AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Level 22
530 Collins Street
Melbourne VIC 3000

Postal address
GPO Box 2008
Melbourne VIC 3001

T 1300 858 724
F 03 9609 8010
E info@aemo.com.au

6 May 2022

Ms Anna Collyer
Chair
Australian Energy Market Commission

By online submission

Dear Ms Collyer,

Rule change request – Flexible Trading Arrangements (Model 2) and Minor Energy Flow Metering in the National Electricity Market (NEM)

The Australian Energy Market Operator (AEMO) requests that the Australian Energy Market Commission (AEMC) consider making a rule change under section 91 of the National Electricity Law.

This rule change request details a proposal to establish Flexible Trader Model 2 (FTM2), the second of two flexible trading models put forward by the Energy Security Board in its Post 2025 Market Design Final Advice to Energy Ministers. It also details complementary reforms to make the NEM metering framework more flexible to accommodate the proposed connection arrangements, with flow-on benefits for other applications such as smart streetlighting.

The establishment of FTM2 would enable end users to separate their controllable electrical resources and have them managed independently from their passive load without needing to establish a second connection point to the distribution network. For energy consumers, this option offers more flexibility and new opportunities to benefit from innovative products and services that create value, increase competition, and expand choice around how they manage and engage with their distributed energy resources (DER). More broadly, by enabling consumers to be rewarded for their flexibility without needing to change their on-demand energy use, FTM2 is expected to support the transition towards a two-sided market, more efficient integration of DER into the electricity system, and enhanced market outcomes for consumers.

If a rule change is made, AEMO will aim to bundle delivery with implementation of the *Integrating energy storage systems in the NEM* rule change for efficiency and to minimise cost and participant impacts. AEMO requests the AEMC facilitate this process through prompt consideration of this rule change proposal.

AEMO requests the AEMC consider making the proposed rule. Any queries concerning this rule change proposal should be directed to Kevin Ly, Group Manager - Reform Development & Insights on Kevin.Ly@aemo.com.au.

Yours sincerely,

Violette Mouchaileh

Executive General Manager Reform Delivery

Attachment:

Rule change proposal: Flexible trading Arrangements (model 2) and Minor Energy Flow Metering in the NEM

Appendices:

A: Summary table of issues and proposal

B: HLD Flexible trading Arrangements in the NEM

C: Proposed amendments to NER Schedule 7.6

D: Current rules – Flexible Trading Arrangements in the NEM

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Electricity Rule Change Proposal

Flexible trading arrangements and metering of minor energy flows in the NEM

May 2022

aemo.com.au

New South Wales | Queensland | South Australia | Victoria | Australian Capital Territory | Tasmania | Western Australia

Australian Energy Market Operator Ltd ABN 94 072 010 327

Contents

1. Summary

In July 2021, the Energy Security Board (ESB) released its Post 2025 Market Design Final Advice to Energy Ministers[1]. The advice detailed models for the development of flexible trading arrangements in the National Electricity Market (NEM). The delivery of flexible trading arrangements is a key part of the ESB's Distributed Energy Resources (DER) Implementation Plan, which was endorsed by National Cabinet in October 2021[2].

Flexible trading arrangements enable the separation of controllable electrical resources (e.g. battery, solar system and electric vehicle charging) from passively connected electrical resources (e.g. household lighting and general appliances) in an end user's home or business. This would enable the end user to access competitive offers and services for their controllable resources, independent from their general electricity supply, enhancing their ability to be rewarded for their flexibility and maximising the value of their distributed energy resources (DER).

The ESB proposed two models to enable flexible trading. The first is an extension to the current arrangements for Small Generation Aggregator (SGA) connections that has been given effect via the Australian Energy Market Commission's (AEMC) recent *Integrating energy storage systems into the NEM* rule change[3]. The second model seeks to deliver at least the same benefits as model 1, whilst removing material barriers which might inhibit end user uptake (most notably access to and costs of obtaining an additional connection point to the distribution network).

The ESB noted that amendments to the National Electricity Rules (NER) and the National Energy Retail Rules (NERR) would be required to accommodate flexible trading arrangements and that the Australian Energy Market Operator (AEMO) should develop a rule change request for the implementation of model 2. The ESB also noted that the potential to adopt non-traditional types of metering installation and meter location within the design of model 2 was key to the take up of flexible trading arrangements, and that this should be considered as part of the rule change request.

This rule change request proposes modifications to the NER and NERR[4] in accordance with the ESB recommendations, for the implementation of:

- **Flexible Trader Model 2 (FTM2)**, which enables end users to establish a private metering arrangement (PMA) for controllable resource(s) within their electrical installation, and to have these resources managed by a separate financially responsible Market Participant (FRMP); and
- **Minor energy flow metering**, to accommodate connection arrangements not currently considered in the NEM metering framework (principally the inclusion of metering installations within PMAs) by enabling the adoption of non-traditional metering installation types.

AEMO has prepared a high-level design (HLD) to accompany this rule change (Appendix B). The HLD provides detail on key issues and design considerations for the implementation of FTM2 and minor energy flow metering arrangements, as well as consumer protections considerations, AEMO procedure and system changes, and stakeholder impacts.

---

[1] ESB, 2021. Post 2025 Market Design Final Advice to Energy Ministers. Available at https://esb-post2025-market-design.aemc.gov.au/final-advice-july-2021.

[2] Recommendation 7. ESB 2021. Summary of the final reform package and corresponding Energy Security Board Recommendations. Available at https://www.energy.gov.au/sites/default/files/2021-10/Summary%20of%20the%20final%20reform%20package%20and%20corresponding%20Energy%20Security%20Board%20recommendations0.pdf.

[3] AEMC, 2021. Rule determination: National Electricity Amendment (Integrating Energy Storage Systems into the NEM) Rule 2021. Available at https://www.aemc.gov.au/sites/default/files/2021-12/1._final_determination_-_integrating_energy_storage_systems_into_the_nem.pdf.

[4] To give effect to the proposed new flexible trading arrangements, AEMO would also need to make consequential changes to its procedures and systems

National Electricity Rules

AEMO proposes amendments to Chapter 7 and Schedule 7 of the NER to give effect to this rule change request. The key proposed amendments provide for:

- Creation of a new role to provide NMI creation services within PMAs – the 'National Metering Identifier (NMI) Service Provider'; emulating the requirements and functions of the existing Embedded Network Manager (ENM) role.
- Accommodation of minor energy flow metering installations, including exemption from requirements to meet the minimum services specification.
- Establishment of new accreditation categories for Metering Providers and Metering Data Providers (MDPs) for the provision of services within PMAs and minor energy flow metering installations.
- Clarification of the ability for Metering Coordinators (MCs) to propose bespoke arrangements for the testing and inspection of existing, new, and emerging metering devices, technologies, and systems.

National Energy Retail Rules

The NERR provide detailed content on the consumer protection measures that govern the relationships between consumers and retailers and consumers and Local Network Service Providers (LNSPs). AEMO recognises the need for consideration of consumer protection requirements resulting from any change to the method and processes by which a customer can engage more than one retailer or move into a property where more than one retail relationship has previously been established. Accordingly, matters for the AEMC's consideration in the NERR are included in this proposal and the accompanying HLD (section 5), and AEMO recommends the use of the consumer risk assessment tool recently developed by the AEMC in concert with the ESB in further assessing necessary changes.

AEMO Procedures

AEMO will need to update its procedures and systems to give effect to this rule change request, as outlined in HLD section 7.1. This includes updates to AEMO systems, Metrology procedures (Parts A and B), and the Service Level Procedures.

Implementation

AEMO considers that there is an opportunity to align implementation of proposals in this rule change request with the implementation timeframes for the *Integrating Energy Storage Systems into the NEM* rule change and looks forward to working collaboratively with the AEMC to fully enable the flexible trading arrangement models envisioned by the ESB.

2. Relevant background

2.1 ESB recommendations

In July 2021, the ESB released its Post 2025 Market Design Final Advice to Energy Ministers. The advice detailed models for the development of flexible trading arrangements in the NEM, which forms part of the ESB's DER Implementation Plan.

The ESB considered how end users could be provided with greater choice in accessing DER and the range of services that flexible forms of generation, storage and load could support. Flexible trading arrangements were identified as a way to enable the separation of controllable (for example solar PV, batteries, electric vehicles, pool pumps) from uncontrollable resources (the primary source of electricity to an end user's home or business). This separation would enable end users to be rewarded for their flexible demand and generation, while not necessarily making significant behaviour changes for their conventional energy usage.

The ESB proposed two models to enable flexible trading, both based on amendments to features of the existing regulatory framework:

- **Flexible Trader Model 1 (FTM1) – SGA+**: FTM1 seeks to extend the existing SGA framework. The AEMC has progressed FTM1 through the *Integrating Energy Storage Systems into the NEM* rule change process[5]. The main change moves the SGA design from generation only to cater for bi-directional energy flows and participation in ancillary services markets. Doing this will enable SGAs to provide new products and services to end users.
- **Flexible Trader Model 2 (FTM2) – Sub-meter connection point**: FTM2 proposes a specific category of connection arrangement, a private metering arrangement (PMA), that enables a NMI to be established within an end user's electrical installation. FTM2 is represented in **Figure 1** below.

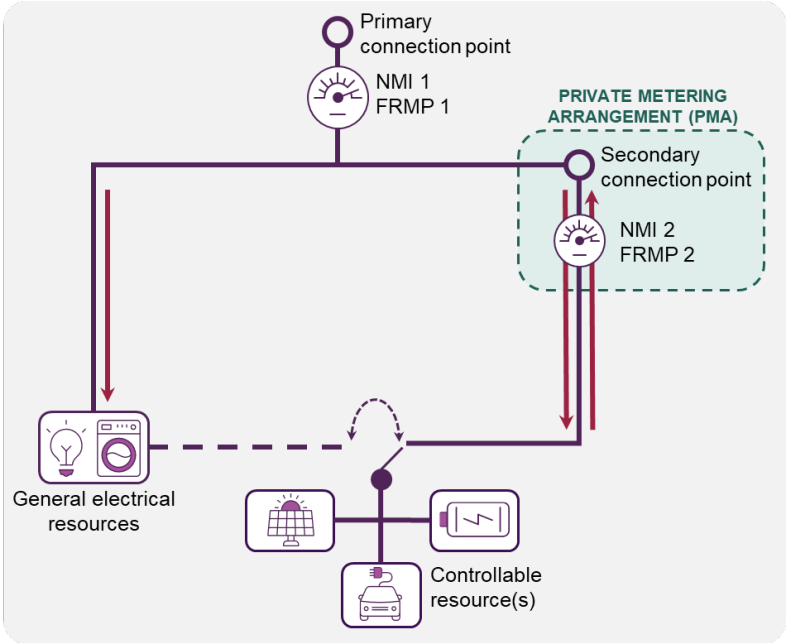
FTM2 has the following key features:

- Like FTM1, FTM2 enables controllable resources to be switched between connection points (e.g. to enable the end user or their agent to arbitrage) or to establish a wholly separate trading arrangement that is not switched between connection points (e.g. a dedicated electric vehicle connection point).
- FTM2 enables an additional 'sub-meter' to be installed, either as retrofit to an existing electrical installation or concurrently with a new DER installation (e.g. solar PV, battery, pool pump or electric vehicle charger). This could be delivered without additional involvement from the distributor or need to upgrade existing electrical infrastructure over and above what would nominally be required for the connection of the electrical equipment in question. The wholesale settlement process already caters for the allocation of flows of energy between a primary and secondary NMI, ensuring that the traders appointed by the end user are only ever charged for energy attributable to them.
- This model could reduce energy-related network charges in comparison with FTM1 by design because energy flows to and from the distribution network are netted, and all energy withdrawn or injected into the local network is measured at a single point – the primary connection point[6].

[5] AEMC, 2021. Rule determination: National Electricity Amendment (Integrating Energy Storage Systems into the NEM) Rule 2021. Available at https://www.aemc.gov.au/sites/default/files/2021-12/1._final_determination_-_integrating_energy_storage_systems_into_the_nem.pdf.
[6] Section 3.6 of the HLD discusses effect on network changes in further detail

- Once a NMI within a PMA is established, current retail market processes such as customer switching, meter churn and metering role appointments function as they would for a traditional connection to the distribution network. Customers would have the same ability to switch providers, or to request the de-energisation or de-activation of a NMI within a PMA that is no longer required.

Figure 1 Flexible Trader Model 2 (FTM2)



Note: FTM2 involves establishing a PMA which includes a sub-metered connection point and separate NMI within the customer's electrical installation, providing the ability to engage a different FRMP for the end user's controllable resources. Like FTM1, FTM2 enables an end user's controllable resources to be switched between connection points (allowing arbitrage across them), or alternatively to establish an entirely separate arrangement without switching (e.g. dedicated electric vehicle charging). An end user could potentially have multiple PMAs behind the same primary connection point. In this example, the flow of energy is bi-directional at the secondary connection point (as indicated by the arrows) as the controllable resources are all connected to it, with the energy flow being uni-directional to the general electrical resources. In practice, energy flows would be uni or bi-directional (withdrawing energy from or injecting energy to the market) depending on the resources connected via each connection point, and how those resources are being used.

The ESB highlighted the importance of considering appropriate metering requirements for metering installations within a PMA. It considered that the PMA requirements could provide a flexible framework for the adoption of non-traditional types of metering installation and meter location for more general application in the NEM—providing device, installation and maintenance standards can be maintained.

The ESB noted that amendments to the NER and the NERR would be required to accommodate flexible trading arrangements and recommended that AEMO develop a rule change request to implement FTM2 within six months of publication of the ESB report, for the AEMC's consideration. In developing the rule change, the ESB recommended that AEMO consider matters raised by interested parties in response to the ESB's consultation, including:

- The application of the consumer protection framework for PMA connection points.
- The precise linking of connection points for accurate wholesale settlement.
- The application of network charges (if any) to the NMI within the PMA and how these would be reconciled across both connection points between the traders.
- A requirement for data access for market participants.
- De-energisation rights and responsibilities.

In October 2021, the National Cabinet agreed to the ESB's recommendation to support the DER Implementation Plan, which includes implementation of flexible trading arrangements.

- The rule change for Integrating Energy Storage Systems in the NEM[7].
- Changes to AEMO systems and procedures to enable the implementation of five-minute settlement, global settlement, wholesale demand response and other ongoing AEMO system development activity.
- The AEMC's Review of the regulatory framework for metering services[8].
- Development of the Consumer Data Right and its application in the NEM[9].
- Development of other ESB initiatives including interoperability requirements, scheduled lite and dynamic operating envelopes.
- AER's Retailer Authorisation and Exemption Guideline review.

[7] AEMC, 2021. Rule determination: National Electricity Amendment (Integrating Energy Storage Systems into the NEM) Rule 2021. Available at https://www.aemc.gov.au/sites/default/files/2021-12/1._final_determination_-_integrating_energy_storage_systems_into_the_nem.pdf.
[8] AEMC, 2021. Review of the regulatory framework for metering services. Available at https://www.aemc.gov.au/market-reviews-advice/review-regulatory-framework-metering-services.
[9] ACCC, 2021. *CDR in the energy sector.* Available at https://www.accc.gov.au/focus-areas/consumer-data-right-cdr-0.

3. Statement of issue

The increasing availability and adoption of controllable DER is providing new opportunities for end users (or parties acting on their behalf) to actively engage with the energy market, however the NER framework does not support end users easily accessing products and services that might maximise the value of DER uptake, for the end user at their connection point and the market more broadly, due to:

- The requirement to establish a second physical connection to the distribution network to access additional energy service providers,
- The limitations of the NER metering framework, which does not cater for non-traditional connection arrangements.

The recently published rule for *Integrating Energy Storage Systems in the NEM* (IESS) makes a number of improvements to the current SGA framework to better enable end users to engage an alternative energy service provider for their DER. This rule recognises the case for enabling greater flexibility for end users and has created structures designed to support the development of additional models - such as the creation of the Integrated Resource Provider (IRP) role. For many end users, the IESS rule improvements to the SGA framework will remain impractical and costly to implement due to the requirement to establish a second connection point to the distribution network. This is particularly the case for small customers, with many barriers preventing or disincentivising uptake of this option, including:

- Network policy – which in some cases does not allow certain types of customers from obtaining a second connection point to their premises.
- Timeliness – where second connections are allowed, the process to obtain one can be cumbersome and requires coordination between multiple parties.
- Cost – there can be a material cost in establishing a second physical connection to the distribution network up front, and end users might be required to pay multiple network tariff access charges for ongoing support and maintenance of additional connection points and metering installations.
- Practicality – the requirements for size and location of fusing, metering and other equipment to support the second connection point will make it impractical for many end users.

These barriers can be observed to an extent in practice, as AEMO understands that it is most common for current SGA connection points to be limited to new builds for small customer connections, where issues of practicality, timeliness and cost issues can to an extent be mitigated if network policy allows connection.

The metering framework does not cater for the types of connection arrangement considered in the ESB's FTM2 design, where the metering installation is connected within the end user's electrical installation rather than directly to the interconnected system. Current NER metering specifications for residential connection points will be impractical and costly to implement within the FTM2 design and are unlikely to provide any material benefit to the end user or market participants. More generally, there are connection arrangements in the NEM that might benefit from an expansion of the metering framework that would support FTM2 – for example, the connection arrangements for street 'furniture', telecommunications equipment kiosks, and legacy connections for some end users within embedded networks are currently prevented from participating in the market and accessing competitive retail offers.

Issues limiting uptake of products and services maximising the value of DER are explored in more detail in Section 2 of the HLD (Appendix B).

4. How the Proposal will address the issues

The HLD (Appendix B) provides detailed design proposals for the implementation of FTM2 and minor energy flow metering, explores the key issues and options associated with these changes, and considers interactions with other ESB reforms. Alongside the requirements for the creation of FTM2 and the establishment and maintenance of a PMA in the NER, AEMO has considered implications for consumer protections in the NERR.

The proposed rule change to allow FTM2 addresses the issues outlined in section 3 by enabling end users to obtain the benefits of separating their controllable resources, without the need to establish an additional connection point to the distribution network—and therefore avoiding the practical barriers and costs associated with this option[10].

The proposed amendments to the NER metering framework to allow minor energy flow metering will provide additional flexibility for connection design and adoption of developing technologies within FTM2, while ensuring the integrity of market processes including energy settlement, network and retailer billing.

The application of changes needed to implement FTM2, in particular to the metering framework, also have the potential to provide material benefits to the market beyond flexible trading arrangements. For example, implementation of the changes required to support FTM2 will remove barriers so that metering can be designed for deployment at connections in the NEM that are currently unmetered, and legacy connections within embedded networks, expanding retail competition and improving the accuracy of market settlement.

4.1 Flexible Trader Model 2 design requirements

As described in section 2.1, FTM2 is made possible through the creation of a PMA—a connection arrangement whereby conditions are established within an end user's electrical installation for the connection, operation, and maintenance of a NMI and an associated NEM metering installation for the connection of flexible DER.

Section 3 of the HLD details the design requirements for FTM2 and key considerations for implementation. These can be summarised as follows:

Arrangements for the creation and maintenance of a NMI within a PMA

AEMO proposes that a new role should be established in the NER for creation and maintenance of NMIs beyond the boundary of the transmission and distribution network, based on the design of the Embedded Network Manager (ENM) role. Rather than being specific to a type of connection, as is the case for the ENM role, the new role should be established so that it could apply to PMAs and, in principle, any future non-LNSP NMI creation and maintenance requirement. AEMO proposes that the role is named 'National Metering Identifier Service Provider' (NMI Service Provider). HLD section 3.1 provides further detail on the proposed arrangements.

PMA authorisation and configuration approval

AEMO considers that the MC role is well suited to undertaking its existing responsibilities within a PMA. AEMO proposes that a new Metering Provider category (e.g. Category 4P) for metering installations within a PMA is created in NER Schedule S7.2. Similar distinct categorisation should also be provided

[10] See section 2.1.1 of the HLD and Energeia, 2020. *Expert Advice on the Cost of Establishing a Second Connection Point.* Available at https://esb-post2025-market-design.aemc.gov.au/32572/1608712682-enegeia-expert-advice-on-the-cost-of-establishing-a-second-connection-point.pdf.

for MDPs seeking to operate at a NMI within a PMA. This will provide the framework for bespoke PMA requirements to be developed in supporting procedures and for Metering Providers and MDPs to demonstrate the required capabilities for these arrangements. Further detail is provided in HLD section 3.2 and HLD section 3.8 outlines the proposed roles and responsibilities for key parties involved in the set-up and ongoing provision of PMAs.

What resources can be connected to a PMA

To ensure the frameworks established in the NER and NERR are appropriate, AEMO recommends that clear specification is provided around the types of resources that can, or cannot, be connected within a PMA. For example, resources connected to a PMA should be controllable, whereas electrical wiring and equipment that is required on-demand, such as life support equipment, should not be connected via a PMA. AEMO proposes that MCs seeking to provide services within a PMA should seek authorisation from AEMO regarding the resources they are planning to connect in line with the guidance provided in the NER. This could be delivered as an authorisation step and ongoing condition related to MC registration for PMA provision. HLD section 3.3 provides further detail on this issue.

Energy settlement arrangements for a PMA

FTM2 relies on a subtractive settlement approach for the allocation of energy flows between the FRMPs for the primary and secondary connection points. The accurate linking of primary and secondary NMIs in Market Settlement and Transfer Solutions (MSATS) standing data is critical. The subtractive settlement approach is detailed in HLD section 3.4.

