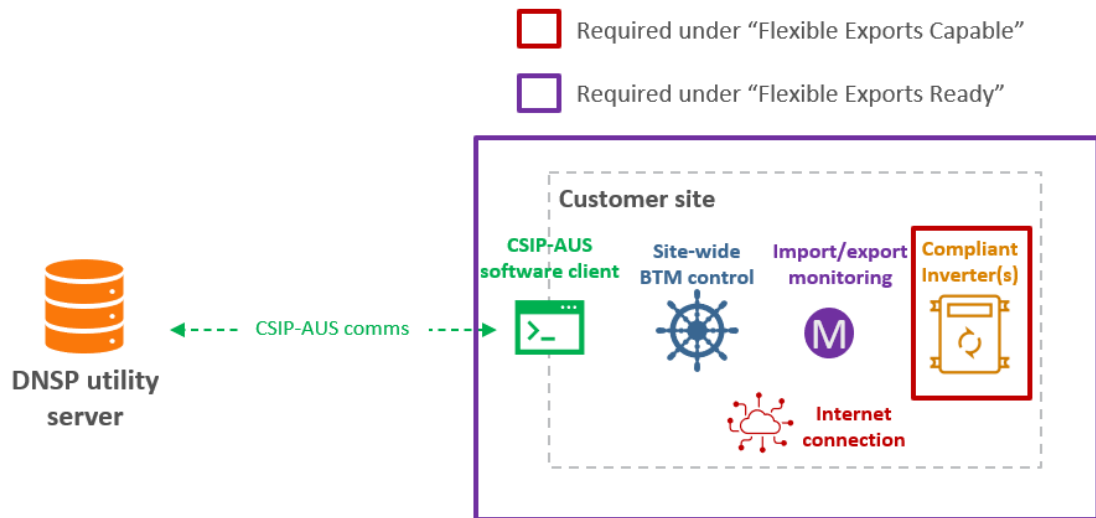


2. “Flexible Exports Ready” mandate:

Under this model, sites must comprise all components required to be ready to enrol in a flexible exports connection option. This includes:

- Flexible Export capable inverters
- CSIP-AUS software client and site control (in the inverter, gateway/HEMS device or in the cloud)
- Export monitoring device
- Internet connection
- Registration with the DNSP (if the DNSP Utility Server is ready)

The requirements for these two approaches are illustrated in the diagram below:



While a “Flexible Exports Ready” mandate would ensure customers can enrol in a Flexible Export connection offer without any additional hardware or configuration, it could potentially introduce extra cost and complexity for installations in jurisdictions where flexible connection offers are not available for several years.

Alternatively, a “Flexible Exports Capable” mandate would ensure customers systems can be easily upgraded to become “Flexible Exports Ready” if a customer chooses to opt in later.

Once flexible export programs are rolled out in South Australia and Queensland, the majority of inverters will be able to meet “Flexible Exports Capable” requirement, meaning there will not be significant additional effort for inverter OEMs to comply with this mandate.

On that basis, SA Power Networks recommends the ESB pursues a nation-wide “Flexible Exports Capable” mandate, as it best balances the objectives of enabling customers to opt into flexible connections as they become available, promotes national consistency in standards and provides a clear signal to OEMs to develop the capability without adding cost and complexity to all CER installations that may never opt into flexible connections. We recommend this is achieved through reference to AS4777.3 capabilities within the rules.

5. An obligation should be put on DNSPs to ensure that when implementing Flexible Exports, their Utility Server is compliant with CSIP-AUS communications



SA Power Networks supports the ESBs proposal to place an obligation on DNSPs to ensure their Utility Server is compliant with CSIP-AUS when implementing flexible exports capability. This will ensure compliant products can be truly “plug and play” between states.

6. Existing industry-led product certification and compliance processes should be adapted to support Flexible Exports capability

In lieu of national testing and certification being available to support the Dynamic Export Regulations in SA, SA Power Networks has been given the role to test and certify inverters and CSIP-AUS software clients which are then listed as compliant by the CEC. To achieve this, we have developed a test procedure and online test server which validates end to end compliance with the OTR’s Dynamic Exports guidelines.