Energy flows when PMAs are isolated from the grid

AEMO considers that the proposed new categorisation for Metering Provider accreditation (noted above) can mitigate settlement anomalies that arise from DER being utilised as a source of local back-up generation during supply outages. Metering Provider configuration designs must be approved by AEMO prior to deployment. For PMA metering installations, the configuration requirements could include measures to ensure that any energy from DER capable of continued operation within the end user's electrical installation when the supply from the distribution network to the primary connection point is down, is not able to flow through the PMA metering installation.

In addition to the mitigation of this settlement risk via physical connection arrangements, AEMO proposes that MDPs operating within PMAs should be enabled to:

- identify loss of power at the connection to the network; and
- ensure that recorded energy flows (if physical mitigation fails) are treated and that only market metering data is sent to AEMO and market participants for settlement and billing.

Such arrangements can be established in AEMO procedures for accreditation and operation of metering data provision and the Metrology procedure requirements for validation and substitution of metering data. HLD section 3.5 provides further detail.

Treatment of network charges

The end user's relationship with the LNSP is not materially changed due to the establishment of a PMA. As such, AEMO contends that the principles determining the end user's network charges should remain unchanged upon establishment of an FTM2 connection arrangement. That is, network charges should be based on the nature of the connection to the LNSP's network and the flows of energy at the LNSP connection point (i.e. the primary connection point for a PMA). This arrangement requires no change in process for LNSPs.

The FRMP at the primary connection point will be responsible for the payment of all network charges relating to the end user, noting that energy flows used to determine network charges will differ from energy flows charged to the FRMP at the primary connection point for wholesale settlement. AEMO has considered options to mitigate risks related to this proposal, in addition to presenting a range of alternative, but potentially more costly to implement and operate, approaches for the AEMC's consideration - refer to HLD section 3.6 for a detailed discussion of these issues.

4.2 Minor energy flow metering design requirements

Section 4 of the HLD provides a detailed overview of AEMO's proposals and design requirements which accommodate connection arrangements that are currently outside or otherwise not considered within the NEM metering framework (and therefore are not the subject of the AEMC's current metering framework review). This includes:

- metering installations connected within a PMA (not including the primary connection point metering installation which is connected to the network and not within the PMA); and
- traditionally unmetered 'street furniture' connections (e.g. streetlighting, traffic lighting, publicly provided park hotplates/barbeques, and telecommunications kiosks).

For the purpose of this paper, AEMO uses the term 'minor energy flow metering' to identify the metering requirements for these connection types, that are typically associated with flows of energy that are materially lower than residential, commercial and industrial metering installations in the NEM.

AEMO considers that most requirements that apply to type 4 metering installations should also apply to connections with minor energy flows (e.g data accuracy and granularity), with points of differentiation for the following:

- **MC, MDP and Metering Provider roles** (HLD section 4.1): AEMO proposes that that an additional category of Metering Provider accreditation (e.g. Category 4T) is established in NER Schedule 7.2 to ensure Metering Providers have the capability and competency specific to the installation and maintenance of minor energy flow metering installations. AEMO also considers that DNSPs should not be excluded from acting in the role of MC, MDP and Metering Provider for street furniture minor energy flow metering installations given these assets are often maintained by DNSPs and housed within DNSP infrastructure.
- **Metering installation components – meter display** (HLD section 4.2): AEMO considers that the display component of the metering installation is a key area where requirements in the NER can be adjusted to accommodate new technologies and metering systems. AEMO considers that metering systems allowing the end user to access the metering display via an alternative source (e.g. smartphone or in-home display) can provide superior information relative to in-built displays. As such, there is no compelling reason for the NER or NERR to require the ability for a small customer to access a reading locally for a metering installation within a PMA, or any other minor energy flow metering installation. The specifications for proposed new Metering Provider category 4T could provide a mechanism to enable the assessment and application of an equivalently accessible display as contemplated by NER clause 7.8.2(a)(1).
- **Application of NER clauses 7.8.3 and 7.8.4** (HLD sections 4.3 and 4.4): AEMO considers that minor energy flow metering installations should not be required to comply with the minimum services specification. In addition, concessions provided in clause 7.8.4 should not be extended to minor energy flow metering installations – that is, acceptance of remote communications must be a

precursor to PMA establishment in all cases. AEMO proposes establishment of a new clause 7.8.4A to accommodate the requirements for minor energy flow metering installations.

- **Inspection and testing requirements** (HLD section 4.5): AEMO notes that amendments to NER Schedule 7.6 (Inspection and testing requirements), previously provided for the AEMC's consideration (see Appendix C), are critical for the adoption of both FTM2 and minor energy flow metering arrangements within the metering framework. These minor amendments provide clarity regarding the ability for MCs to propose bespoke arrangements for the testing and inspection of existing, new, and emerging metering devices, technologies, and systems, and for these to be assessed for approval to ensure that the integrity of metering data is not compromised.

Small customer metering installations for residential child connection points in embedded networks, connected prior to 1 January 2012, might also benefit from the changes presented in this paper. AEMO considers that whilst not the subject of this proposal, limitations should not be established which might prevent these connection types from accessing changes to the metering framework which might otherwise result in end users obtaining greater access to retail competition.

4.3 Consumer protections

AEMO recognises that the review of the retailer authorisation process, currently being undertaken by the AER in conjunction with the AEMC, will include deliberation of the flexible trading arrangement models.

Section 5 of the HLD (Appendix B) provides detailed treatment of consumer protection issues relevant to this rule change and recommends opportunities for the application of the consumer risk assessment tool. In summary, AEMO considers that the application of FTM2 requires specific review in the following areas of the NERR:

Retailer obligations in relation to customer transfer (rules 57 – 59)

AEMO considers that the small customer transfer requirements should be reviewed to cover the establishment of more than one trading relationship at a customer's premises; this is particularly important where a customer is moving into a premises where a flexible trading arrangement has already been established. The NERR might need to place obligations on prospective FRMPs to inform the customer of their options with respect to any current or inactive NMIs at the same premises to ensure the customer is sufficiently informed of their options. Similarly, it is important that prospective FRMPs can identify the suite of connection services established at the customer's premises so they can offer the most appropriate services and options to the customer. Refer to HLD section 5.1 for more detail.

De-energisation (or disconnection) and re-energisation of premises (rules 107 – 122)

A PMA NMI is dependent on the supply of electricity being maintained via the primary connection point; it would thus be disconnected by default if the primary NMI is disconnected for any reason. AEMO does not consider this arrangement to be problematic and does not consider that amendments to de-energisation and re-energisation provisions are required, as long as appropriate notifications are provided to interested parties within the NER framework. The option of providing primary connection point NMI status updates to related PMA NMIs can be explored as part of AEMO's procedure change consultation process for this rule change. Refer to HLD section 5.2.

Customer information requirements (in particular Part 2, Division 7 Market retail contracts – particular requirements, rules 46A to 52)

The creation and maintenance of additional connection point(s) at a single premises (and for FTM2, explicitly for the same customer within their electrical installation) adds a layer of complexity that might

require simple-to-understand and easily accessible information to be made available to end users. AEMO recommends that the AEMC consider requirements for provision of information in the NERR, particularly in relation to Part 2, Division 7. AEMO considers that this area presents an opportunity to utilise the consumer risk assessment tool[11]. Refer to HLD section 5.3.

Life support equipment (rules 123 – 126)

AEMO considers that customers requiring life support need a greater level of protection than could be provided under a PMA. As such, AEMO considers that the NERR provisions for life support should not need to apply to PMA NMIs, as life support equipment and similar sensitive equipment would be excluded from connection via a PMA connection point by provisions established in the NER to make this limitation explicit (as noted earlier in this section).

[11] ESB, 2021. *Post 2025 Market Design Final Advice to Energy Ministers Part C*, section 2.2, page 26. Available at https://esb-post2025-market-design.aemc.gov.au/32572/1629945838-post-2025-market-design-final-advice-to-energy-ministers-part-c.pdf.

5. How the proposed rule contributes to the NEO and NERO

Before the AEMC can make a change to the NER it must apply the rule making test set out in the NEL, which requires it to assess whether the proposed rule will or is likely to contribute to the National Electricity Objective (NEO). Section 7 of the NEL states the NEO is:

> *… to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity with respect to –*
>
> *(a) price, quality, reliability and security of supply of electricity; and*
>
> *(b) the reliability, safety and security of the national electricity system.*

Similarly, the National Energy Retail Law (NERL) requires that for the AEMC to make a change to the NERR, it must assess whether the proposed rule will or is likely to contribute to the National Energy Retail Objective (NERO). The NERL states that the NERO is:

> *… to promote efficient investment in, and efficient operation and use of, energy services for the long-term interests of consumers of energy with respect to price, quality, safety, reliability and security of supply of energy.*

The Commission must also, where relevant, satisfy itself that the rule is "compatible with the development and application of consumer protections for small customers, including (but not limited to) protections relating to hardship customers" (the "consumer protections test"), Section 236(2)(b) of the NERL.

Where the consumer protections test is relevant in the making of a rule, the Commission must be satisfied that both the NERO test and the consumer protections test have been met.

The proposed amendments to the NER and the NERR for the creation of PMAs and amendments to the metering framework for enabling minor energy flow metering should contribute to the achievement of the NEO and NERO by enabling:

- **Access to competition:**
  - Enabling end users to move to a preferential provider for their DER, without incurring the costs or facing barriers in the establishment of a second connection point to the network.
  - Enabling the end user's chosen provider to offer more diverse products and services for that end user's controllable resources, and to have those resources independently treated in market settlement.
  - Expanding the metering framework to better enable access to flexible trading arrangements and to provide a pathway for currently unmetered non-contestable connections to access retail competition.
- **Reduced barriers of entry to new technologies as they emerge:** providing a framework where registered and accredited participants can apply for the adoption of new technologies and metering installation configurations, through existing approval mechanisms, as they become available for use in the NEM.
- **Energy efficiency and DER integration:**
  - Better enabling end users to select products and services to maximise the use of "active" DER, benefitting the market as a whole.

  - Enabling contestable unmetered loads, such as streetlighting, to access energy efficiency products and services such as smart streetlighting dimming.
- **Improved energy settlement:** metering framework changes enable the reduction of unaccounted for energy and more accurate measurement of energy flows for both contestable and non-contestable unmetered connections.

These benefits are discussed in more detail below.

Access to competition

The proposal streamlines the requirements and processes for the separation and connection of controllable from uncontrollable resources so end users can be rewarded for their flexible demand and generation whilst not requiring a significant behavioural change for other parts of their household energy needs. It removes barriers, such as the need to obtain an additional connection to the distribution network, which might otherwise deter or prevent an end user from engaging specialised service providers and energy plans for their controllable resources.

End users will be able to choose additional energy services suppliers for their flexible demand or generation while remaining on their current retail plan for all other energy needs. This may also provide end users the option to 'try out' new service providers without needing to find a FRMP that meets all their energy requirements, especially where those needs are more diverse and complex.

Energy services suppliers will be able to develop and offer products and services to existing customers, enabling end users to benefit from their controllable resources in new ways, with these resources recognised independently in market systems, processes and settlement.

The proposed supporting changes to the metering framework enable electrical connections that are not catered for within the NEM to be brought within its ambit, and for the first time access retail competition. This includes connections that are currently prevented from accessing retail competition due to the inability to physically fit a NEM compliant metering installation at their connection to the network and connections that are currently unmetered.

Reduce barriers of entry to new technologies

The proposed supporting changes to the metering framework for the establishment of minor energy flow metering requirements would enable metering technologies that are approved for use by the National Measurement Institute in the future to be adopted via application into a review and approval process, rather than requiring bespoke rule or procedure change processes to enable use.

Critically, the combination of adopting FTM2 alongside the proposed amendments to the metering framework for minor energy flow metering means that the location of the connection point and associated metering installation can be local to the DER it is measuring. For example, an electric vehicle charging "unit" might also be capable of being a secondary connection point and metering installation within a PMA.

Other known use cases include metering technology being developed for smart streetlighting, within the control unit of each light or combination of lights. This arrangement has the potential to be materially advantageous in its flexibility when compared to the ESB's flexible trading arrangements model 1 and previous models considered by the AEMC such as the multiple trading relationship rule change in 2015 – both of which require measurement at the connection point to the network via a metering installation that must at least meet the requirements of the minimum services specification.

In the future, electric vehicle charging 'poles' fitted as street furniture might also present as a use case for the adoption of AEMO's proposed changes to the metering framework.

Energy efficiency

The benefits that can be obtained from active management of DER go beyond the potential for a reduction in the price paid for electricity by the end user. This proposal enables providers to enter the market with a specific aim of better utilising DER, which may help reduce power system augmentation costs and therefore reduce the overall cost of electricity supply faced by all end users in the NEM. By making it easier for end users to participate in wholesale markets with their DER (for example, through participation in virtual power plants), this rule change could support increased competition and lower wholesale market prices for all end users.

Optimising the use of renewable generation and energy storage systems might also reduce the emissions intensity of the NEM, by displacing other more emissions intensive resources.

Introducing a framework for minor energy flow metering enables the measurement of currently unmetered connections, providing an incentive for the end user to optimise energy use, as for the first time it will directly influence the size of their electricity bill. It will also enable unmetered connections that are required to be predictable in order that they may be contestable, such as type 7 metering installations, to become unpredictable whilst retaining contestable status and access energy savings as a result (e.g. streetlighting dimming technology at times of no footfall or traffic flow).

Improved energy settlement

In recent years there have been a number of rule changes that have either indirectly or directly sought to improve the accuracy and granularity of the energy settlement process, including the competition in metering rule change[12] and the introduction of both five-minute settlement and global settlement. The proposed changes to the metering framework extend the outcomes delivered through these market enhancements to connections that are currently unmetered. The energy use at these connections is currently calculated or otherwise determined for the purpose of energy settlement; calculation being an unavoidably inaccurate but necessary method of accounting for unmetered connections[13] to assist in the associated mathematical determination and distribution of unaccounted for energy. Any reduction in the volume of calculated energy flows resulting from a movement to a metered value will improve the accuracy of settlement including allocation of unaccounted for energy in the NEM.

[12] AEMC, 2015. *Expanding competition in metering and related services.* Available at https://www.aemc.gov.au/rule-changes/expanding-competition-in-metering-and-related-serv#:~:text=On%2026%20November%202015%2C%20the,a%20wider%20range%20of%20services.

[13] Noting that preliminary calculations of non-contestable unmetered load in the NEM show to be in the region of 350-400 GWh per annum.

6. Expected benefits and costs of the proposed rule

This proposal seeks to remove barriers in order that end users can more easily access at least the same benefits that were considered in the recent IESS rule regarding amendment to the SGA framework.

In 2015-16, the AEMC considered a rule change proposal for the introduction of Multiple Trading Relationships, which sought to deliver similar outcomes for end users to those proposed by the ESB's FTM2[14]. The design proposed at that time was unsuccessful, mainly due to the cost and practicality of implementation, however material benefits were identified by enabling access to additional retail services at an end user's premises.

In particular, a 2015 KPMG report commissioned by the AEMC as part of the rule change, *New Energy Services and Multiple Trading Relationships*[15], identified a number of benefits. Of the nine services examined, enabling end user access to additional trading arrangements was critical for the adoption of two key services:

- A complete charging package for electric vehicles.
- An aggregator purchasing an end user's distribution generation or storage capability, where the aggregator can offer more value to the end user for its demand side response compared to standard retailers.

For the remaining services, KPMG considered that access to additional retailer arrangements could better enable the end user to capture the service's value proposition, noting that:

> *"For demand side flexibility services, the advantage… is that it enables the customer to unbundle its demand response capability from its normal consumption. This could expand the range of providers offering services to the customer and therefore improve choice and possibly help them to negotiate a better price for its demand response compared to the current arrangements where the customer will be negotiating with its existing retailer."*

and that:

> *"For the vulnerable customer services, the advantage… is that it avoids the need for the government or charity to enter into contracts with multiple retailers in order to deliver the service to vulnerable customers. …the government or charity could negotiate directly with one supplier for that particular service while the remainder of the premises' consumption is supplied through standard retailers. This could ease implementation costs also and avoids issues arising when the customer switches retailers as the vulnerable customer service has been de-coupled from the premises consumption."*

The proposal in this rule change request is materially different in design to that considered by the AEMC in the Multiple Trading Relationships rule change. The ESB's FTM2 enables access to at least the same benefits identified by KPMG in their 2015 paper without imposing material cost on market participants. The associated changes to the metering framework for minor energy flow metering enables FTM2 to adopt new technologies as they emerge as well as opening up access to retail competition and energy efficiency measures (as discussed in section 5) for end users where the current NEM requirements act as a barrier.

The HLD provides an overview of the potential impacts on market participants and AEMO procedure and system changes required to implement FTM2 and minor energy flow metering. In summary, the costs

[14] AEMC, 2016. *Multiple trading relationships*. Available at https://www.aemc.gov.au/rule-changes/multiple-trading-relationships.
[15] KPMG, 2015. *New* Energy Services and Multiple Trading Relationships. Available at https://www.aemc.gov.au/sites/default/files/content/0299bffe-193c-4c82-b8d3-36930f578fc6/Report-to-AEMC-KPMG-New-Energy-Services.PDF.

identified by AEMO to implement this proposal in line with the design presented in the HLD would reside with:

- AEMO making changes to procedures and process, including accreditation and configuration changes to the MSATS system.
- MCs, Metering Providers and MDPs seeking to opt in to providing services within PMAs.
- Any party wishing to obtain accreditation from AEMO as a NMI service provider.
- FRMPs adapting their processes in order for them to maximise the benefits of FTM2.
- Technology providers adapting their products to take opportunities made available by minor energy flow metering arrangements.

AEMO considers that other than its own costs to implement FTM2 and minor energy flow metering, the proposals do not impose material costs on participants other than those that wish to provide services in offering FTM2 connection arrangements and minor energy flow metering services (i.e. new business opportunity cost).

The market conditions that informed the KPMG report in 2015 have demonstrably changed over the proceeding years—for example, electric vehicle growth (both overseas and local adoption), development in large- and small-scale battery storage systems and correspondingly, growth in aggregation services as demonstrated via the many virtual power plant trials in the NEM.

AEMO considers that to facilitate the changing market dynamics in the NEM (and specifically the development of new services and technology), models for connecting resources and maximising their use, customer access rights to data, tariff reform, increasing competition and customer choice, and universal access to flexible trading arrangements are required.

7. Proposed Rule

7.1 Description of the proposed Rule

7.1.1 National Electricity Rules

NER rule 7.5 and clause 7.16.6

AEMO proposes that a new rule 7.5B be established to accommodate the requirements for the provision of NMI creation and maintenance services within a PMA (see section 3.2 of the HLD), and that a new accredited role of NMI service provider be created.

Consistent with the AEMC's recent determination for the *Integrating energy storage systems into the NEM* rule change and the creation of a universal 'trader' role in the form of the IRP, AEMO proposes that 7.5B be drafted in order that it might provide for the universal provision of services for connections that are not owned, controlled, or operated by an LNSP, including but not limited to PMAs.

Clause 7.16.6 should be extended with provisions for the NMI service provider role, which place obligations on AEMO for the creation of service level procedures and guides to support accreditation.

NER rule 7.8

AEMO proposes that rule 7.8 (Metering installation arrangements) be amended to accommodate minor energy flow metering installations. Specifically, AEMO recommends that a new clause, 7.8.4A, is created to accommodate the requirements for minor energy flow metering as described in section 4 of the HLD.

AEMO recommends the AEMC consider including the following requirements in the proposed new clause:

- The conditions and situations within which minor energy flow metering could be installed.
- Situations and connection arrangements that are explicitly prevented from connection via a minor energy flow metering installation (e.g. electrical installations that accommodate life support equipment).
- The establishment of procedures, by AEMO, for technical requirements for minor energy flow metering installations and requirements for their installation in PMAs.

Clause 7.8.3(a) should be amended to include reference to the new clause, in order that minor energy flow metering is not required to meet the minimum services specification.

NER Schedule 7.2

NER S7.2 confirms requirements for Metering Provider registration and accreditation and details the categories of registration for the provision, installation, and maintenance of the various types of metering installation. S7.2 also details the capabilities that must be exhibited by applicant Metering Providers to AEMO when seeking accreditation.

AEMO proposes the creation of two new categories within NER S7.2:

- Category 4P – for the provision of Metering Provider services within a PMA (see HLD section 3.2)
- Category 4T – for the provision of Metering Provider services for minor energy flow metering installations (see HLD section 4.1).

These categories will leverage the existing framework for provision of Metering Provider services for type 4 metering installations, including equipment class requirements in NER table S7.2.2.2 and capabilities specified in S7.2.3.

Further specification could be provided in NER Schedule 7.2 in relation to these categories. For example, a new clause S7.2.5A could be established to specify requirements for provision of an alternative meter display as contemplated by NER clause 7.8.2(a)(1) for category 4T. Similarly, a new clause S7.2.5B could be established to specify requirements for the treatment of energy flows within a PMA during a power outage on the LNSP's network for category 4P.

These amendments will establish the basis for metering configuration design application, approval and ongoing assurance assessment via the NEM accreditation framework.

NER Schedule 7.3

NER S7.3 confirms requirements for MDP registration and accreditation and details the categories of registration for the collection, validation, and provision of metering data. The schedule also details the capabilities that must be exhibited by applicant MDPs to AEMO when seeking accreditation.

Amendments proposed to S7.2 should be extended to S7.3 in order that accreditation for metering data provision can be specifically considered within PMAs and for minor energy flow metering installations (see HLD sections 3.2 and 4.1).

NER Schedule 7.6

AEMO proposes that S7.6 be amended as provided in Appendix C, to assure confidence in the accuracy of metering used in the NEM whilst enabling the adoption of innovative approaches to testing and inspecting metering installations as technology and systems develop over time (refer to section 4.5 of the HLD).

NER – other matters for the AEMC's consideration

AEMO has proposed several matters for the AEMC's consideration in this paper that might need to be reflected by amendments to the NER, including:

- NER clause 7.6.4 (inclusive of changes made for the global settlement final rule – Type 7 metering installations and non-contestable unmetered loads) for the treatment of these connection points upon becoming metered, and the LNSP's role in operating as MC as discussed in section 4.1 of the HLD.
- AEMO considers that an amended NER clause 7.16.6 (requirements for the NMI service provider service level procedures) as proposed above, should encompass AEMO's ability to specify requirements for the provision of NMI linking requirements for PMAs as discussed in section 3.4 of the HLD, to ensure accuracy of energy settlement.
- Making precise separation between PMAs and embedded networks, in order that parties interested in seeking to obtain the benefits of FTM2 cannot circumvent the corresponding obligations by exploiting any lack of clarity or deficiency in the application of the embedded network framework, as discussed in section 2.1.3 of the HLD.

7.1.2 National Energy Retail Rules

As outlined in HLD section 5, AEMO recommends that the AEMC review and consider the implications of this rule change for the following sections of the NERR:

- Retailer obligations in relation to customer transfer (rules 57 – 59).

- De-energisation (or disconnection) of premises – small customers (rules 107 - 120) and re-energisation of premises (rules 121 – 122).
- Customer information requirements (in particular Part 2, Division 7 Market retail contracts – particular requirements, rules 45A to 52).
- Life support equipment (rules 123 – 126).
- Tariffs and charges (rule 46) with regard to amendments resulting from network charge allocation requirements for PMA connection points.

AEMO also considers that the development of flexible trading arrangements presents an opportunity to utilise the consumer risk assessment tool recently developed by the AEMC in concert with the ESB to further assess any necessary changes.

7.2 Implementation

The HLD provides an overview of implementation issues including timing, impacts on market participants, and changes required to AEMO systems and procedures.

Due to the interdependence between the design of AEMO procedures and the proposed changes to the NER and NERR discussed in this proposal, AEMO intends to work collaboratively with the AEMC in order that the development of the rules and procedures, consultation with interested parties and the implementation and effective dates of any changes to rule and procedures can be aligned to the extent that it is necessary and practical to do so.

7.3 Interactions with other ESB reforms

AEMO considers that this proposal is a logical extension of the recently published IESS rule change and is sufficiently separate from other ESB initiatives to be progressed independently and without unnecessary delay.

AEMO is aware that discussions on the design of Dynamic Operating Envelopes (DOE) have referenced the flexible trading arrangement models, however AEMO does not consider that the design contemplated in this proposal is sufficiently novel that it requires unique or problematic consideration in the design of DOE.

DOE design will need to accommodate existing arrangements where customers have connections beyond the connection point to the distribution network – including the complex range of embedded networks that operate in the NEM today, many of the connections and the resources behind them being invisible to NEM market participants. Likewise, other complex connection arrangements, including where a single customer has more than one connection point to the distribution system (e.g. a second connection point operated by an IRP for the customer's DER) will need to be examined. AEMO considers that solutions for the application of DOE at these more complex connection point arrangements will also provide a model that can be applied to the more simplistic connection arrangements presented in this proposal.

Volume increase in complex connection arrangements resulting from both the IESS rule and this proposal might be a matter requiring consideration in the design of DOE, however AEMO contends that just as this was not a matter of substance within the final rule and determination for the IESS rule, there is no rationale for it to be a material factor in the consideration of this proposal.

Whilst FTM2 connections might enable better visibility of controllable resources in the NEM, AEMO has identified no interdependency with proposals to implement Scheduled Lite and to the extent that proposals on Interoperability are understood at this time, no impediment that would delay the progression of this proposal for FTM2.

8. Appendices

The appendices to this rule change are provided as separate documents as outlined below.

Appendix A	Summary table of issues and proposal
Appendix B	High-Level Design
Appendix C	Proposed amendments to NER Schedule 7.6 (Metering Framework Review)
Appendix D	Current rules relevant to the rule change request

Appendix A: Summary table of issues and proposal

1.1 Overarching issue

ISSUE	PROPOSAL	REFERENCE FOR FURTHER DETAIL
Flexible trading was established by the *Integrating Energy Storage Systems in the NEM (IESS)* rule change, but there are material barriers to its uptake by end users. As a result, current arrangements in the National Electricity Rules (NER) are not sufficient to facilitate the innovative business models and services required to make the most of Distributed Energy Resource (DER) opportunities, enable end users to maximise the value of their investments and optimise the integration of DER into the evolving energy system. Specific barriers include: • Network policy: Some networks currently do not allow multiple connection points at a residence. • Timeliness: The process is not controlled by any one party, but instead is multi-step with multiple opportunities for delay. • Cost: the cost of establishing a second connection point to the distribution system is material and it is likely that an end user will have to pay ongoing network access charges for each network connection point.	Provide a framework within the NER that lowers barriers for end users to obtain flexible trading, by enabling the establishment of connection points within end users' electrical installations – 'Private Metering Arrangements' (PMAs). Establishing a connection point within end user electrical installations does not require the involvement of the local network service provider, is likely to be implemented with greater efficiency, at a lower cost and incur lower ongoing operational costs and fees. A key design requirement is the creation of a new role in the NER – the National Metering Identifier (NMI) Service Provider – to create and maintain NMIs within PMAs.	Rule change request: section 3 High Level Design (HLD): section 2.2.1

1.2 Regulatory barriers to the establishment or use of proposed model

ISSUE	PROPOSAL	REFERENCE FOR FURTHER DETAIL
Metering		
Current requirements for *small customer metering installations*[1] aren't necessarily applicable to PMAs and, if imposed, are likely to create unnecessary barriers. Application of the minimum services specification (NER S7.5) would require metering device design and componentry that is not relevant to a PMA connection – adding cost and physical size requirements to devices that comprise the metering installation.	Define metering installation requirements for PMAs independently to *small customer metering installations*, and do not require the application of NER S7.5 for metering installations withing a PMA. Note that type 4 metering installation requirements must be maintained to support market processes and energy settlement – e.g. remote communications, device accuracy, interval length, data formats, etc.	Rule change request: section 4.2 HLD: section 2.2.3
NER requirements for a physical display at the metering installation are not relevant at a PMA connection – the NER allows for an 'equivalently accessible' display, but does not provide a framework or guidelines to support what might reasonably constitute 'equivalently accessible'.	Clarify requirements for the provision of an 'equivalently accessible' display. Consider utilising the Metering Provider and Metering Data Provider (MDP) accreditation and procedure frameworks to assist in specifying, authorising or otherwise enabling alternatives to a physical display at the metering installation.	Rule change request: section 4.2 HLD: section 4
Current metering service provider role requirements do not directly address the requirements for management of metering installations and metering data within PMAs. For example: • Management of metering installations and metering data where there is no physical display on the device • Management of metering data relating to flows within the end user's electrical installation at times when the supply of energy from the network is down.	Extend the Metering Provider and MDP categories to allow bespoke PMA requirements to be developed in supporting procedures. This has the benefit of ensuring that only those Metering Providers and MDPs who choose to engage in the provision of services at PMA connection points are required to adapt systems and processes to do so.	Rule change request: section 4.2 HLD: section 4

[1] *small customer metering installation* as defined in the NER Chapter 10

1.3 Outcomes: Questions or potential risks if PMAs are established

ISSUE	PROPOSAL	REFERENCE FOR FURTHER DETAIL
Consumer protections / end user experience		
End users may not know the options available to them regarding access to flexible trading when they move into a new premises.	Review small customer transfer requirements and consider obligations on retailers for information provision to prospective customers.	Rule change request: section 4.3 HLD section 5.1
De-energisation and re-energisation processes need to be considered and requirements made transparent for all interested parties regarding PMA connection points.	National Energy Retail Rules (NERR) obligations in this area should not require amendment, providing that all interested parties understand and have clarity on the relationship between the primary and secondary connection points for Flexible Trader Model 2 (FTM2). Matters of process to de-activate and re-activate PMA NMIs and data streams may be further considered in changes to AEMO procedures resulting from a new rule.	Rule change request: section 4.3 HLD section 5.2
Additional complexity resulting from enabling flexible trading could create confusion for end users in choosing, contracting and dealing with multiple retailers or other energy service providers.	Consider requirements for provision of information in the NERR. Consider simplifying the model by limiting resources that can be connected to a PMA and utilising the consumer risk assessment tool.	Rule change request: section 4.3 HLD section 5.3
An additional level of retailer between the customer and the network could create complexity and therefore an unnecessary risk for life support arrangements.	Exclude life support equipment from being able to be connected to a PMA, i.e. life support equipment can only be connected to a primary connection point in a PMA.	Rule change request: section 4.3 HLD section 5.4
Commercial and charging		
If the current process for allocation of network charges to Financially Responsible Market Participants (FRMPs) is retained, the primary connection point FRMP will be responsible for network charges relating to energy flows that will be different (more or less) than they are responsible for in wholesale settlement. This could lead to the primary connection point	AEMO proposes a number of alternative models for the AEMC's consideration, however, proposes that the current process for network charges should remain, supported with transparent connection point information and metering data	Rule change request: section 4.1 HLD section 3.6

FRMP over or under recovering from the end user depending on the nature of the DER at secondary connection points, the prevailing network fee structures and the FRMPs agreed charges with the end user.	available to incumbent and prospective FRMPs.	
There is a risk of 'primary' retailers being 'hollowed out' by having all services at a premises connected via secondary meters.	Consider explicitly prohibiting the creation of a PMA where its intent is to separate energy flows for the electrical circuitry and plant that is the principal user of the connection to the distribution network and limiting the type and capacity of resources that can be connected via a PMA connection point, to mitigate against this risk.	Rule change request: section 4.1 HLD section 3.3 and 3.6
Metering		
The proposed subtractive settlement process would not work efficiently unless the metering data is provided to AEMO to the same schedule and in the same format.	Both the primary meter and the sub-meters must have remote communications established and must all produce 5-minute metering data.	Rule change request: section 4.2 HLD section 3.4 and 3.7
NER Schedule 7.6 requires clarification regarding the development and approval of an asset management strategy by Metering Coordinators (MCs) – this clarification is critical in enabling innovative approaches to testing and inspection of metering installations to be proposed, assessed, approved, deployed and monitored.	Minor amendments should be made to S7.6 to clarify the ability for MCs to propose bespoke arrangements for testing and inspection of existing, new and emerging devices, systems and technologies.	Rule change request: section 4.2 HLD section 4.5 and Appendix C
Ensure the correct framework is used once available		
The embedded network framework is being used to create a 'flexible trading' arrangement within an end user's electrical installation. This is problematic as it creates the potential for uncontrolled energy settlement anomalies to occur and is not transparent to all market participants, inhibiting market processes from operating and the correct application of consumer protections.	On establishment of FTM2 arrangements, the use of the embedded network framework as described should be explicitly disallowed.	HLD section 2.2.2

1.4 Outcomes: Use of minor energy flow metering outside of PMAs

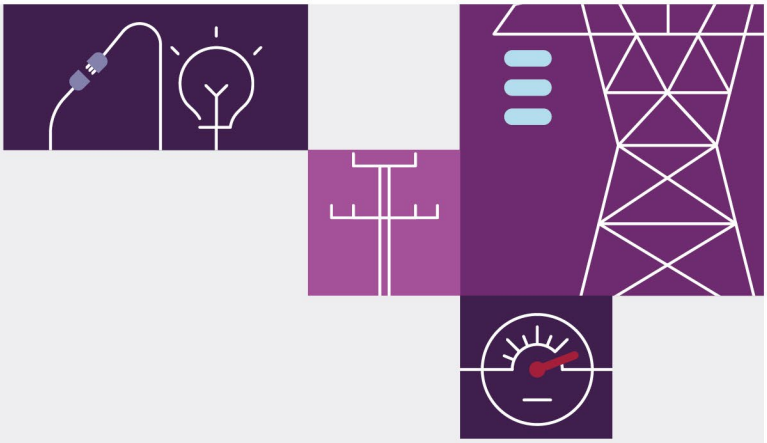
ISSUE	PROPOSAL	REFERENCE FOR FURTHER DETAIL
Current metering requirements mean there are many existing connection types currently unable to engage in the energy market, such as traffic signals, customers within "legacy" embedded networks (ENs) (due to the size, location and design of the measurement devices used as meters for installations pre-2012 in embedded networks) and telecommunications equipment kiosks and infrastructure. Currently, energy flows for these connection types are either: • off-market - in the case of connections for end users within legacy embedded networks, or • identified in energy settlement processes, from the Global Settlements implementation date, as non-contestable unmetered loads (NCONUML). Until a metering solution is identified for these connection types: • End users within legacy ENs will not be able to access retail competition in any circumstances, regardless of the progression of the AEMC's EN review, or potential changes to embedded network requirements in Victoria. • Connections within the NCONUML framework will continue to be treated as "franchise loads", not able to access retail competition • National Electricity Market (NEM) settlement will be less accurate as NCONUML calculation is inherently imprecise.	Minor energy flow meters should be able to be used for these applications.	Rule change request: section 4.2 HLD section 2.2.3 and 4
Loads currently settled in the NEM as type 7 metering installations are not able to access	Minor energy flow meters should be able to be used for these applications, thereby	HLD section 2.2.3 and 4

energy efficiency products and services as, when they become unpredictable, they are no longer suitable to be treated as a type 7 load and must be metered to remain contestable.	facilitating actual measurement of energy flows for these connection points (as contemplated in NER Table S7.4.3.1 Item 5(d)).	
If streetlighting and other street furniture (such as traffic signals, park barbeques, bus shelter lighting, etc.) can adopt minor energy flow metering, it might be impractical for a party other than the Distribution Network Service Provider (DNSP) to act in the role of Metering Provider due to the location, authorisation and safety requirements that might apply, as it will be common for these connections to be located within DNSP's infrastructure.	DNSPs should not be excluded from acting in the role of MC, MDP and Metering Provider for 'street furniture' connections.	HLD section 4.1

Flexible Trading Arrangements (Model 2) and Minor Energy Flow Metering

May 2022

Appendix B: **High Level Design**



Important notice

Purpose

This publication has been prepared by AEMO to provide information on the potential design for the implementation of the Energy Security Board's (ESB) Flexible Trader Model 2. This paper considers the National Electricity Rules, National Energy Retail Rules, AEMO Procedures and market processes in the National Electricity Market, as at the date of publication.

Disclaimer

This document or the information in it may be subsequently updated or amended. This document does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the Wholesale Electricity Market Rules or any other applicable laws, procedures or policies. AEMO has made every effort to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness.

Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this document:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document; and
- are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, or for any use or reliance on the information in it.

Executive summary

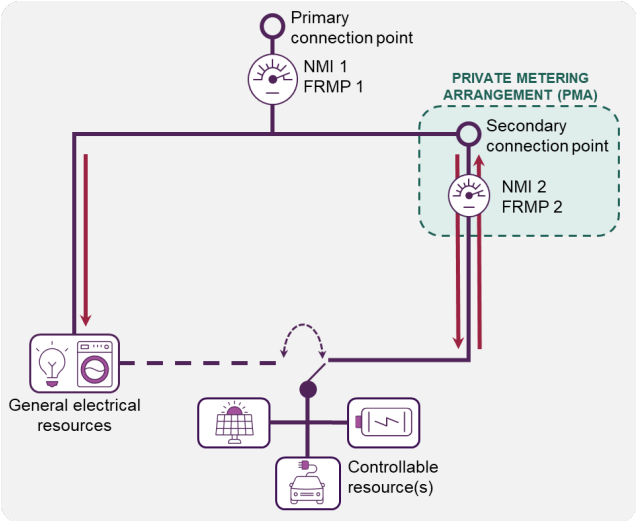
This high-level design (HLD) has been prepared to accompany the Australian Energy Market Operator's (AEMO's) rule change request to enable flexible trading arrangements and metering for connections with minor energy flows in the National Electricity Market (NEM). It is based on recommendations provided by the Energy Security Board (ESB) in its Post 2025 Market Design Final Advice to Energy Ministers, which outlined two models for the development of flexible trading arrangements and noted that the adoption of non-traditional types of metering installation would be critical to the uptake of flexible trading.

Flexible trading arrangements enable end users to 'unbundle' their controllable electrical resources (e.g. distributed energy resources [DER] like batteries, solar PV and electric vehicle chargers) from their passively connected resources (such as household lighting or general appliances). This separation gives end users the option to engage a different financially responsible Market Participant (FRMP) to manage the controllable portion of their load—and therefore, to be better rewarded for their flexible demand and generation without necessarily making behaviour changes for their conventional energy usage.

This HLD outlines the key design requirements for the implementation of:

- **Flexible Trader Model 2 (FTM2)**, which is the second of two models proposed by the ESB to enable flexible trading. FTM2 enables end users to have a private metering arrangement (PMA) where a National Metering Identifier (NMI) is established within their electrical installation (see Figure ES1). With FTM2, end users can access similar benefits to establishing a second connection point (that is, ESB's Flexible Trader Model 1), without many of the associated barriers around access and cost.
- **Minor energy flow metering arrangements**, which would accommodate connection arrangements not currently considered in the NEM metering framework by enabling the adoption of non-traditional metering installation types and meter locations. This includes metering installations within PMAs, as well as a range of other applications including traditionally unmetered street 'furniture' connections like streetlighting.

Figure ES1 Flexible Trader Model 2 (FTM2)



The implementation of FTM2 and minor energy flow metering arrangements would promote competition, reduce barriers to entry for new technologies, and provide customers with more choice in how their flexible energy

resources are managed. It would also have broader benefits, including providing a pathway for currently unmetered non-contestable connections and legacy customers within embedded networks to access retail competition; helping to reduce wholesale and network costs for all end users by maximising the use of 'active' DER; and providing new ways to support vulnerable customers through energy services.

FTM2 design features

This HLD proposes the following design features for implementation of FTM2:

- Creation and maintenance of a NMI within a PMA would be undertaken by a new accredited role, a 'NMI Service Provider', which would be scoped to encompass provision of NMI services for any connections not owned, controlled, or operated by a local network service provider (LNSP).
- PMA authorisation and configuration approval would require the establishment of new accreditation categories for Metering Providers and Metering Data Providers (MDPs) for the provision of services within PMAs. This would ensure parties seeking to provide these services have the required capabilities.
- Limitations on the type, and potentially the capacity, of resources connectable within a PMA should be established in the National Electricity Rules (NER), enabling the connection of controllable DER but excluding the connection of life support and other sensitive equipment. Metering Coordinators (MCs) seeking to provide services within a PMA should seek authorisation from AEMO regarding the resources they wish to connect to confirm compliance with guidance and requirements provided in the NER.
- Energy settlement for FTM2 would be determined using a subtractive settlement approach in AEMO systems for the allocation of wholesale energy flows between the FRMPs at the primary and secondary (i.e. PMA) connection points.
- New requirements for the management of data within PMAs are required to avoid the risk of anomalies in energy settlement caused by back-up generation when PMAs are isolated from the grid and can be accommodated in the accreditation requirements for MDPs.
- The principles determining network charges for the end user are critical for the effective implementation of FTM2. AEMO considers that these arrangements should remain unchanged from the status quo upon establishment of an FTM2 connection arrangement, principally because network charges should be based on the nature of the connection and flows of energy to and from the LNSP's network and the end user's relationship with the LNSP is not materially changed upon creation of a PMA connection point.

Minor energy flow metering design features

A more flexible metering framework is required to accommodate new technologies and metering systems, including PMAs and other minor energy flow metering applications such as street furniture connections. AEMO recommends that for minor energy flow metering installations, requirements for the display component should be re-evaluated, and the minimum services specification should not apply. In addition, clarification is required regarding the ability for MCs to propose bespoke arrangements for the testing and inspection of existing, new, and emerging metering installations.

As with FTM2, new accreditation categories would be established for Metering Providers and MDPs for provision of minor energy flow metering services.

Consumer protections

Because it changes the nature of the tripartite relationship between customer, retailer and distributor, AEMO considers that a range of consumer protection issues relevant to FTM2 require further review. This includes customer switching requirements, de-energisation and re-energisation of connection points, customer information requirements and life support equipment provisions. The rule change request provides an opportunity for application of the consumer risk assessment tool recently developed as part of the Post 2025 Market Design process.

Implementation and impacts

AEMO considers that the proposals in this HLD do not impose material costs on participants other than those wishing to provide services offering FTM2 connection arrangements and minor energy flow metering services (i.e. new business opportunity cost).

AEMO intends to work collaboratively with the Australian Energy Market Commission (AEMC) to ensure the development of the rules and procedures, consultation with interested parties, and implementation of changes to rules and procedures can be aligned to the extent that it is necessary and practical.