We do not see it as our role to continue to test and certify equipment once flexible exports and CSIP-AUS capability is adopted more broadly. The test procedure and test server we have developed could be readily adapted to cover the full scope of potential AS4777.3 compliance and fit into a process like that used for AS4777.2 as outlined in the diagram below.



SA Power Networks’ test procedure is already under review by the DER API Technical Working Group (CSIP-AUS working group) to assess its applicability beyond South Australia. We recommend the outcomes of this review feed into the AS4777.3 development process.

Additionally, we recommend a CSIP-AUS Utility Server test procedure and certification process is established to ensure DNSPs Utility Servers are compliant with CSIP-AUS.

7. DNSPs are best placed to enforce a “Flexible Exports Capable” Mandate

Per our submission to the *AEMC consultation on DER technical standards* paper, we believe DNSP connection agreements are the right mechanism for placing obligations on owners/operators of CER to conform to standards and connection requirements. Given DNSPs have existing connection application processes that rely on the CEC whitelist of AS4777 compliant inverters and will also have ongoing visibility of compliance for customers enrolled in flexible connection agreements, DNSPs are the natural fit to enforce the “Flexible Exports Capable” mandate.

8. A national approach to PKI and the establishment of a national Certificate Authority are critical to the success of the mandate

In a future where the majority of CER is interoperable and controllable, a cyber security incident could have a significant impact on consumer data privacy, network reliability and power system security. Digital certificates play an essential role in ensuring communications are trusted and secure, but they must be carefully managed to ensure the certificate chain is not compromised. Establishing Public Key Infrastructure (PKI) and a Certificate Authorities (CA) that are fit-for-purpose to manage digital certificates for CER communications at scale is a complex and costly exercise.



Without a centralised PKI and CA, there would be duplication of costs in establishing the capability for each jurisdiction and each CSIP-AUS communications software client would be required to manage certificates from multiple regions.

Because of this, we strongly recommend a national PKI and CA are established as soon as possible. We understand the DEIP ISC are progressing work in this area which we would encourage the ESB to accelerate to ensure it can support the early implementations of flexible exports in SA and Queensland and be ready for the proposed national mandate.

We look forward to continuing to engage with the ESB, AER and AEMC as the three concurrent, CER related consultation processes progress and we would welcome the opportunity to meet with the ESB to discuss these matters in more detail. In the meantime, If the ESB has any questions on any aspect of our response, please contact James Brown, Strategy Lead – DER integration on 0432 813 042 or james.brown@sapowernetworks.com.au.



Mark Vincent
General Manager Strategy and Transformation



Attachment A – feedback on consultation questions

- **Are the five identified domains correctly summarised? Are there gaps or major limitations in this framing?**
 - The interoperability domains are well described
 - Where a trader is present, DNSP to CER communication could be mediated through the aggregator/trader platform or run in parallel
- **What priority should each domain be assigned, considering the interest of all electricity consumers within the consumer energy resource interoperability landscape?**
 - We recommend the following priority order:
 1. Domain 3 (DNSP to CER) to support consistency in current and near-term DOE rollouts
 2. Domain 2 (CER to CER) to prevent customer lock-in and enable churn between providers
 3. Domain 4 (DNSP to traders) DNSP to trader communication of DOEs is partially captured in domain 3, where the trader is mediating DOE communications to the customer site.
 - Domain 5 is a low/non-priority given the small number of DNSPs and existing protocols and interfaces between DNSP and AEMO
 - Domain 1 is a matter for consideration by traders, aggregators and CER OEMs
- **What are the likely costs and benefits for consumers associated with a national ‘flexible export ready’ mandate including in relation to future readiness of customer installations and installation costs?**
 - We recommend a “flexible export capability” mandate rather than “flexible exports ready” per feedback point 4 in the body of our submission.