Contents

Tables

Figures

1 Introduction

1.1 Purpose

The purpose of this report is to provide an operational high-level design (HLD) for the implementation of the Energy Security Board's (ESB) flexible trading arrangements model 2 (Flexible Trader Model 2 [FTM2]) and associated metering arrangements for connections with minor energy flows.

This HLD follows the recommendations of the ESB in its Post 2025 Market Design Final Advice to Energy Ministers (July 2021)[1], which detailed models for the development of flexible trading arrangements in the National Electricity Market (NEM) and recommended the Australian Energy Market Operator (AEMO) draft a rule change proposal for the Australian Energy Market Commission's (AEMC) consideration. The ESB's recommendations were approved by National Cabinet in October 2021.

Section 2 of the rule change proposal provides a detailed overview of the ESB's recommendations and the key features of FTM2, as well as proposed changes to the National Electricity Rules (NER) and National Energy Retail Rules (NERR) required for implementation.

This HLD accompanies the rule change request and has the following objectives:

- Provide the AEMC and other interested parties with:
  - a recommended design for the implementation of FTM2 consistent with the ESB's design outline and recommendations; and
  - associated requirements for changes to the NEM metering framework necessary to facilitate FTM2.
- Identify areas of particular interest that the AEMC might consider evaluating via the recently developed consumer risk assessment framework[2].
- Enable market participants and other affected stakeholders to evaluate the system and process changes they would need to make in relation to the ESB's recommendations.

This HLD also covers a range of matters recommended for AEMO's consideration by the ESB, including:

- the application of the consumer protection framework for private metering arrangement (PMA) connection points;
- the precise linking of connection points for accurate wholesale settlement;
- the application of network charges (if any) to the National Metering Identifier (NMI) within a PMA and how these would be reconciled across both connection points between financially responsible Market Participants (FRMPs);
- data access requirements for market participants; and
- de-energisation rights and responsibilities.

[1] ESB, 2021. *Post 2025 Market Design Final Advice to Energy Ministers*. Available at https://esb-post2025-market-design.aemc.gov.au/final-advice-july-2021

[2] ESB, 2021. *Post 2025 Market Design Final Advice to Energy Ministers Part C*, section 2.2, page 26. Available at https://esb-post2025-market-design.aemc.gov.au/32572/1629945838-post-2025-market-design-final-advice-to-energy-ministers-part-c.pdf

AEMO has in-depth knowledge of the processes used to support retail contestability, metering data processes, accreditation and registration requirements, and energy settlement. AEMO has considered how to best achieve the implementation of FTM2 and presents proposals which leverage existing systems, processes, and obligations to minimise the scale of change required by market participants and providers. AEMO has also identified use cases and end users that can benefit from the proposals beyond the application of FTM2 as outlined by the ESB.

1.2 Consumer adoption

The ability to more easily separate DER and for it to be managed independently from the general energy usage could support a range of existing and future use cases[3] for diverse end users, including:

- **Aggregation and demand response services**: An end user could engage a separate provider to independently manage their controllable resources (e.g. batteries, pool pumps, hot water) and participate in energy services on their behalf, without needing change their primary retailer or adjust their general energy use behaviour.
- **Electric vehicle (EV) charging packages**: An end user could select an electric vehicle package bundled with a certain period or range of free or discounted charging included (say three years). FTM2 would enable the charger to be installed with its own connection point and the EV service provider would be responsible for managing the energy flows and billing for the EV charger. At the end of the agreed three-year charging period, the end user would have the flexibility to select a new EV-specific charging product or have their charger default to their primary retailer. As part of these arrangements, a service provider could establish an agreement with the end user to actively manage their EV charging to avoid peak periods, delivering savings to the end user and reducing network impacts.
- **Vulnerable customer support**: A local Council could directly assist vulnerable local end users with their energy bills by negotiating or covering the cost of services such as hot water or space heating. FTM2 would enable the Council to negotiate and contract with a single service provider for all end users within such a scheme, while end users could retain their existing retailer (and switch retailer at any time) for the rest of their electricity use.
- **Commercial/industrial wholesale pass-through contracts**: A commercial/industrial end user could contract with a specialist provider for the controllable portion of its load without needing to establish a separate network connection point, while all other electrical resources are supplied via a traditional retail contract. This arrangement expands the options and service providers available to the end user to manage electrical resources and maximise the value of resource flexibility.

The proposed design needs to manage complexity and ensure that end users are able to switch provider as they do today, independently for each established connection point and that flexible trading is entirely optional for end users, regardless of whether these arrangements have been established at their premises in the past.

The proposal provides opportunities to implement the recently developed Customer Risk Assessment Tool to evaluate risks that might arise and develop proportionate mitigation strategies. AEMO also acknowledges the work currently being undertaken by the Australian Energy Regulator (AER) in its *Retailer authorisation and*

[3] These use cases are partly based on work commissioned by the AEMC as part of the Multiple Trading Relationships rule change process in 2015: KPMG, 2015. *New Energy Services and Multiple Trading Relationships*. Report for AEMC. Available at https://www.aemc.gov.au/sites/default/files/content/0299bffe-193c-4c82-b8d3-36930f578fc6/Report-to-AEMC-KPMG-New-Energy-Services.PDF

exemption review to better understand the application of existing consumer protection frameworks to emerging energy services and business models and Consumer Insights work being conducted by the ESB.

1.3 Document Structure

This remainder of this report is structured as follows:

- Section 2 provides the context for the HLD, including key issues addressed by the rule change request.
- Section 3 outlines the main design issues and requirements for implementation of FTM2.
- Section 4 outlines the main design issues and requirements to enable minor energy flow metering.
- Section 5 provides an overview of relevant consumer protection issues.
- Section 6 outlines implementation issues, including impacts of the rule change for market participants and other stakeholders, AEMO procedure and system changes, and interaction with other ESB reforms.
- Section 7 provides a list of abbreviations.

2 Context for this design

2.1 Key issues to be addressed

This section details the key issues which the implementation of FTM2 and minor energy flow metering arrangements would help to address. In summary:

- The rapid uptake of DER is providing new opportunities for end users to engage actively with the energy market to maximise the value of their investment and provide broader DER integration benefits.
- Practical barriers to accessing additional connection points to the distribution network prevent end users from easily engaging with multiple energy service providers at a single site and accessing the benefits of these arrangements.
- In some cases, these barriers have led end users to apply the embedded network framework in ways not explicitly provided for in the NEM, risking unintended impacts on market processes and outcomes.
- The NER metering framework is inflexible and does not currently cater for connection types characterised by minor energy flows, including FTM2 PMAs as well as other applications such as 'street furniture' connections, preventing them from participating in the market and accessing competitive retail offers.

2.2 New opportunities for active engagement by end users

The vast majority of end users in the NEM are connected via a single connection point with an associated metering installation. For many end users, this arrangement will not be restrictive – competition amongst retailers is strong in most NEM regions, with customer switching volumes high in comparison to similar markets overseas. Recent changes to the customer switching processes[4] in the NEM have significantly reduced the timeframe for a customer switch to take effect, moving from weeks or months to same day or next day switching (and even backdated to the recent past). These changes will better enable end users to access retail products and services to suit their needs for traditional supply of energy.

However, the increasing availability and adoption of controllable distributed energy resources (DER), including at residential connections to the distribution network, is providing new opportunities for end users (or parties acting on their behalf) to actively engage with the energy market. Existing connection arrangements may not be sufficient to facilitate the innovative business models and services required to make the most of these opportunities, enable customers to maximise the value of their investments, and optimise the integration of DER into the evolving energy system.

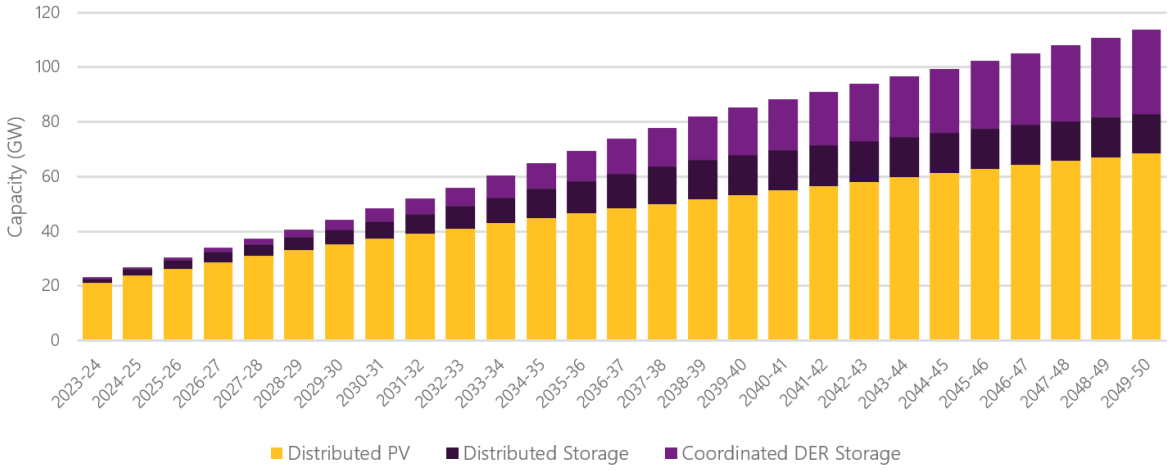
AEMO's forecasts suggest that distributed solar PV capacity could more than double from 16 GW today to 36 GW by 2030, supplying around one-fifth of overall annual consumption in the NEM (Step Change scenario)[5]. Uptake of behind-the-meter battery storage (commercial and residential) is expected to grow strongly in the late 2020s and early 2030s as costs decline, providing around 24 GWh of storage capacity by 2030 (Step Change scenario).

[4] AEMC, 2019. *Reducing customers' switching times (retail)*. Available at https://www.aemc.gov.au/rule-changes/reducing-customers-switching-times-retail

[5] AEMO, 2021. *2021 Input and assumptions workbook*. Available at https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/current-inputs-assumptions-and-scenarios

By 2050, over 65% of detached homes are expected to have solar PV, and most of these systems will be coupled with a battery[6]. Figure 1 illustrates the increasing volume of capacity in the NEM provided by distributed PV and storage over the coming decades.

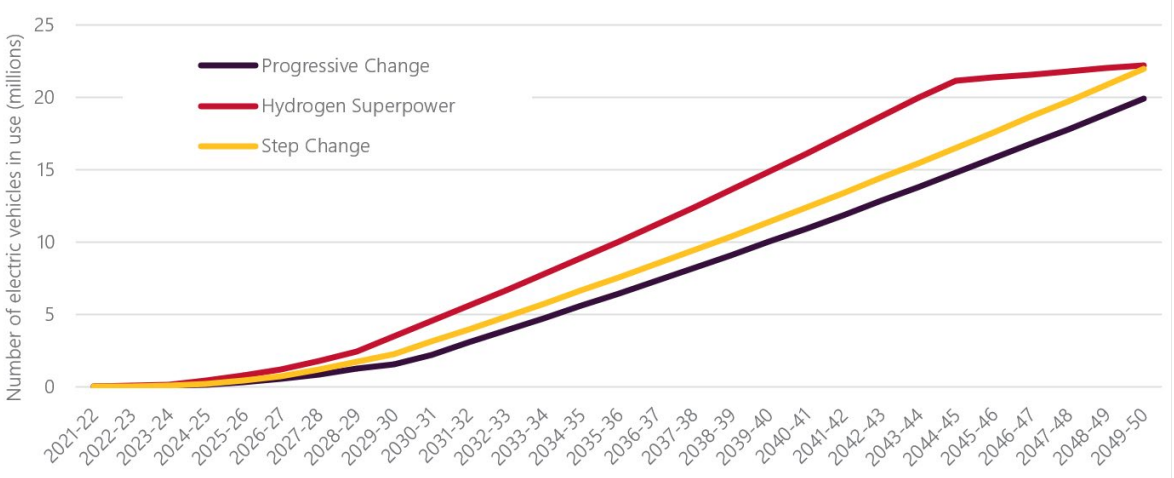
Figure 1 Forecast NEM distributed solar and storage capacity to 2050 (Step Change scenario with transmission)



Source: AEMO 2021 Input and assumptions workbook (forecast).

The uptake of electric vehicles is similarly forecast to rise substantially (Figure 2), increasing from 26,000 vehicles today to more than 3 million in 2030 (Step Change scenario). By 2050, around 60% of all vehicles are expected to be battery electric vehicles, comprising around 16% of overall annual electricity consumption.

Figure 2 Forecast uptake of electric vehicles in the NEM to 2050



Source: AEMO 2021 Input and assumptions workbook (forecast). Note: Includes both battery and plug-in hybrid electric vehicles.

The growth in distributed PV is radically influencing the NEM operational demand profile, with maximum demand now occurring near sunset in most regions, and minimum demand rapidly declining and increasingly occurring in the middle of the day in some regions of the NEM[7]. New sources of dispatchable capacity and critical system

[6] AEMO, 2021. *Draft 2022 Integrated System Plan*. Available at https://www.aemo.com.au/-/media/files/major-publications/isp/2022/draft-2022-integrated-system-plan.pdf?la=en

[7] AEMO, 2020. *Renewable Integration Study, Stage 1 Appendix A: High penetrations of distributed solar PV*. Available at https://aemo.com.au/-/media/files/major-publications/ris/2020/ris-stage-1-appendix-a.pdf?la=en

services will be required to complement these new resources. Emerging forms of DER such as electric vehicles could contribute to these sources, but this will require a well-designed interface to the energy system.

As DER uptake accelerates, the option to engage an alternative financially responsible Market Participant (FRMP) for the controllable component of their electrical installation can provide end users with greater choice and access to competitive offers, helping to maximise the benefit of their DER investment. More broadly, through more active control and utilisation of DER assets (e.g. participation in virtual power plants), flexible trading arrangements may deliver broader benefits to all end users through reduced grid augmentation costs and lower wholesale market prices. It may also facilitate opportunities to support vulnerable end users through access to services specific to components of their electrical installation as discussed in section 1.2.

2.2.1 Access to additional connection points to the local distribution network

Currently, end users are not formally restricted from engaging multiple FRMPs, but this can be challenging. Should the end user wish to engage more than one FRMP at their premises, the NER require them to first establish additional connection points to the local distribution network. This can be problematic in practice, with many barriers preventing or disincentivising end users from doing so. An October 2020 report by Energeia for the ESB, *Expert advice on the cost of establishing a second connection point*[8]*,* identified three key areas where end users seeking to install a second connection point could encounter a barrier, including:

- **Network policy** – Currently, some networks do not allow the installation of a second connection point to a small customer's premises even though the NER does not disallow this.
- **Timeliness** – The process timeline for a second connection is not controlled by any one party and is a multi-step process with multiple opportunities for delay.
- **Tariffs** – Currently, each NMI is assigned a tariff with a network access charge, meaning an end user with multiple connection points to the grid is likely to have to pay multiple access charges.

Consequently, whilst provided for in the NER, the current regulatory framework does not support end users easily engaging with multiple energy service providers at a single site. In addition to the barriers in obtaining a second connection point, from a practical perspective, network connection points are subject to a number of technical requirements, including physical location and size.

The establishment of arrangements for PMAs in the NER and associated procedures as proposed by the ESB provides an ideal mechanism to overcome these barriers.

2.2.2 Misapplication of the embedded network framework

While end users have the ability under the NER to establish a second connection point, the practical challenges outlined in the previous section have led some end users to seek alternative methods. AEMO is aware that some end users have sought to establish second connection points for their DER using methods not explicitly provided for in the NER. In some cases, an end user's electrical installation has been proposed to be an embedded network, with "child" connection points used to separate the DER circuitry within.

Given the inherent complexity of the NEM and the NER, the use of any provision within the NER beyond the scope of its intended design risks impacting market processes and outcomes, including for end users,

[8] Energeia, 2020. *Expert advice on the cost of establishing a second connection point.* Available at https://esb-post2025-market-design.aemc.gov.au/32572/1608712682-enegeia-expert-advice-on-the-cost-of-establishing-a-second-connection-point.pdf

intentionally or otherwise. The differences between an embedded network and an end user's electrical installation are outlined in Table 1 below.

Table 1 Comparison between an embedded network and end user electrical installation

Embedded Network	End user's electrical installation
Embedded networks are private electricity networks that are owned, controlled, or operated by exempt network service providers. The embedded network forms part of the national grid[9].	The end user's electrical installation typically comprises a fuse-board, household wiring, electrical outlets (plug sockets, etc.), switches, lights, electrical appliances, and other electrical equipment. It often includes short lengths of powerline, from the distribution fuse or switch to the metering position, but is not a network and does not form part of the national grid.
Embedded networks are connected to a distribution or transmission network through a parent connection point and serve multiple end users at child connection points (e.g. shopping centres, retirement villages, apartment complexes and caravan parks).	The end user's electrical installations are for the use of the end user themselves or provided by a property owner or their agent for the end user.
Service providers for embedded networks must gain an exemption from the AER from the requirement to register as a network service provider. If on-selling energy to end users within the embedded network, it must also hold a retailer authorisation from the AER or be exempted from this requirement.	A single Market Customer is responsible for all flows of energy to and from an end user's electrical installation. Energy is not on-sold via any formal or recognised mechanism in the NER.

Exemptions from the requirement to register with AEMO as a network service provider are governed by the AER through its *Network service provider registration exemption guideline*[10], which provides three categories of exemption: deemed, registrable and individual. Where an end user believes or determines that the deemed exemption category is applicable to it, there is no requirement to apply for an exemption or register with the AER and exemption is automatic. Deemed exemptions apply to a range of parties and typically cover small-scale supply arrangements where the cost of exemption registration would outweigh the benefits. The AER is currently undertaking a review of its guideline[11].

There are many complexities in the operation of, and energy settlement within, embedded networks. These complexities and the associated impacts on end users, were highlighted both in the AEMC's embedded network framework review[12] and more recently in the Victorian Department of Environment, Land, Water and Planning's (DELWP) embedded networks review[13]. Both reviews highlighted that end users within embedded networks:

- do not have the same consumer protections as on-market customers (such as lower standards for disconnections and life support arrangements);
- do not have the same access to rebates and concessions as on-market customers;
- have varying access to dispute resolution services; and
- face significant practical barriers to accessing retail market competition.

[9] NER Chapter 10 definition: The sum of all connected transmission systems and distribution systems within the participating jurisdictions.

[10] AER, 2018. Electricity Network Service Provider - Registration Exemption Guideline (version 6). Available at https://www.aer.gov.au/system/files/AER%20electricity%20NSP%20Registration%20Exemption%20Guideline%20-%20Version%206%20-%201%20March%202018.pdf

[11] AER, 2021. *Network service provider registration exemption guideline review 2021*. Available at https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/network-service-provider-registration-exemption-guideline-review-2021

[12] See AEMC, 2017. *Review of regulatory arrangements for embedded networks*. Available at https://www.aemc.gov.au/markets-reviews-advice/review-of-regulatory-arrangements-for-embedded-net.

[13] Victorian Government DELWP, 2021. *Victoria's Embedded Networks Review*. Available at https://engage.vic.gov.au/embedded-networks-review

Whilst continuing to support reform to improve arrangements for embedded networks, as considered within both AEMC and DELWP reviews, AEMO contends that misapplication of the embedded network framework in the manner described is manifestly unsuitable for the establishment of additional trading arrangements within an end user's electrical installation.

The ESB's FTM2 design explicitly considers a framework for the establishment of a connection point within an end users' electrical installation, as detailed and expanded on in this HLD. Upon establishment of FTM2, AEMO considers that it is critical for the Rules to have clear mechanisms for connection point establishment and that use of the embedded network framework in this fashion should be explicitly disallowed to avoid confusion for market participants and end users.

2.2.3 Lack of flexibility in the NER metering framework

The NER metering framework is highly structured, ensuring that the accuracy and service capability of each metering installation is commensurate with the quantity of energy flowing and the characteristics of typical end users across the multitude of market connection points. Current metering installation types considered within the framework include grid-scale generation system connections to the electricity transmission system, interconnections between electricity distribution systems, industrial and commercial connections, residential property connections, and arrangements for the calculation of some unmetered loads such as streetlighting.

In recent years, rule changes and reviews[14] have assisted in identifying electrical connections that are not catered for within the NER metering framework, the vast majority of which have a minor flow of energy at the connection point (i.e. substantially less than the flow of energy at an occupied residential premises). The energy flows at these connections are either not granted access to participate in the market or are not able to access competitive retail offers. These connection arrangements include:

- street 'furniture', such as streetlighting, traffic lighting, advertising lighting and bus shelter lighting;
- telecommunications equipment kiosks; and
- legacy connections for end users within embedded networks, connected via non-NEM compliant small footprint "DIN rail" mounted metering with insufficient physical space to accommodate NEM standard metering.

Over the same timeframe, metering technologies have developed and now have the potential to overcome limitations—such as physical size, cost, complexity of installation and maintenance—that have hitherto prevented these connection types from being considered within the metering framework. For example, streetlighting control system technologies have developed significantly and now offer the potential for energy flows to be measured at individual streetlights.

While the NER allows for minor energy flow connections to be metered, it does not contemplate metering requirements for these connection types, with the lowest level of metering type being specified in NER 7.8.3 (a small customer metering installation) – the typical metering installation required for a small commercial or residential connection to the distribution network.

[14] For example: AEMC, 2018. *Global settlement and market reconciliation*. Available at https://www.aemc.gov.au/rule-changes/global-settlement-and-market-reconciliation and AEMC, 2019. *Updating the regulatory framework for embedded networks.* Available at https://www.aemc.gov.au/market-reviews-advice/updating-regulatory-frameworks-embedded-networks.

The potential to separate resources within an end user's electrical installation, as considered within the ESB's FTM2 design, provides an additional use case with which to test the applicability and comprehensiveness of the metering framework in a contemporary context, and in particular:

- NER clause 7.8.2 – requirements for metering installation components.
- NER Schedule 7.5 – applicability of the minimum services specification requirements.

At the time of writing, several initiatives are considering enhancements and extensions to end user services and choice, utilisation of DER and energy efficiency measures in the NEM, including those identified in the ESB advice. These include demand response aggregation, electric vehicle adoption and virtual power plants, and have been facilitated by electricity market reforms like installation of advanced metering and five-minute and global settlement. It is important to ensure that the metering framework is well suited to these changes as well as addressing basic access to market competition and energy efficiency incentives for existing connection types that are currently unable to engage in the energy market. Notably, the metering framework in its current form was identified as a potential barrier to the uptake of FTM2 in submissions to the ESB reviews, with the ESB considering the potential to adopt non-traditional types of metering installation and meter location within PMAs as critical to the take up of flexible trading[15].

Metering installation components (NER clause 7.8.2)

A metering installation is comprised of four main components:

- **Measurement element** – accurately measures the volumes of energy flows.
- **Clock** – accurately assigns flows of energy to periods of time.
- **Energy data storage facility** – retains volumes of energy flows and the period to which they relate.
- **Display** – presents an on-demand set of information to the viewer, relating to the measurement of energy flows.

Modern remotely read metering installations include one additional component – a **communications device.**

The measurement element, display and energy data storage are features of every metering installation operating in the NEM today. The 'clock' component for the most simplistic manually read accumulation metering installations (Type 6) is held remotely in Metering Data Provider (MDP) systems and applied upon data being collected and delivered from a meter reader.

Interval metering installations (Types 1, 2, 3, 4, 4A and 5) combine all four components in the physical devices at the connection point, with remotely read metering installations (Types, 1, 2, 3 and 4) including a communications device.

Since late 2017, all new metering installations are required to have remote communications (noting exceptions as provided for in NER 7.8.4) and due to the introduction of five-minute settlements, will need to facilitate the recording of energy flows in five-minute intervals. It is reasonable to consider that any future extension to the metering framework must, as a minimum, meet this requirement as it is fundamental to the collection and processing of energy data for settlement across participant systems and processes. These requirements establish

[15] ESB, 2021. *Post 2025 Market Design Final Advice to Energy Ministers Part C*, section 2.5 Flexible trading arrangements, page 40. Available at https://esb-post2025-market-design.aemc.gov.au/32572/1629945838-post-2025-market-design-final-advice-to-energy-ministers-part-c.pdf

a benchmark for the measurement element, remote communications, energy data storage and the clock within the metering installation component set.

AEMO contends that developing technologies have the potential to reframe how the requirements for the display can be provided via components that are remote from the physical point of connection, in particular for non-residential connections with minor energy flows. Physical 'real-estate' available for metering installations in the scenarios considered in this proposal will, in many cases, be too small to accommodate a readable display, and the location of installed devices might make the viewing of a physical display impractical in any case (e.g., a metering installation fitted within the housing of a streetlight). At a residential level, modern technologies are supplanting the need for end users to read physical metering device displays, as demonstrated by the Victorian DELWP-supported rollout of in-home displays for smart metering data[16].

AEMO understands that the National Measurement Institute[17] have already received enquiries from device manufacturers regarding the potential to obtain pattern approval for metering installation designs that disaggregate meter display components from 'on-site' to 'remote'. It is therefore opportune to explore when, where and how these types of design might reasonably be accommodated in the NEM, and connection types where it is not appropriate to do so.

Minimum services specification (NER Schedule 7.5)

NER S7.5 (minimum services specification), requires new and replacement meters to be type 4 meters that are capable of providing the following minimum set of services:

- remote disconnection service
- remote reconnection service
- remote on-demand meter read service - active and reactive energy
- remote scheduled meter read service - active and reactive energy
- metering installation inquiry service
- advanced meter reconfiguration service.

AEMO supports the position taken by the AEMC in its current metering framework review[18] – that for small customer metering installations the specification is valid and set at the right level. However, AEMO considers that the application of the specification should be re-evaluated for metering installations connected within an end user's electrical installation in accordance with the FTM2 design. For example, should the requirements for current, power and frequency measurement be required for the delivery of a metering installation inquiry service, where the metering installation is provided solely to measure flows to and from an electric vehicle charging point that is connected within an end user's electrical installation (i.e., not directly to the distribution network)?

[16] Victorian Government DELWP. *Victorian Energy Saver – In-home displays*. Available at https://www.victorianenergysaver.vic.gov.au/save-energy-and-money/victorian-energy-upgrades/save-with-these-energy-efficient-products/in-home-displays

[17] The requirements for pattern approval and verification of meters is overseen by the National Measurement Institute within the Department of Industry, Science, Energy and Resources. Information about electricity metering pattern approval and verification can be found here: https://www.industry.gov.au/regulations-and-standards/buying-and-selling-goods-and-services-by-weight-and-other-measurements/utility-meters

[18] AEMC, 2021. *Review of the regulatory framework for metering services*. Available at https://www.aemc.gov.au/market-reviews-advice/review-regulatory-framework-metering-services

The application of the minimum service specification could also be evaluated if the metering framework were to be extended to support the metering of the other minor energy flow connections previously discussed in this section.

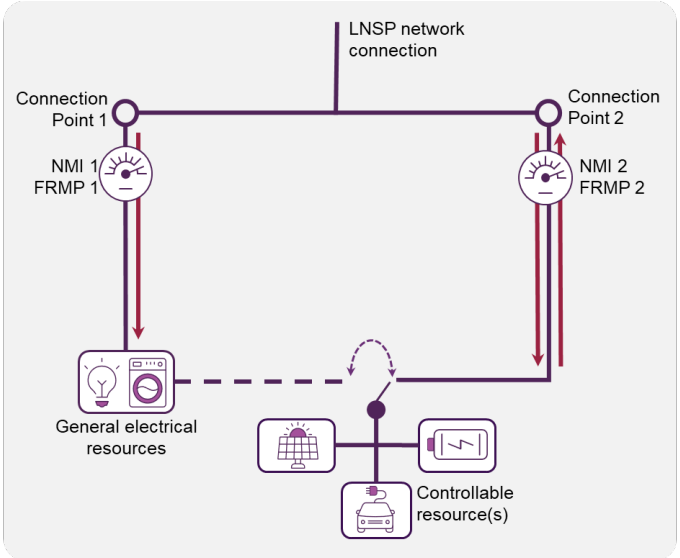
2.3 Related rule change processes

Integrating Energy Storage Systems rule change

On 2 December 2021, the AEMC published the final rule and determination for *Integrating Energy Storage Systems into the NEM*[19] (IESS). Amongst other matters, the IESS changes are important in the context of flexible trading arrangements due to the:

- creation of a "universal" participant category, the Integrated Resource Provider (IRP), and a series of service or unit classifications including for large and small storage devices; and
- establishment of requirements for the operation of the ESB's Flexible Trader Model 1 (SGA+), by amending the SGA design from generation only to cater for bi-directional energy flows and participation in the ancillary services market. Flexible Trader Model 1 is illustrated in Figure 3 below.

Figure 3 Flexible Trader Model 1 (facilitated by IESS rule change)



The IRP role replaces the SGA role (with the SGA role obtaining the new label of 'Small Resource Aggregator') but is much broader in function; within its scope is the ability to operate bi-directional resources (such as batteries and other forms of storage) and provide ancillary services. Treated as a FRMP in AEMO's Market Settlement and Transfer Solutions (MSATS) system, the IRP will appoint Metering Coordinators (MCs) and have access to MSATS NMI discovery and end user transfer rights and obligations.

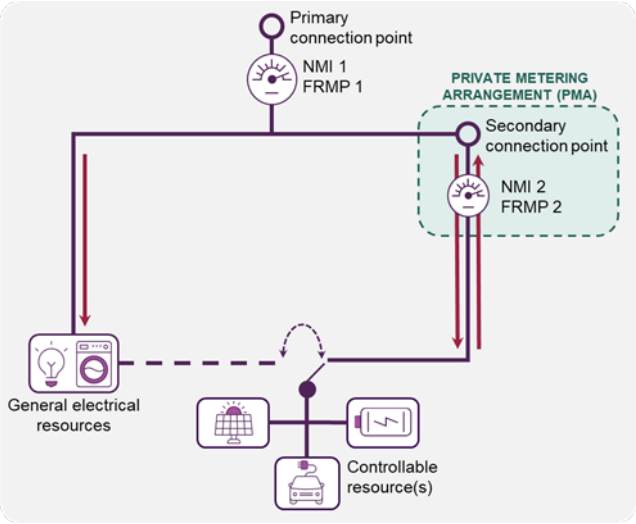
AEMO considers that the IRP role is well suited to operation within the ESB's Flexible Trader Models 1 and 2. Matters regarding the IRP role are not considered further in this HLD.

[19] AEMC, 2021. *Rule determination: National Electricity Amendment (Integrating Energy Storage Systems into the NEM) Rule 2021*. Available at https://www.aemc.gov.au/sites/default/files/2021-12/1._final_determination_-_integrating_energy_storage_systems_into_the_nem.pdf

3 FTM2 design requirements

As outlined in section 2 of the rule change request, FTM2 is made possible through the creation of a private metering arrangement (PMA) - a connection arrangement whereby conditions are established within an end user's electrical installation for the connection, operation, and maintenance of a NMI and associated NEM metering installation for the connection of flexible DER (Figure 4).

Figure 4 Flexible Trader Model 2 (FTM2)



FTM2 involves establishing a PMA which includes a sub-metered connection point and separate NMI within the customer's electrical installation, providing the ability to engage a different FRMP for the end user's controllable resources. Like FTM1, FTM2 enables an end user's controllable resources to be switched between connection points (allowing arbitrage across them), or alternatively to establish an entirely separate arrangement without switching (e.g. dedicated electric vehicle charging). An end user could potentially have multiple PMAs behind the same primary connection point.

This section outlines the key design requirements for the implementation of FTM2, including:

- Creation and maintenance of a NMI within a PMA
- PMA authorisation and configuration approval
- What can be connected to a NMI within a PMA
- Energy settlement within a PMA (subtractive settlement)
- Energy flows when PMAs are isolated from the grid
- Arrangements for network charges
- Requirement for remotely read interval metering installations
- Overview of proposed roles and responsibilities for FTM2.

3.1 Creation and maintenance of a NMI within a PMA

NMIs are currently provided to FRMPs by the LNSP. In the case of FTM2, secondary NMIs within PMAs are not directly connected to either the transmission or distribution network; rather they are created, and must be maintained, within the infrastructure of the end user's electrical installation.

The embedded network framework has established a role specifically for non-LNSP creation and maintenance of NMIs – the Embedded Network Manager (ENM) role, which is accredited to operate by AEMO[20]. Whilst applied exclusively within embedded networks, the ENM accreditation requirements establish a model that can be emulated to support NMI creation within a PMA.

AEMO considers that an equivalent role to the ENM be established in the NER for creation and maintenance of NMIs beyond the boundary of the transmission and distribution network. Rather than being specific to a type of connection, as is the case for the ENM role, the new role should be established so that it could apply to PMAs and, in principle, any future non-LNSP NMI creation and maintenance requirement. AEMO proposes that the role is named 'National Metering Identifier Service Provider' (NMI Service Provider).

It is likely that AEMO accreditation requirements would be designed to simplify and, where appropriate, consolidate accreditation applications for parties interested in becoming both an ENM and a NMI Service Provider. Initial and ongoing competency and capability assessments that form part of accreditation are likely to be substantially similar if not identical. It is also possible that parties already accredited as ENM will have a low barrier to obtain accreditation as a NMI Service Provider due to already demonstrated competency. If amendments are made to the operation of embedded networks in the future, it is possible that the ENM role could be subsumed within the NMI Service Provider role.

Under this arrangement, FRMPs would continue to be responsible for requesting NMI creation, including within a PMA.

AEMO has considered whether the establishment of a new role could be avoided, for example if the requirements for NMI creation and maintenance became a component of another existing role which is subject to accreditation, such as the Metering Provider role (see section 3.2) or the ENM. AEMO contends that this approach is problematic for a number of reasons, including:

- amending or expanding the ENM role risks adding complexity and changes to the framework for operating embedded networks, which is the subject of a number of reviews as noted elsewhere in this HLD;
- parties already capable of providing NMI creation and maintenance services (e.g. ENMs) would be blocked from offering services within PMAs in practice if they needed to also obtain accreditation as a Metering Provider;
- competition in NMI creation would be limited to those parties capable of also providing metering installation and maintenance services;
- future provision of services for creation and maintenance of NMIs beyond the boundary of the transmission and distribution network would not be accommodated beyond PMAs; and
- as the party responsible for appointing Metering Providers, obligations for NMI creation and maintenance might need to be extended to Metering Coordinators.

[20] As specified in NER clauses 7.4.2A (Qualification and registration of Embedded Network Managers) and 7.16.6A (Requirements of the ENM service level procedures).

3.2 PMA authorisation and configuration approval

The NER confers responsibility for the provision, installation, maintenance, and ongoing accuracy of physical metering installations on the MC[21] regardless of the location or type of metering installation[22]. In its current form, the MC role is well suited to undertaking its existing responsibilities within a PMA.

The technical installation and maintenance requirements for metering installations within a PMA are critical to its accurate establishment and ongoing operation – these fall within the ambit of the Metering Provider role. The Metering Provider role is accredited and registered by AEMO. Accreditation is provided only for the type of work each Metering Provider is qualified to provide. For example, a Metering Provider may only be accredited to perform work on metering installation types 5 and 6 (manually read metering installations for small customer connections), only types 1, 2 and 3 (e.g. if capable of working on transmission-connected metering installations), or a broad range of metering installation types according to its demonstrated capabilities and competency. In recent years and as a result of the competition in metering rule change, a specific category of Metering Provider registration for accreditation was established for the installation and maintenance of modern smart metering, Category 4S[23].

PMA NMIs are not directly connected to a network, rather they are established behind the network-connected metering installation, within the end user's electrical installation; this is a novel scenario that is not currently contemplated in the NER metering framework. Accordingly, matters including metering installation housing, location and accessibility, configuration and wiring design, application of sealing and accurate linking of secondary and primary NMIs to ensure accuracy in the calculation of energy settlement must be considered distinctly.

The creation of a new Metering Provider category (e.g., Category 4P) for metering installations within a PMA in NER S7.2 would provide the framework for bespoke PMA requirements to be developed in supporting procedures and applicant Metering Providers to demonstrate their capability and competency to deploy and maintain.

Similar distinct categorisation will be required for MDPs seeking to operate at a PMA NMI. In addition to ensuring accurate linking of primary and secondary NMIs to ensure accuracy in the calculation of energy settlement, an applicant MDP would need to demonstrate that they can identify energy flows within a PMA at times when supply to the connection point is down (as discussed in section 3.5).

Tailored categorisation for Metering Provider and MDP accreditation will enable the NER and associated procedures to adapt as connection of DER within PMAs develops and changes over time.

3.3 What can be connected to a NMI within a PMA

FTM2 is designed to provide an end user with the opportunity to separate their controllable DER in order that an additional FRMP can provide services specific to those resources. It is important, therefore, to consider whether to be specific about the nature of the resources that can, or cannot, be connected to a secondary NMI within a PMA and for all interested parties to have clarity on role obligations and responsibilities to assure compliance with any constraints or limitations.

[21] As specified in NER rule 7.3 (Role and Responsibility of Metering Coordinator).

[22] Noting that there are specific provisions for the operation of type 7 metering installations.

[23] See NER clause S7.3.2.

The risk of applying limitations to PMA connection points is that they are unreasonably restrictive, or become so over time, particularly when applied to rapidly evolving DER technology.

Conversely, applying clear and enforceable limitations for PMA connections, at least initially, has the potential to limit the opportunity for misuse or misapplication of the framework, reduce the complexity for end users and of changes that might be necessary to consumer protections, and mitigate risks to competition between FRMPs that might otherwise arise on implementation of flexible trading. These are explored further below:

- **Misapplication of the framework**

  Existing frameworks in market rules can be applied in ways other than was intended. Often a broader application of the framework is benign, although this is not always the case – section 2.1.3 of this paper highlights a contemporary example of problems resulting from the use of the framework for embedded networks.

  Enabling retail competition for resources within an end user's electrical installation is a neoteric approach for the NEM, beyond the limited scope of the current SGA arrangements. Outside of the NEM, flexible trading is not prevalent; like-markets overseas have signalled a desire to increase flexibility similar to that presented in the ESB's models but are yet to progress any such initiative to implementation. Setting clear boundaries within which the new and dynamic trading arrangements in the NEM can operate, should provide clarity on roles and obligations to market participants, end users, ombudsman and regulators alike, and the boundaries within which each party must operate. This can mitigate the risk of a misapplication of the framework and assist in identifying excursions should they occur.

- **Complexity for end users and consumer protections for PMAs**

  With an increase in choice and optionality, there is a prospect of increased complexity for the end user. Establishing boundaries for PMA application up front can help to reduce complexity for end users and set the context for the provision of information and advice in order that end users can make well informed decisions.

  These boundaries could also limit the need to make material amendments to consumer protections. For example, detailed requirements are provided in the NERR for the management of connection points to the distribution network where life support equipment is needed. If requirements are established that prohibited connection of life support equipment to a PMA connection point, no amendments to the NERR provisions in this area would be required by default as they would not apply in practice.

- **Competition risks**

  Just as it is important for end users to be appropriately informed about the products and services they can access, it is important that service providers have sufficient information to tailor products and services to prospective customers. For residential connection points, retailers currently have access to a set of information in AEMO's MSATS system upon which offers to prospective residential customers are constructed. This includes details of the connection point location, the applicable network tariff code, and metering installation type as well as an indication of the average daily energy flows from and to the connection point.

  At residential connection points in particular, retailers do not typically limit, control, or have any guarantees regarding the volume of energy flows at a connection point. End users may materially increase or decrease energy use over time (e.g. by installing new appliances, replacing gas heating with electric or vice versa) without approval or any other involvement by their retailer. Flexible trading arrangements introduce a new dynamic, enabling end users to separate resources from their established retail arrangement. If there are no

limitations to the resources that could be connected via a PMA, in an extreme case, it would be possible for a primary connection point retailer's relationship with the customer to be "hollowed out", potentially leaving them with the costs of maintaining a connection to the distribution network with little or no energy flows attributable to them in wholesale settlement (this risk is discussed further in section 3.6 (Arrangements for network charges)). If limitations are applied, for example consistent with the concept of controllable DER as discussed in the ESB papers, that risk is reduced and the impact of establishing flexible trading arrangements on the retailer at the primary connection point is likely to resemble the typical variability of small end user energy use.

AEMO considers that there is merit in applying limitations to the electrical equipment and resources that can be connected to PMA connection points, but that as far as reasonably practicable, the mechanisms employed to limit should be flexible to accommodate new technologies and services.

Consistent with the approach taken by the ESB, AEMO considers that as a general principle, resources connected within a PMA should be controllable. Electric vehicles, pool pumps, hot water heating elements, battery storage systems, and solar PV systems are obvious candidates for connection within a PMA. On the other hand, electrical circuits and equipment required by the end user on-demand, and therefore not typically suitable for third party control, should not be connected via a PMA. This includes life support equipment and typical lighting and general power circuits that might reasonably be used by an end user to connect life support equipment, and other critical resources such as the supply to emergency lighting and bilge pump installations.