Costs:

- Majority of OEMs are developing CSIP-AUS and flexible export capability to comply with the 1 July 2023 Dynamic Exports mandate in SA.
 - This development is largely a “sunk cost” for OEMs
 - Any operational costs associated with OEM cloud platforms only apply when customers sign up to flexible export connection agreements and DOEs are communicated.
- As “flexible export ready” only requires inverters to be capable, there should be no additional cost for consumers at time of installation

Benefits

- Consumers benefit by having systems that are able to be made Flexible Export Capable and opt-in to DNSP flexible export connection agreements as they become available.
- DNSPs benefit from a much larger pool of resources having FE capability when offers are available

- Given the forecasts for CER uptake in the ISP, this capability will be essential for managing the supply/demand balance in an efficient, highly decentralised renewable energy system
 - This capability could eliminate the need for coarse “solar backstop” mechanisms as other regions encounter challenges with managing Minimum System Load
 - Promotes equity by preventing customers with non-compatible products from being “locked in” to legacy fixed export arrangements
 - Greater fleet of devices support digital registration capability that can assist with improving visibility and compliance to other standards, e.g. AS4777.2.
- **Do stakeholders agree that DNSPs are best placed to enforce a ‘flexible export ready’ mandate at the time of installation? If not, what alternative models should be considered?**
 - Yes. Please refer to feedback point 7 in the body of our submission for more detail.
 - **What requirements should a ‘flexible export ready’ installation have with regard to internet connectivity (e.g. embedded mobile communication versus LAN connectivity)?**
 - CSIP-AUS fail safe/fallback to lower export levels provide a cost/benefit trade-off for establishing reliable comms.
 - i. If a customer highly values stable export they could have wired LAN + cellular backup
 - ii. If they do not, they could rely on WiFi.
 - iii. Smart meter cellular communications could be utilised in future
 - This is best solved between OEMs, solar industry and customers.
 - **What are the pros and cons of a flexible export ready mandate set in the Rules, via a subordinate instrument, or under a separate head of power (e.g. jurisdictional technical regulation)?**
 - A reference to AS4777.3 capability in the Rules could be the easiest path
 - Mandate through jurisdictional technical regulation was necessary due to timing requirements in South Australia, but does not promote national consistency
 - **If implemented under the Rules, which market body is best placed to establish and oversee the proposed requirement on DNSPs?**
 - AER
 - **What are the pros and cons of a flexible export ready mandate referring to CSIP-Aus in Standards Australia Handbook form?**
 - Has gone through consultation process and drafting guidelines
 - DERAPITWG will maintain a “working version” that can be evolved to support emerging trials and capabilities. If a specific feature is required as part of the mandate, parties should raise a project with Standards Australia to have the changes from the DERAPITWG pass through the SA process.

- **Would there be value in agreeing a national approach to public key infrastructure for consumer energy resources?**
 - Yes. Please refer to feedback point 8 in the body of our submission for more detail.

- **Are there existing examples that could be used as a model for the consumer energy resources ecosystem?**
 - Sunspec PKI program is used in California to support Rule 21 CSIP security
 - This is linked to the Sunspec CSIP certification program which is not fit-for-purpose in the Australian context
 - Root certificates are located in the USA, which wouldn't align with Australian critical infrastructure requirements
 - More investigation is required to determine whether this model can adapted/replicated in Australia.

- **What are the pros and cons of establishing a national certificate authority?**
 - Please refer to feedback point 8 in the body of our submission.

- **What views do stakeholders have about the adaptability of existing industry-led product certification and compliance processes for future use?**
 - Please refer to feedback point 6 in the body of our submission.

- **What views do stakeholders have about the most appropriate body to have oversight of the product certification and listing/delisting processes?**
 - This should be determined through the AEMC standards governance review process.

- **What role could DNSPs have in the product certification/decertification process in the context of improving outcomes for industry and consumers?**
 - DNSPs could provide feedback on products that display non-compliance in the field.