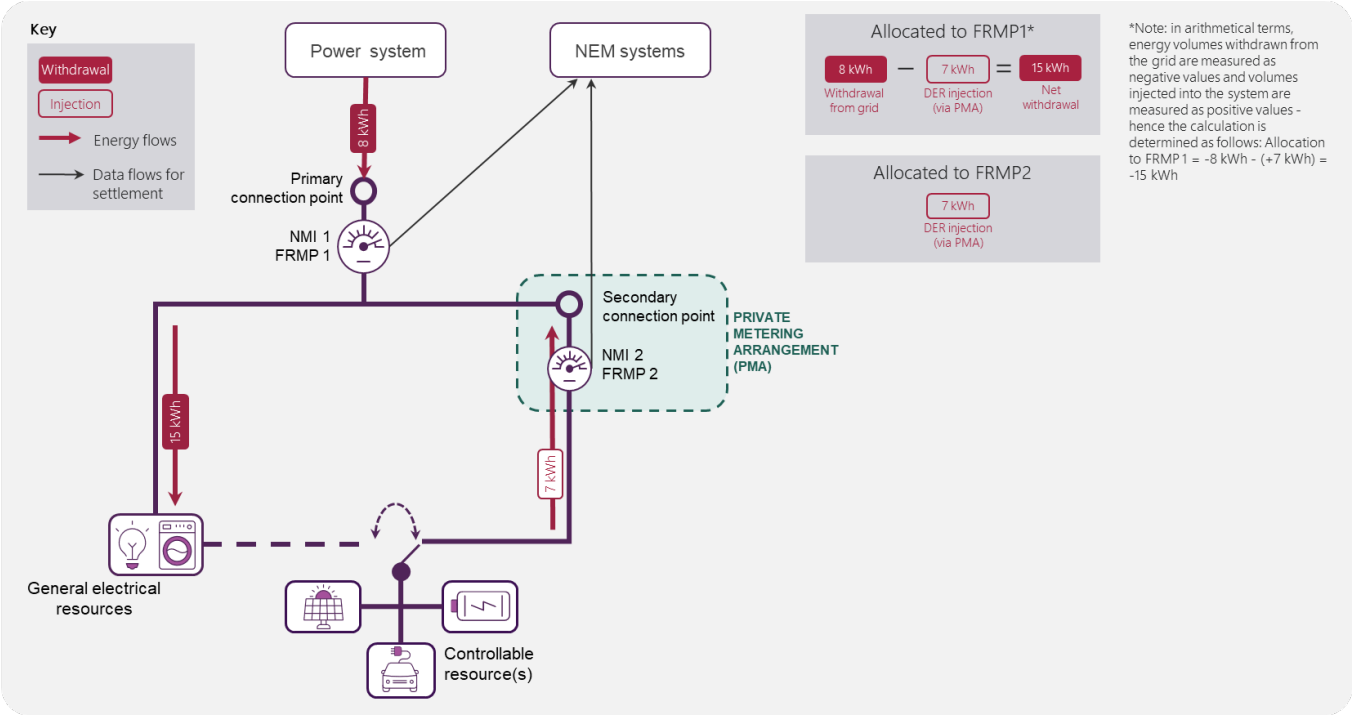
AEMO proposes that baseline requirements in the NER are established to ensure that necessary exclusions are made clear and that the FRMP at the connection point in the PMA would be responsible to comply with them. These requirements could be related to the capacity of the electrical equipment (e.g. rated at ≤*n*kW injection capacity and ≥*n*kW withdrawal capacity for small customer connection points), the nature of the resources connected (e.g. no life support equipment, or general light and power circuits that life support equipment could connect to in the future), or a combination of these.

AEMO proposes that MCs seeking to provide services within a PMA seek authorisation from AEMO regarding the resources they intend to connect in line with the guidance provided in the NER. This would provide additional assurance that FTM2 is being implemented in line with the requirements and intent of the NER. This could be delivered as an authorisation step and ongoing condition (assessed as part of the MC annual audit requirements) related to MC registration for PMA provision, for example. As technology and services develop, such a process would enable these to be considered on application by each MC, rather than requiring lengthy rule or procedure change processes to enable adoption.

3.4 Energy settlement within a PMA (subtractive settlement)

FTM2 relies on a subtractive settlement approach to the allocation of energy flows (Figure 5). In a PMA, any energy flowing at a secondary NMI is measured and following validation, is assigned to the FRMP at that secondary NMI. This value is subtracted from the energy flowing at the primary NMI to calculate the allocation for the FRMP at the primary NMI.

Figure 5 Example of subtractive settlement with a PMA



Participants capable of operating in embedded networks are familiar with these arrangements as the mechanism and calculation method described above is what is utilised to determine energy flow allocation for embedded network parent and child connection points. AEMO can make amendments to the Metrology Procedure to specify process requirements supporting energy settlement within PMAs.

Critical to this arrangement is the accurate linking of primary and secondary NMIs in MSATS standing data – which establishes the NMI relationship to enable the subtractive calculation and the correct assignment of energy flows to respective FRMPs. Embedded networks use NMI-linking codes, the arrangements for which are detailed in AEMO's retail market procedures[24].

Embedded network NMI-linking processes are designed to accommodate the complex nature of embedded network designs (e.g. multiple parent connection points per embedded network, multiple child connection points and embedded networks within embedded networks). Embedded network linking-code creation and population requires coordination between the LNSP, ENM and AEMO and is driven by manual updates and checks to verify accuracy of NMI standing data in MSATS. The process is inelegant and not scalable.

Unlike embedded network connections, PMA connections will only ever have one primary NMI and could be established without impacting or otherwise requiring the involvement of the LNSP. Accordingly, AEMO does not consider that embedded network NMI linking processes are suitable for use within PMAs and that an alternative model will need to be established. An evident option that could be explored within AEMO procedure consultation for the linking of NMIs within a PMA would be the creation of a new "PMA" field in MSATS. This new field could be populated by the NMI Service Provider (as proposed in section 3.1) on creation of a secondary connection point within a PMA, with the NMI of the primary connection point. This would require no new or amended

[24] AEMO, 2018. *Allocation of embedded network codes.* Available at https://www.aemo.com.au/-/media/files/electricity/nem/retail_and_metering/accreditation/mt_gn1710v008---allocation-of-embedded-network-codes_v8_clean.pdf?la=en

processes to be adopted by LNSPs, no new PMA linking code to be created, would avoid double handling, minimise points of failure and be scalable.

3.5 Energy flows when PMAs are isolated from the grid

Overview of the issue

Modern residential DER systems can have the capability to act as a back-up source of supply to the end user's loads when the supply from the distribution network is down; this functionality was highlighted in media reports during prolonged network outages in rural Victoria in mid-2021[25]. It is commonplace for end user-owned generating systems at commercial premises to be specifically designed for this purpose, as it is for health and other critical infrastructure facilities that require ongoing supply of energy during network power outages. In these scenarios the back-up supply is limited to use locally within the electrical installation to which it is connected and not beyond their connection to the distribution network.

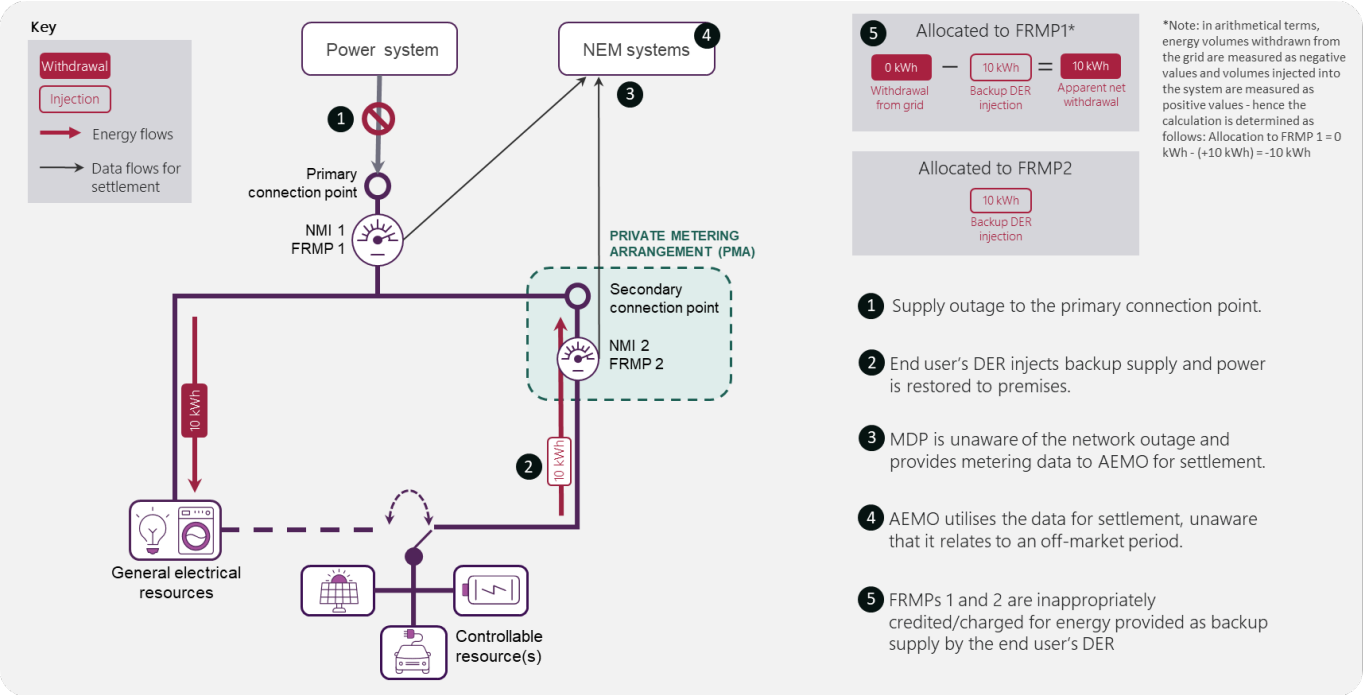
If generation and storage resources within an end user's electrical installations are able to provide a back-up supply and they are connected within an FTM2 arrangement, there is a risk that an anomaly is created in energy settlement, as follows:

- Situation – the supply of electricity to the end user's premises from the distribution network fails. Generation and storage resources inject energy to act as a back-up supply. Supply of energy is maintained within all or part of the end user's electrical installation and electricity flows through secondary connection points within the PMA.
- For the duration of the distribution outage, these energy flows are neither part of the interconnected system, nor would they be described or otherwise considered within the NER.
- In the absence of rules or procedural requirements that would require them to do otherwise, MDPs would be, in practical terms, oblivious to the outage and will record the flows of energy assuming that they are market flows. This metering data will be provided as "Actual Metering Data" for processing in NEM settlements, despite it not being explicitly related to the market (as defined in the NER), or the interconnected national electricity system (as defined in the National Electricity Law [NEL]).
- MDPs would provide the metering data to AEMO for use in settlement – AEMO is unaware that the data provided is for a non-market period and processes it for settlement.
- Energy is settled – AEMO applies market prices and associated factors for the energy flows at each connection point, crediting some FRMPs and charging others.
- Money changes hands – some FRMPs will be charged, and others will receive funds, for energy settled and related charges such as loss allocation and non-energy cost recovery.

Figure 6 below illustrates this issue.

[25] ABC News, 2021. *What the Dandenong Ranges extended power outage teaches us about backup battery power*. Available at https://www.abc.net.au/news/2021-07-03/battery-power-dandenong-ranges-tesla-agm-grid/100264988

Figure 6 Settlement anomaly created by backup generation during distribution network outage



AEMO considers that these energy flows should be explicitly considered for recognition in the NER and either treated so they are excluded from settlement and other processes or acknowledged as a known and accepted anomaly.

The current embedded network framework has similar challenges regarding the identification and treatment of flows of energy within embedded networks when the supply from the distribution network to the embedded network parent connection point is down. Although not a dependency for the progression of the flexible trading arrangements rule change request, AEMO believes that there is benefit in the AEMC and AEMO considering this apparent gap in the NER due to the increasing capabilities of DER, either within the context of this proposal, within the consultation on AEMO NER procedures resulting from the progression of this proposal, within the broader AEMC review of embedded networks, or via a similar mechanism that is subject to consultation with interested parties.

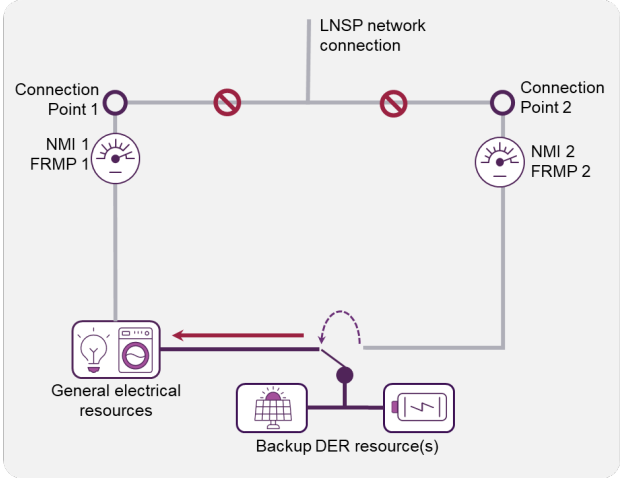
Proposed solution

The proposed new Metering Provider accreditation category (discussed in section 3.2) would enable the settlement anomaly issue described above to be somewhat mitigated in the operation of PMAs. Metering Provider configuration designs must be approved by AEMO prior to being deployed. For PMA metering installations, the requirements for configurations could include measures to ensure that any energy from DER capable of continued operation within the end user's electrical installation when the supply from the distribution network to the primary connection point is down, is not able to flow through the PMA metering installation.

Approval of Metering Provider designs is not an onerous ongoing task for either the applicant Metering Provider or AEMO. If all designs and configurations are provided for AEMO assessment on initial application, then they are assessed as part of that application. However, if an accredited Metering Provider seeks to introduce a new design, that design must be provided for AEMO's approval prior to deployment. This approval process for metering configuration design is standard practice for all accredited Metering Providers in the NEM today.

An alternative approach for small residential end users, is for technical requirements to be established which explicitly prohibit such a generating system being connected within a PMA. The ESB's Flexible Trader Model 1, delivered via the IESS rule change (see section 2.2), would provide an alternative method for an end user to obtain a flexible trading arrangement for DER plant with this capability whilst avoiding the risk of energy flowing through a market connection point and being accounted for in settlement (illustrated in Figure 7). However, such a restriction might prevent an end user with such resources from accessing flexible trading arrangements, particularly if prevented from accessing a second connection point by the LNSP.

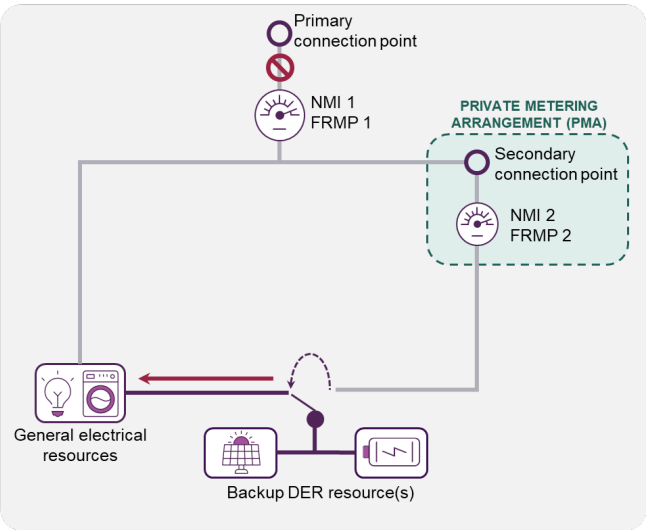
Figure 7 Flexible Trader Model 1 in back-up power supply mode (power supply outage at both connection points)



Technical requirements, such as those established in the AER's *Electricity network service provider registration exemption guideline*[26], might be required for a generation source located within an exempt network operator's exempt network as they consider aspects of safety beyond the remit of AEMO procedures. Commercial and industrial end users (whose connection points to the grid are often large) might need to apply additional technical requirements – for example, fitting inter-locking electrical switching (which would ensure that a supply outage automatically switches DER into the same electrical circuitry as is connected to the primary connection point. Figure 8 illustrates what a physical mitigation arrangement would look like for FTM2. Injections from the end user's DER is directed toward the end user's loads, with no energy going through the secondary NMI.

[26] AER, 2018. *Electricity network service provider registration exemption guideline - Version 6 (1 March 2018)*, section 4.1(4). Available at https://www.aer.gov.au/system/files/AER%20electricity%20NSP%20Registration%20Exemption%20Guideline%20-%20Version%206%20-%201%20March%202018.pdf

Figure 8 Physical mitigation of risk to settlement anomaly during a supply outage for FTM2



In addition to the mitigation of this risk to settlement via physical connection arrangements, AEMO proposes that MDPs operating within PMAs would be enabled to identify loss of power and ensure that recorded energy flows (if physical mitigation fails) are treated and that only market metering data is sent to AEMO and market participants for settlement and billing. Such arrangements can be established in AEMO procedures for accreditation and operation of metering data provision and the Metrology Procedure requirements for validation and substitution of metering data.

It is important to note that whilst physical connection arrangements for PMA establishment and operation can mitigate the issue of continuing to account for energy flows within isolated systems in market settlement for FTM2, the proposals will not mitigate the current risk of the same occurrence in an embedded network with active child connection points. The proposed arrangements for the management of metering data (validation and substitution of metering data ex-post) have the potential to do so, and this could be explored by AEMO in consultation with interested parties upon establishment of requirements for PMAs.

3.6 Arrangements for network charges

There are three main components to a typical end user bill: the energy flows at the connection point, the allocation of losses and other sundry charges in relation to energy flows, and the cost of maintaining a connection to the LNSP's network.

The subtractive settlement approach discussed in section 3.4 will ensure that energy flows, losses and other sundry charges are allocated to the FRMP responsible for those flows within FTM2. This leaves only the allocation of LNSP charges to be determined.

Connection points to LNSP networks incur network charges based on three variables:

- Time the FRMP is at an active NMI (e.g., daily connection charge).

- Volume of energy flow over a billing period (historically only related to withdrawal of energy from the grid, however as a result of the recent *Access, pricing and incentives arrangements for DER* rule change[27], LNSPs may apply charges for injections as well).
- Maximum demand (maximum kVA or kW values measured in any interval over a day, month or year as determined by the LNSP).

Under the current framework for network charges, the following arrangements would apply:

- **Daily connection charges**

  These charges would not be affected by the creation and operation of FTM2. From the perspective of both the end user and the LNSP, the end user's connection to the network is unchanged. Connection charges would be calculated at the connection to the LNSP network (that is, the primary connection point) and charged to the FRMP at the LNSP connection point determined by the time (typically based on daily rates) that the FRMP is appointed to the active NMI.

- **Energy flow charges**

  FTM2 allows the separation of energy flows within the end user's electrical installation for the purpose of wholesale settlement allocation to respective FRMPs; however, the metering data provided for network billing at the connection point to the LNSP's network is the net sum of all the flows within the end user's electrical installation, accurately reflecting the flows to and from the LNSP's network. This enables the LNSP to continue to invoice the FRMP at the primary connection for energy flow charges.

  Importantly, where there is a PMA, this means the primary connection point FRMP will be responsible for network charges based on the net energy flows at their connection point rather than only the energy flows attributable to them in wholesale energy settlement. The net energy flow can be greater or smaller than the wholesale energy attributable to the FRMP at the primary connection point, depending on the nature of the DER connected within the PMA and its usage over a billing period.

  For example:

  – if DER injects energy at a PMA NMI and some or all that energy is consumed within the end user's electrical installation, the net effect is that network charges at the primary connection point will be based on energy flows that are lower than the wholesale energy flow attributable to the primary connection point FRMP.

  – if DER withdraws energy at a PMA NMI, that withdrawal is added to any withdrawals at the primary connection point for the end user's other loads and the network charges at the primary connection point will be based on energy flows that are larger than the wholesale energy flow attributable to the primary connection point FRMP.

  This is not a novel issue; all regions of the NEM allow retail competition in embedded networks and FRMPs must currently have processes to reconcile the difference between wholesale energy and energy flows that attract network charges should they become the FRMP for a parent connection point (which can occur at any time and without the FRMP's approval). Upon becoming the FRMP for a parent connection point, the FRMP is then no longer responsible for wholesale energy charges for market child connection points within the embedded network but retains responsibility for the net energy flows at the parent connection point (that

[27] AEMC, 2021. *Access, pricing and incentive arrangements for distributed energy resources*. Available at https://www.aemc.gov.au/rule-changes/access-pricing-and-incentive-arrangements-distributed-energy-resources

determine energy flow related network charges). In this case, reconciliation of flows and charges is made possible as the FRMP at the parent connection point receives metering data for any related market child connection points.

- **Demand charges**

  Demand charges are calculated based on the kVA peak (or more often for small customers, the kW peak) in any measured interval over a billing period (typically 30-minute interval over a monthly billing period).

  In maintaining a single connection to the LNSP network, FTM2 ensures that all energy withdrawn from or injected into the LNSP's network by the end user is measured at a single point (the primary connection point). Whilst in many cases the use of DER will act to reduce demand at the connection to the network, it is possible that energy flows at a secondary connection point in a PMA could contribute to the peak interval across a billing period (e.g. where end user's load at their primary connection point is combined with load withdrawn for fast charging an electric vehicle at a secondary connection point). In either scenario, this "combined" or "net" peak is the accurate representation of the demand placed by the end user on the network at the primary connection point.

  That energy flows at a secondary connection point might have contributed to or reduced the peak measurement is moot - identifying the contributory factors is likely to be both impractical and without value. For example, if an injection of energy at a secondary connection point had the effect of avoiding a peak at the primary connection point, separating that energy flow from the demand charge calculation would result in a higher peak demand being applied than the LNSP's network experienced in practice.

FTM2 is designed to support an end user separating some or all their controllable DER from their traditional supply arrangements. It is not a model designed to enable multiple end users to connect traditional, uncontrollable electrical installations beyond a single point of connection to the LNSP network (the embedded network arrangements are designed for that purpose) or to enable more than one end user connecting to the network at the same premises. AEMO contends that this is a key consideration in determining the value of an alternative to the status-quo arrangement described above.

As the end user's relationship with the LNSP is not materially changed due to the establishment of a PMA, AEMO contends that the principles determining the end user's network charges should be unchanged on establishment of a FTM2 connection arrangement. That is, network charges should be based on the nature of the connection to the LNSP's network and, where applicable, the flows of energy at the corresponding LNSP connection point (i.e. the primary connection point for a PMA). Introducing new charges risk double counting or otherwise charging the end user for energy flows within their own electrical installation rather than the use of the LNSP's network.

AEMO has considered five options for the allocation of network charges for an FTM2 arrangement:

1. **Retain the status-quo** – all network charges apply at the primary connection point and are payable by the FRMP at the primary NMI.

   This arrangement requires no change in process for LNSPs. It leverages principles applied to the existing framework for embedded network settlement and network charging processes required by FRMPs for reconciliation of metering data at parent connection points (used to calculate network charges) and metering data used for wholesale energy allocation (i.e. parent energy flow minus child connection point flow(s)).

   This option does introduce a dynamic that might affect the equity of network fee allocation, in situations where a secondary NMI is the principal driver of energy-related network charges for an end user. For example, if a high usage electric vehicle smart charger is connected via a secondary connection point and the end user is

an otherwise low user of electricity at their primary connection, the retailer at the primary connection point will be responsible for energy flow related network charges out of proportion with their wholesale market energy allocation.

Conversely, an end user who has "right-sized" a solar PV array and battery system to match their general energy needs and has their DER connected via a secondary connection point might result in the retailer at the primary connection point charging the end user for energy related network charges that they are not themselves incurring. Providing the end user is appropriately informed of this when agreeing to the establishment of the secondary connection point arrangement, this "feature" is not necessarily problematic.

In general terms, it is possible for the risk of this issue becoming material to be mitigated if limitations are placed on resources and electrical circuitry that can be connected via a PMA, as discussed previously in section 3.3. The risk to FRMPs being exposed to network charges unrelated to their wholesale energy flows could be mitigated further if FRMPs at primary connections points amend their terms and conditions with the end user in order that they reflect the end user's energy usage and its effect on energy related network charges. It is possible that restrictions might already exist that limit FRMPs ability to make such changes in response to a small end user obtaining a PMA connection point[28]. It is important to also consider the application of constraints in order that such a change did not unreasonably act to penalise or otherwise disincentivise the end user from accessing competitive offers available to them.

In any arrangement, the rules framework should not allow the connection of the entire energy resources at a connection point to be connected to a PMA connection point as an alternative pathway to selecting a replacement FRMP at the connection point to the LNSP network. For example, a connection point established to only provide energy to an irrigation pump might qualify to be connected to a PMA connection point, even if capacity and controllability restrictions were imposed in the NER; connecting the pump via a PMA connection point would expose the FRMP at the primary connection point to all network fees without any responsibility for energy flows in wholesale settlement, and the FRMP would have limited if any ability to unilaterally withdraw from the role. Whilst there is no apparent rationale for setting up such an arrangement, explicitly prohibiting it would remove the risk of an occurrence.

2. **LNSP to allocate network fees or develop a new network tariff that can be shared between FRMPs** – LNSPs could either play a role in separating network charges across two or more FRMPs, mimicking the charge that would apply if the end user had additional physical connections to the network, or develop a new network tariff that can be shared between FRMPs with components that can be spread across different end user devices[29].

   Whilst this arrangement would remove the risks to the FRMP at the primary connection point, discussed in option 1 above, it would require LNSPs to recognise all PMA connection points in their systems, with at least some responsibility for creation and maintenance of NMI standing data, and to develop bespoke charging arrangements for connection points beyond the boundaries of their network.

[28] For example, section 23C (Condition relating to renewable energy customers) of the Victorian Electricity Industry Act 2000 https://content.legislation.vic.gov.au/sites/default/files/2020-12/00-68aa089%20authorised_0.pdf

[29] As suggested by: CitiPower, Powercor and United Energy, 2021. *Submission to Post 2025 Market Design Consultation Paper* (June 2021). Available at https://web.archive.org.au/awa/20211005080115mp_/https://energyministers.gov.au/sites/prod.energycouncil/files/publications/documents/20.%20CitiPower%20Powercor%20United%20Energy%20Response%20to%20P2025%20Market%20Design%20Consultation%20Paper_0.pdf

3. **Requiring the FRMP at the primary connection point to pass on charges and credits -** in order that wholesale energy volumes match the energy flows used to calculate network energy charges at each respective PMA connection point.

   Such a model could avoid the need for LNSP involvement as presented in option 2 but is likely to require an entirely new framework to be constructed for the calculation of charges, FRMP to FRMP invoicing, dispute management and revision processes.

4. **An independent third party (e.g., AEMO) to perform a "wash-up" service** - in order that costs could be exchanged between FRMPs within PMAs ex-post network billing.

   This option would avoid the need for LNSPs and FRMPs to make material changes to systems and processes necessary to accommodate option 2 or 3 and is likely to minimise the cost of process establishment due to it being centralised rather than replicated across all LNSPs or FRMPs. A well-managed "wash-up" service (similar to the management of wholesale settlement currently) is likely to reduce the risk of dispute. The transaction volumes would be minimised in comparison with option 2 or 3 as the value of exchanges between FRMPs could be based on net calculations rather than gross.

5. **A hybrid capacity-based tier system**, where PMA connections below a pre-determined capacity limit would be treated as outlined in option 1 (status quo arrangements), with a bespoke network fee allocation method (e.g. option 2, 3 or 4) only being applied for PMA connection that exceed that limit.

   For example, a PMA connection point with connected resources rated at ≤5kW injection capacity and ≤5kW withdrawal capacity, would not require bespoke treatment. This would accommodate many residential sized DER systems such as hot water heating elements, solar PV systems and small customer battery storage systems.

   PMA connection points with a greater capacity, such as a >7kW rated electric vehicle fast charger would be treated differently, either prevented entirely from being connected via a PMA, or being connectable with a requirement for a limited version of option 2, 3 or 4 being applied to manage allocation of network fees.

Option 1, retention of the status quo for network charge allocation, is appealing since it requires little process or system change to implement. Conversely, and to varying degrees, all alternative charging arrangements require administrative, process and system change, would require new layers of data sharing, and costs would be incurred for implementation. Any lack of robustness in an alternative model's application will also have the potential to lead to double counting or overcharging and dispute amongst participants; to this extent, options 2 and 3 are likely to be more problematic and are likely to be more costly to implement than option 4.

More generally AEMO considers division of network charges by options 2, 3 and 4 to be unnecessary and to be avoided where possible, as the resulting charges (with additional costs incurred to facilitate division amongst FRMPs) relate to services provided to, and ultimately payable by, the same end user. In current market arrangements, small customer retail bills rarely if ever provide direct pass through of the charges applied to the FRMP at the connection point by the LNSP; the complexities of the network bill to the FRMP are therefore not directly exposed to end users today. Network charging arrangements to FRMPs can change materially (e.g. introduction of a demand charge to small customer connections) without material impacts or changes to FRMP agreements with end users. AEMO considers that the competitive retail market should be similarly capable of adapting to discrepancies in network fee allocation when compared to wholesale energy allocation providing that the market arrangements for network fee allocation are transparent to all parties and appropriate consumer protections are established. Such protections might include limitations being placed on the FRMP at the primary

connection point in order that they do not seek to over recover, or otherwise act to unreasonably penalise the end user for selecting an alternative FRMP to establish a PMA connection point.

Controls or limitations placed on the resources and circuitry that can be connected to a PMA are likely to be capable of mitigating the risk to the FRMP at the primary connection point of their customer relationship being "hollowed-out". This risk is mitigated even further should a capacity limit (or similar) be adopted, which could enable the connection of most residential scale resources via a PMA connection point without presenting a material risk to the retailer at the primary connection point.

Accordingly, AEMO proposes that status quo processes for network charge application should continue (option 1), with network charges invoiced in their entirety to FRMP at the primary connection point within a PMA (and be based on the net flows of energy at that connection point); with limitations and constraints considered in line with those proposed both in this section and in section 3.3.

If the controls or limitations required to implement option 1 are likely to be overly restrictive, to the extent that common types of DER would be prohibited from connecting via a PMA connection point without risking the FRMP at the primary connection point being compromised (e.g. facing material costs in relation to network charges resulting from a PMA connection's energy flows that it had no reasonable route to recover) the hybrid option 5 might provide a suitable alternative. This would enable smaller scale DER to access flexible trading with minimal impact to market systems and processes and would limit the need for systems to reallocate network fees other than for larger DER resources. It is feasible that large DER loads, such as very high capacity fast electric vehicle charging systems, or high-capacity air conditioning systems at residential connections, might need to be recognised or otherwise approved through bespoke arrangements (e.g. prescribed electrical work requiring distribution network service provider authorisation to connect) in any case and that the management of network charges could be a feature of the connection, including within a PMA.

It is possible that a mechanism for reallocating or otherwise assigning fees related to the use of, or upstream connection to, the network might be required to support future initiatives, for example:

- Enabling retail competition within neighbourhood battery systems (e.g. aligning a portion of the energy flows to and from a neighbourhood or community battery system to a customer with a stake in that system).
- Assigning network fees along with energy charges to a FRMP for an electric vehicle, charging at a roadside or carpark charging point.

AEMO notes that similar mechanisms to those described in options 2 and 4 were considered within the AEMC's review of embedded networks for the calculation of 'shadow' network charges to child connection points and if more complex connection arrangements are likely to expand beyond the current proposals for flexible trading, the creation of the framework needed to support option 2, 3 or 4 might be required in any event.

Importantly, in all cases:

- MDPs at secondary NMIs within a PMA must be required to provide metering data to the FRMP at the primary NMI (as is currently the case for all subtractive settlement arrangements in the NEM) to facilitate reconciliation of both wholesale settlement and network charges; and
- prospective retailers for either or both primary and secondary NMIs within a PMA must be able to see the average daily load for data streams at related connection points via the MSATS NMI discovery search facility, and this will assist in understanding the nature of the end user's energy usage, the optimum product and service to offer and the likely impacts relating to network charge allocation.

3.7 Requirement for remotely read interval metering installations

For a PMA to be established, the end user would be required to have a remotely read interval metering installation at their primary NMI, if for no other reason than to enable the subtractive settlement process to operate effectively. AEMO notes that the connection of most DER precipitates the need for the installation of remotely read interval metering, so this requirement is unlikely to be an issue in most circumstances where an end user might seek to establish a PMA. The AEMC notes in its metering framework review consultation paper[30] that the installation of solar PV systems is the main reason for customer requests for smart meters, which are currently the main driver of smart meter uptake in the NEM (excluding Victoria which has almost complete smart meter penetration for residential and small business end users).

As discussed in section 4, PMA NMIs must also be a remotely read interval meter, with end user acceptance of remote communication capabilities being a necessary requirement for PMA establishment. In the unlikely event that an end user requests a removal of remote communications at their primary NMI, the natural consequence is that by default they forfeit their ability to access FTM2 concurrent with the termination of primary NMI comms.

[30] AEMC, 2021. *Consultation paper – Review of the regulatory framework for metering services*. Available at https://www.aemc.gov.au/market-reviews-advice/review-regulatory-framework-metering-services

3.8 Overview of proposed roles and responsibilities for FTM2

Table 2 outlines the key roles and responsibilities proposed for FTM2, including the creation and maintenance of PMAs.

Table 2 Summary of proposed roles and responsibilities for FTM2

Role	Description/responsibilities
FRMP for the PMA	• Requests the (non-LNSP) creation and maintenance of NMI within PMA via NMI Service Provider and appoints MC for the secondary connection point • Ongoing role as customer's FRMP for the secondary connection point
FRMP at primary connection point	• Retains existing role • Responsible for paying network charges from LNSP for net energy flow to and from the LNSP's network (may be smaller or greater than the energy flows attributable to them in wholesale settlement)
NMI Service Provider	• New role which emulates the functions of the Embedded Network Manager and is accredited by AEMO • Responsible for creation of PMA NMI, linking secondary to primary NMI in MSATS and maintenance of standing data in AEMO's systems
MC	• Has the option to extend provision of existing role responsibilities and obligations by offering services for PMA connection points. • Appoint suitably accredited Metering Provider and MDP (for PMA connections)
Metering Provider	• Option to obtain accreditation (e.g. Category 4P) to provide services to PMA to install and maintain PMA metering installations. • Configuration designs must be approved by AEMO prior to deployment (as per existing requirements)
MDP	• Option to obtain accreditation (e.g., Category 4P) to provide metering data services to PMA connection points (e.g. ensure accurate linking of primary and secondary NMIs for calculation of energy settlement and identify energy flows within a PMA at times when supply to connection point is down for substitution)
LNSP	• Retains existing role and relationship with primary connection point • Allocates network charges to FRMP at primary connection point based on net flows to and from LNSP's network (i.e. no change)
AEMO	• Allocate energy flows for settlement for FRMP1 and FRMP2 via subtractive settlement method • Accredit Metering Providers and MDPs under new categories for PMA metering installations • Approve metering installation configuration designs submitted by Metering Providers (via initial accreditation and ongoing from time to time) • Provide NMIs to the NMI Service Provider

4 Minor energy flow metering requirements

The development of the FTM2 model has enabled a re-evaluation of the flexibility and completeness of the NEM metering framework in a contemporary context. As the FTM2 design seeks to enable the establishment of a metering installation within an end user's electrical installation, requirements within the framework designed to support network information and services might not be applicable. Removal of unnecessary requirements has the potential to reduce the cost of devices and increase the flexibility of their use and practicality of installation (e.g. physical size and location of installation). In addition to FTM2 connections, there are other connection types in the NEM that might also benefit from such an expansion to the metering framework.

The proposals in this HLD do not seek to materially alter the application of the connection arrangements and metering installation types that are currently considered within the NER[31]. Rather, they seek to explicitly accommodate connection arrangements that are currently outside or otherwise not considered within the NEM metering framework and are therefore not the subject of the AEMC's current metering framework review.

The term "minor energy flow metering" is used to consider the framework requirements for the following connection types:

- Metering installations connected within a PMA (not including the primary connection point metering installation which is connected to the network and not within the PMA).
- Traditionally unmetered 'street furniture' connections (e.g. streetlighting, traffic lighting, publicly provided park hotplates/barbeques, telecommunications kiosks).

The characteristics of these connection types are similar in that they involve the measurement of a minor energy flow (either a sub-set of a small customer's energy flow, a typically minor load such as LED luminaires, or a larger instantaneous load such as a park barbeque that is not in operation for the majority of any given year), and they have limited 'real estate' within which to house the metering components.

AEMO considers that small customer metering installations for residential child connection points in embedded networks, connected prior to 1 January 2012, should also be included within the scope of minor energy flow metering. Whilst in some cases the quantity of energy flows at such a connection might approach those within a typical small customer connection to the distribution network, without access to a small 'footprint' NEM-compliant metering solution, customers within these embedded network connections have limited, or no ability to access retail competition. Embedded network connections established after 1 January 2012 were required to comply with NEM standards and should not limit customers accessing retail competition to the same extent.

Most requirements that apply to type 4 metering installations should also apply to connections with minor energy flows. Accuracy requirements for type 4 metering installations (defined in NER clause S7.4.3) apply to all metering installations with a volume limit per annum per connection point of less than 750 MWh, and this includes numerous connection points with very small flows of energy per annum.

[31] Noting that the metering framework is currently the subject of a review by the AEMC (available at https://www.aemc.gov.au/market-reviews-advice/review-regulatory-framework-metering-services)

The format, timing, and data quality and quantity requirements on MDPs should remain unaltered and be consistent with the recent global settlement and five-minute settlement rule changes. Provisions in NER S7.6 provide extensive flexibility regarding maintenance testing and inspection; the ability for MCs to develop and seek approval for an asset management strategy as an alternative to the NER requirements for the testing and inspection of metering installations is already established and could be utilised by MCs for connections with minor energy flows.

AEMO considers that points of differentiation from standard type 4 metering installations for minor energy flow metering installations should include:

- MC, MDP and Metering Provider roles.
- Metering installation components – meter display.
- Application of NER clauses 7.8.3 (small customer metering installations) and 7.8.4 (type 4A metering installation).

4.1 Metering Coordinator, Metering Data Provider and Metering Provider roles

Metering Providers will have to demonstrate capability and competency specific to the installation and maintenance of minor energy flow metering installations. For example, Metering Providers will have to demonstrate processes for the commissioning of a metering installation in the absence of a physical display, the accurate set up of remote display capability and in many cases will need to develop maintenance access, testing and inspection methods specific to the location and type of minor energy flow metering installation to which they are appointed. AEMO proposes that an additional category of Metering Provider accreditation (say, type 4T) is established in NER S7.2 (Metering Provider) to facilitate this. An equivalent category of MDP accreditation would also be established to accommodate variances in the provision of MDP services.

AEMO considers that there is value in enabling distribution network service providers (DNSPs) to act in the role of MC for minor energy flow metering installation connections for street furniture, in particular for connections such as streetlighting and traffic lighting. These items of street furniture are often maintained by DNSPs, with various connection assets being fixed to, or housed within, DNSP infrastructure and access to the DNSP's infrastructure by parties other than DNSP personnel may introduce a safety risk. These connections are either currently managed by DNSPs as type 7 metering installations or are non-contestable unmetered (NMI classification code in MSATS = NCONUML), with energy volumes calculated by DNSPs. It might also be most efficient for DNSPs to control the movement of currently unmetered type 7 loads from their inventory tables to being metered via a minor energy flow metering installation. This concept is not relevant for minor energy flow metering installations for connections other than street furniture.

Similarly, AEMO considers that should DNSPs act in the role of MC for minor energy flow metering installations, it is logical to extend ability for DNSPs to also operate in the role of Metering Provider and MDP within the limitations stated above.

4.2 Metering installation components – meter display

As highlighted in section 2.1.4 of this paper, the display component of a metering installation is a key area where requirements in the NER can be adjusted to accommodate new technologies and metering systems and consider how they might be provided remotely from the physical point of connection.

NER requirements for the display component are established in NER clause 7.8.2(a)(1), summarised as follows:

> *A Metering Provider must… ensure that a metering installation (other than type 7):*
>
> *Contains a device that has either a visible or an equivalently accessible display of the cumulative total energy measured by that metering installation (at a minimum).*

Whilst the clause does not explicitly prevent the establishment of a remote display, the concept has not previously been considered to any extent within the NER and has no established framework to support its application. As such, AEMO believes that the application of the term, "equivalently accessible display" should be considered in a contemporary context.

AEMO contends that a metering system which allows the traditional meter display to be accessed via an alternative source (e.g. a laptop, in-home display unit, smart-phone or similar) can provide equal or superior information to the end user to that of a physical display compliant with NER 7.8.2(a)(1).

In practical terms, meter displays configured as currently required in NER 7.8.2(a)(1) are of less use than at first might be apparent. For large customers who commonly access time of use retail products, the physical display on a metering device is largely irrelevant. Increasingly this is becoming true for small customers also; many small customers, in particular those that have smart meters, have metering configurations that record more than one data register. For example, a small customer whose metering installation configuration includes the connection of bi-directional resources and has a peak and off-peak tariff, will typically be billed according to the data assigned to four independent registers. The total cumulative energy register required by the NER to feature on the display of the meter does not feature on the customer's bill.

The only consistent identification marker, that will in all cases be present at the physical point of connection and a small customer's bill, is the metering device(s) identifiers (e.g. the meter device serial number).

AEMO considers that there is no compelling reason for the NER or NERR to require small customers to be able to access a reading locally for a metering installation within a PMA, or for that matter any other minor energy flow metering installation.

Customers can access metering data for their NMI(s) as specified in NER clause 7.15.5(d), far exceeding information visible on a display provided under NER 7.8.2(a)(1), and for small customers this capability is likely to be extended due to pending changes for the introduction of the Consumer Data Right for energy[32]. Customers covered under the National Energy Consumer Framework (NECF) may also query the accuracy of their bills and for corrections to be made in the case of any overcharging or inaccurate measurement by the metering installation.

The commissioning process for a minor energy flow metering installation, including those connected within a PMA, will need to at least match the current requirements for commissioning of a small customer metering installation connected to the distribution network. The point of commissioning, as considered in AEMO

[32] ACCC, 2021. CDR in the energy sector. Available at https://www.accc.gov.au/focus-areas/consumer-data-right-cdr-0

procedures[33], is key in assigning the metering device(s) that comprise the metering installation to the appropriate NMI. This process ensures that energy settlement, retail billing and any network charges are assigned to the correct measurement point.

To the extent that a local or remote readable display is provided as part of the metering system, AEMO procedures could be extended to include a validation process upon commissioning to enable the display. This could include the provision of a verifiable link (e.g. a readable unique identifier such as the meter device serial number/bar code) to the physical device(s). Critically the physical metering installation must continue to have a unique, visible identifier that acts as a point of verification between the measured energy within the metering system, the remote display capability and the end user's energy bill.

4.3 Application of NER clause 7.8.3 (small customer metering installations)

NER clause 7.8.3(a) requires that any new or replacement metering installation in respect of the connection point of a small customer is a type 4 metering installation that meets the minimum services specification. The requirements of the minimum services specification are provided in NER clause S7.5.1 and are summarised in section 2.1.4 of this paper. Typically, minor energy flow metering installations will be installed at small customer connection points so it is appropriate to consider whether the stated purpose for establishment of the minimum services specification is aligned with the use cases under which minor energy flow connections will be established.

The purpose of establishing the minimum services specification in the NER, as detailed in the AEMC's final determination in the competition in metering rule change, is summarised as follows:

- To allow the broader market benefits of advanced meters to be captured, particularly where the party installing the meters may not have an incentive to provide a metering installation capable of providing services that would be of value to others.
- To provide a starting point for third parties, such as retailers and DNSPs, to negotiate access to services that may ultimately benefit their customers, either directly through new retail or energy management service offerings, or indirectly through lower retail and network costs.[34]

The minimum services specification provides three broad categories of services (information provision, connection, and reconfiguration) and details the "access party" who might obtain the service:

- **Information provision**

  With the exception of legacy connections within embedded networks, minor energy flow metering will be established to enable the provision of a bespoke service (e.g. electric vehicle charging within a domestic premises, streetlighting connections, etc.). Whilst metering data and NMI standing data from the connection point will likely be of interest to parties wishing to offer competitive retail offers for bespoke services at minor energy flow connection points, this data will be accessible to them without reference to the minimum services specification. NER clause 7.15.5 provides current and prospective market participants with access rights to metering and standing data and AEMO expects the Consumer Data Right legislation to make this data more accessible to customers and their agents in due course.

[33] AEMO's Metrology Procedures and Service Level Procedures.

[34] AEMC, 2015. Competition in metering final determination (Section C1.1 Introduction – Minimum Services Specification, page 290). Available at https://www.aemc.gov.au/sites/default/files/content/ed88c96e-da1f-42c7-9f2a-51a411e83574/Final-rule-determination-for-publication.pdf

AEMO considers that power quality data required under the metering installation inquiry service is moot for minor energy flow metering – the LNSP will often not have a relationship with the NMI (as it will be within a PMA or embedded network) or in the case of street furniture, is unlikely to obtain a material benefit from it, at least not to the extent that specification within the NER is necessary.

- **Connection services**

  Many minor energy flow metering systems are likely to have switching functionality of some description. For example, PMA connections will need to be configured in order that DER can switch between the primary and secondary connection points, and smart streetlighting systems are typically installed with a primary purpose of enhancing controllability. This functionality should not be confused with the connection services requirements within the minimum services specification which is based on the remote operation of the de-energisation and re-energisation services considered in Part 6 of the NERR.

  Like information services, the LNSP is often not an access party to the service for connections within embedded networks or PMAs. To the extent that a PMA NMI needs to be de-activated, this could be achieved without the need for a remote de-energisation. Simple de-activation of the NMI data streams in MSATS would ensure that no energy was assigned to a secondary NMI within a PMA, which has the same practical effect as a traditional de-energisation without any associated risks, costs, or jurisdictional authorisations. In this scenario, the end user would not lose use of their resource as it would default to a connection via their primary connection point; but rather would no longer access the alternative FRMP's services for use of that resource.

  Other minor energy flow connections, in particular legacy embedded network connections, are unlikely to have the physical space required to enable this functionality and imposing it may prevent customers within these embedded networks from accessing retail competition.

- **Reconfiguration**

  Reconfiguration services are similarly unlikely to be utilised by LNSPs for minor energy flow metering. Street furniture energy flow measurement is typically simple (i.e., one consumption data stream) and if AEMO's proposals for changes to meter display requirements are adopted as discussed in section 4.2, display reconfiguration requirements become moot. The application of 'time-sliced', or 'slab' tariffs can be applied in metering data management systems if needed – e.g. recording energy flows over a 24hr period in five-minute intervals enables different 'time-of-use' rates and charges to be applied to as many as 288 five-minute time slots across any one day without requiring metering reconfiguration.

For the reasons outlined above, AEMO contends that the minimum services specification should not apply to minor energy flow metering installations. The application of the minimum services specification is moot because:

- The service does not reasonably apply, or the access parties are not parties to the NMI.
- Alternative arrangements are superior in application (e.g. NMI de-activation in MSATS in favour of physical de-energisation).
- The requirements would unreasonably limit access to retail competition (e.g. in the case of legacy embedded network connections).

4.4 Application of NER clause 7.8.4 (type 4A metering installation)

NER clause 7.8.4 enables exemptions to the requirements of clause 7.8.3, including the application of the minimum services specification, and provides the ability for the MC to install a type 4A metering installation where an existing telecommunications network necessary to enable remote communications is unavailable or where a small customer has refused installation of remote communications.

AEMO considers that there is no reason to extend these concessions for minor energy flow metering installations and that they should instead be treated like a traditional type 4 metering installation, where remote communications are required for the metering installation to be commissioned. Small customer acceptance of remote communications must be a precursor to PMA establishment in all cases.

4.5 Inspection and testing requirements

The application of the proposals in the rule change request are reliant on clarifications and minor amendments to NER S7.6 (Inspection and testing requirements) presented previously by AEMO for the AEMC's consideration in AEMO submissions to the metering framework review.

The minor amendments proposed by AEMO (and provided in Appendix C of the rule change request) provide, amongst other things, clarity regarding the ability for MCs to propose bespoke arrangements for the testing and inspection of existing, new, and emerging metering devices, technologies, and systems, and for these to be assessed for approval to ensure that the integrity of metering data is not compromised.

Inspection (ongoing assessment of the condition and connection security) and testing (confirmation of the ongoing accuracy of the device(s) that comprise the metering installation) of metering installations form part of the compliance chain that assures all market participants of the reliability of metering data that is used for retail and network billing and market settlement. It is important that the NER sets the baseline expectation for what must be achieved by MCs regarding inspection and testing of metering installations, whilst providing a framework that allows for innovation. This is particularly relevant in a competitive market where development of devices, systems and processes has the potential to afford material benefits to MCs in reducing cost of testing and inspection whilst maintaining or improving the veracity of metering data for use in the market.

AEMO considers these proposed changes to NER Schedule 7 critical for the adoption of both FTM2 and minor energy flow metering arrangements within the metering framework.

4.6 Roles and responsibilities for minor energy flow connections

Establishing requirements for minor energy flow metering installations does not oblige any party to undertake activity or adopt new obligations, roles, or responsibilities - other than AEMO establishing requirements in procedures. Rather it is an enabler that allows various participants and providers to determine whether to utilise the new framework. This includes device manufacturers designing products and obtaining necessary approvals in order that they can operate within the framework. Current and intending MCs (including LNSP MCs), MDPs and Metering Providers can determine their interest in providing services, and FRMPs and end users can consider potential benefits.

5 Consumer protections

In the case of small customers, the NECF provides energy-specific protections which are relevant to the establishment and ongoing services and operations at connection points.

AEMO recognises that the review of the retailer authorisation process, currently being undertaken by the AER in conjunction with the AEMC, will consider how best to apply the energy-specific consumer protections under the NECF for the different products, services, and business models that are likely to emerge as customers seek to optimise their energy use, flexible demand, and the value of DER assets. This review will include deliberation of the flexible trading arrangement models.

AEMO contends that the application of FTM2 requires specific review in the following areas of the NERR:

- Retailer obligations in relation to customer transfer (rules 57 - 59).
- De-energisation (or disconnection) and re-energisation of premises (rules 107 – 122).
- Customer information requirements (Part 2, Division 7 Market retail contracts – particular requirements, rules 46A to 52).
- Life support equipment (rules 123 – 126).

5.1 Retailer obligations in relation to customer transfers

The current requirements for the operation of small customer transfers are predicated on the basis that there is only one trading relationship for the entirety of the customer's premises. The establishment of more than one trading relationship at a single premises demands a review of the customer transfer requirements, in particular where a customer is moving into a premises, so the customer can be appropriately informed of their options.

- **In-situ customer transfers:** It is reasonable to consider that an in-situ customer is aware that they have established one or more trading arrangements for their premises. An in-situ customer may switch between FRMPs of their choosing for any one or more of their connection points, utilising the recently improved customer transfer framework in the NER. A prospective FRMP seeking to provide an offer to an in-situ customer would be able to identify all of the connection points pertinent to them, providing that AEMO's MSATS NMI discovery facility is configured to enable it.
- **Move-ins where the customer has appointed a FRMP(s):** The most common scenario for a customer moving into a premises is for the customer to have agreed provision of electricity retailer services prior to the date of occupancy. A prospective FRMP seeking to provide an offer to a move-in customer will be able to identify all connection points pertinent to the premises and the nature of their relationship via access to AEMO's MSATS NMI discovery facility. The customer switching framework and MSATS will facilitate the following options for the customer to select when engaging their chosen FRMP(s):
  - A single FRMP for the entire installation, with any existing PMA NMIs being retained but made inactive.
  - A single FRMP across all NMIs.
  - Select a FRMP for each NMI at the premises.

Once the move-in is complete, the customer may choose to alter their retail arrangements, including re-establishing flexible trading arrangements if they had determined not to do so upon move-in, without incurring network charges for the energisation or de-energisation of a connection to the network.

- **Move-ins where no agreement has been established between the customer and a FRMP**: It is not uncommon for a customer to move into a property and, where the supply of electricity is connected, not formally agree to a retail contract until a later date. In the case of a premises with an established flexible trading arrangement, this means that all FRMPs at the premises will continue to be responsible for the wholesale energy until such time as they are changed or their respective NMIs are de-energised. Premises with flexible trading arrangements will have been fitted with remotely read interval metering; as a result, the availability of remotely managed de-energisation and re-energisation services, as well as regular data monitoring provides sufficient tools for FRMP to mitigate the risk of this presenting a problem for the FRMP or the move-in customer. The changes to the customer switching processes in October 2021 provide additional assurance, enabling FRMPs to be appointed retrospectively, including at any flexible trading arrangement NMIs.

In each of the three common customer transfer examples provided above, AEMO considers that it is vital for the customer to be informed or reminded of the facilities and options at their disposal when considering a move-in FRMP appointment or switch. Similarly, it is important that prospective FRMPs are able to identify the suite of connection services established at a premises in order that they can offer the most appropriate services and options to the customer.

AEMO proposes that the NERR should place obligations on prospective FRMPs to inform the customer of their options with respect to any current or inactive NMIs at the same premises in order that the customer be sufficiently informed of their options. For move-in customers, the customer switching process provides the optimal opportunity for the customer to be informed and to best exercise their ability to choose the products and services, both at that time or at a time of their choosing in the future.

5.2 De-energisation (or disconnection) and re-energisation of premises

A NMI within a PMA is dependent on the supply of electricity being maintained from the distribution network via the primary connection point NMI in order to operate in the market. A PMA NMI is, in effect, a discretionary NMI in that it is providing an alternative trading arrangement for the customer's DER. Accordingly, a PMA NMI can be de-energised, abolished entirely, or simply left idle with no DER connected to it, without affecting the customer's ability to utilise their DER via their primary connection point NMI and FRMP. Similarly, in many circumstances, a PMA NMI can be maintained or have meters changed without interrupting customer supply. However, should the primary connection point NMI be disconnected from the distribution network for any reason, any downstream PMA NMI would also be disconnected by default.

To examine whether this arrangement is problematic, and whether specific provisions should be considered in the NERR, reasons for disconnection at the primary connection point NMI are explored as follows:

- **Customer move-outs** – it is common for the connection point to be de-energised upon a customer move-out. This type of disconnection does not unreasonably impede PMA NMIs from operating as there is no longer an identified customer at the premises.
- **Temporary planned disconnection** – from time-to-time, parties will arrange temporary planned disconnections, and provisions are made for this in the NERR. This includes maintenance of metering

equipment and network connection assets as well as responding to customer requests for temporary disconnection. Temporary disconnections do not unreasonably impede PMA NMIs from operating and the customer for the premises will be informed of the planned disconnection by the party undertaking the de-energisation as required in the NERR.

- **Non-payment** – there are a number of reasons provided for in the NERR, including non-payment and illegally using energy, where a FRMP or distributor may de-energise a connection point.

In each of these cases, AEMO considers that the party undertaking the disconnection at the primary connection point NMI is the principal stakeholder affected by the act or omission on the part of the customer and that the operation of FTM2 is contingent on the customer maintaining an active connection to the network. Acknowledgement of this contingency will be important in the establishment of agreements between FRMPs offering services within a PMA and their customers.

In each of the above examples, the option of providing primary connection point NMI status updates to related PMA NMIs should be explored during the consultation phase of the MSATS procedures related to the flexible trading arrangements rule change request. For example, PMA NMI FRMPs could be notified about changes to the connection status of the primary NMI to which they are related. AEMO does not consider that NERR amendments to de-energisation and re-energisation provisions are required, as long as appropriate notifications are provided to interested parties within the NER framework.

5.3 Customer information requirements

The NERR includes a range of requirements for FRMPs regarding customer information requirements for market retail contracts. The creation and maintenance of additional connection points at a single premises (and in the case of FTM2, explicitly for the same customer within their electrical installation) adds a layer of complexity that might require simple-to-understand and accessible information be made available to customers to ensure they are sufficiently informed.

For customer switching activity this is highlighted in section 5.1 above, although AEMO recommends that the AEMC consider requirements for provision of information more broadly in the NERR and in particular relating to NERR Part 2 Division 7 (Market retail contracts – particular provisions (rules 46A to 52)). AEMO considers that this area presents an opportunity to utilise the consumer risk assessment tool recently developed by the AEMC in concert with the ESB[35].

Features of FTM2 that might reasonably require consideration within the consumer risk assessment tool include:

- Due to the connection arrangements and flexibility provided within FTM2, a secondary trading arrangement could be established between a FRMP and a customer that is discretionary in nature, utilising resources from time to time that are, in normal circumstances, connected via the customer's primary FRMP. For example, an FTM2 connection used by a "secondary" FRMP to provide an aggregated response for the provision of ancillary services (for the period within which ancillary services is provided, the secondary FRMP has also agreed to manage the wholesale energy price risk for the customer in relation to the resources used). Other

[35] ESB, 2021. *Post 2025 Market Design Final Advice to Energy Ministers Part C*, section 2.2, page 26. Available at https://esb-post2025-market-design.aemc.gov.au/32572/1629945838-post-2025-market-design-final-advice-to-energy-ministers-part-c.pdf

than SGA connections, which suffer from the barriers previously mentioned and have not become mainstream for small customer connections, this type of discretionary arrangement has not been considered in the NERR.

- A term-based retail arrangement could be agreed with a customer at a secondary connection point within FTM2, for example an arrangement to provide electric vehicle charging services for a period of 24 months. As expiry of the arrangement approaches, the options available to the customer and the risks in relation to an action or inaction on the customer's behalf are materially different from a standard connection point to the distribution network. If the customer does not choose to extend the current term arrangements or select a new provider for their electric vehicle charging, the default arrangement is that their primary FRMP becomes the default provider when the secondary connection point is made inactive in market systems.

5.4 Life support equipment

AEMO considers that customers requiring life support need a greater level of protection than could be provided under a PMA. As such, AEMO considers that the NERR provisions for life support equipment should not apply to PMA NMIs. PMA NMIs should be exclusively for the connection of controllable resources as previously discussed and provisions should be established in the NER to make this limitation explicit.

5.5 Retailer of Last Resort (RoLR) scheme

Current RoLR processes include market connection points that are not connected to LNSP networks (child connection points within embedded networks) and connection points where subtractive settlement processes are used to determine wholesale energy volume assignment (parent connection points for embedded networks).

In simple terms, the AER nominates the RoLR. Due to the nature of the FTM2 connection arrangements (e.g. the retailer relationships are with the same end user at a single premises), an alternative approach for management of a RoLR event at a secondary NMI could be for the retailer at the associated primary connection point to act as the default RoLR.

Regardless of the party appointed as a result of a RoLR event, end users are able to switch to a retailer of their choosing and this can occur quickly following the changes made to the customer switching processes in October 2021. AEMO considers that a RoLR event involving either or all the FRMPs at primary and secondary connection points within the FTM2 model would be catered for in existing RoLR processes, and that there are no exceptional conditions warranting bespoke treatment in the RoLR process. Inclusion in the standard process does not limit the ability for the customer to select a retailer for their various connection point arrangements (prospectively or in some cases, retrospectively) and bespoke RoLR requirements for FTM2 are likely to add unnecessary cost and complexity to a time-sensitive process.

5.6 Arrangements in Victoria

The NECF does not apply in Victoria and AEMO is discussing the proposed changes separately with the Victorian Essential Services Commission Victoria (ESCV) to understand potential implications for the Victorian Energy

Retail Code of Practice[36] and its other codes and guidelines (e.g., the Electricity Customer Transfer Code). AEMO considers that the changes proposed in this paper to the NER for the implementation of FTM2 and minor energy flow metering will apply in Victoria as they are not within the scope of the Victorian Government's deferral by Order-in-Council of metering competition in Victoria[37].

[36] Note the ESCV remade the Energy Retail Code into the Energy Retail Code of Practice, which will come into effect on 1 March 2022. ESCV, 2021. *Making an Energy Retail Code of Practice.* Available at https://www.esc.vic.gov.au/electricity-and-gas/codes-guidelines-and-policies/energy-retail-code/making-energy-retail-code-practice

[37] Victorian Government Order-In-Council, No. S 346, Thursday 12 October 2017. Available at https://resources.reglii.com/VGG.2017.10.12.S346.pdf

6 Implementation and impacts

AEMO procedure and system changes

AEMO procedure and system changes required for implementation of this HLD is provided in Table 3.

Table 3 AEMO procedure and system changes

Area	Documents / changes required
Service Level Procedures	• Metering Data Provider (requirements for 4P and 4T metering installations) • Metering Provider (requirements for 4P and 4T metering installations) • Creation of NMI Service Provider Procedures (New) and associated amendment to qualification and deregistration procedures
Metrology procedures	• Part A (technical requirements for PMAs and minor energy flow metering installations) • Part B (metering data requirements for PMAs)
MSATS Procedures	• Standing Data for MSATS (linking codes for primary and secondary NMIs)
System changes	• Ensuring robust subtractive settlement and visibility of data for PMA connection points

Impacts

An overview of the changes required for implementation of this HLD for AEMO, market participants and service providers, is provided in Table 4:

Table 4 Implementation impacts

Participant/stakeholder	Impact
AEMO	• Changes to systems and procedures to facilitate FTM2 (see above)
FRMPs	• FRMP at primary connection point where there is a PMA: The FRMP at the primary connection point will be responsible for the payment of all network charges relating to the end user, noting that energy flows used to determine network charges will differ from energy flows charged to the FRMP at the primary connection point for wholesale settlement • FRMP at PMA: If a participant wishes to become the FRMP for an end user's PMA, changes to systems and processes may be required to enable delivery of this service
LNSPs	• No identified impacts
MCs	• No identified impacts
Metering Providers and MDPs	• Optional - if Metering Providers or MDPs wish to provide PMA metering services or operate at minor energy flow metering installations, there will be additional accreditation requirements for proposed new categories 4P and 4T

Interactions with other ESB reforms

AEMO is aware that discussions on the design of Dynamic Operating Envelopes (DOE) have referenced the flexible trading arrangement models, with concerns raised regarding potential complexity or incompatibility with DOE design.

AEMO considers that DOE design must consider existing arrangements in the NEM, which include end user connections beyond the distribution network, and other complex connection arrangements such as a single premises with a single end user who has more than one connection point.

Both ESB's flexible trading arrangement models fall within the umbrella of current market connection arrangements and AEMO does not consider them to be sufficiently novel such that the progress of either should be delayed pending the development of more advanced DOE design.

The application of DOEs could be retained within the scope of connections made directly to the distribution network. This has the potential to avoid the complexities of including connections beyond the visibility of the distributor and the need to establish agreements or place obligations on parties at connections that the distributor is not otherwise a party to. This would require the outcomes of the IESS rule to be accommodated in DOE design, in addition to the current SGA arrangements which provide the foundation design for flexible trading arrangements Model 1 but would avoid the need to consider embedded network connections and FTM2.

Alternatively, DOEs could be designed so that they apply to connections beyond the distribution network, including the wide variety of embedded networks currently operating in the NEM. When compared to current embedded network arrangements, FTM2 is a simple single-end user concept, that is designed to be ever-visible in market systems with robustly applied consumer protections and access to retail competition. As a result, AEMO considers that solutions for the application of DOE at these more complex connection point arrangements will by default also provide a model that can be applied to the far simpler connection arrangements presented in this proposal.

Timing

Due to the interdependence between the design of AEMO procedures and the proposed changes to the NER and NERR discussed in this proposal, AEMO intends to work collaboratively with the AEMC to ensure development of the rules and procedures, consultation with interested parties and the implementation and effective dates of any rule or procedure changes can be aligned to the extent that it is necessary and practical to do so.

7 List of abbreviations

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
DER	Distributed Energy Resources
DELWP	Department of Environment, Land, Water and Planning (Victoria)
DNSP	Distribution Network Service Provider
DOE	Dynamic Operating Envelope
ECA	Energy Consumers Australia
ENM	Embedded Network Manager
ESB	Energy Security Board
ESCV	Essential Services Commission Victoria
FRMP	Financially responsible Market Participant
FTM2	Flexible Trader Model 2
GW	Gigawatt
GWh	Gigawatt-hour
HLD	High-Level Design
IESS	Integrating energy storage systems
IRP	Integrated Resource Provider

kWh	Kilowatt-hour
LNSP	Local Network Service Provider
MC	Metering Coordinator
MDP	Meter Data Provider
MSATS	Market Settlement and Transfer Solution
MSGA	Market Small Generation Aggregator
MWh	Megawatt-hour
NECF	National Energy Customer Framework
NEM	National Electricity Market
NER	National Electricity Rules
NERR	National Energy Retail Rules
NMI	National Metering Identifier
NSP	Network Service Provider
PMA	Private metering arrangement
PV	Photovoltaic
RoLR	Retailer of Last Resort
SGA	Small Generation Aggregator

Appendix C: Proposed amendments to NER clause S7.6 (Metering Framework Review)

Metering framework review

Proposed amendments to Schedule 7 of the NER

Schedule 7.1 Metering register

S7.1.1 General

(a) The *metering register* forms part of the *metering database* and holds static *metering* information associated with *metering installations* defined by the *Rules* that determines the validity and accuracy of *metering data*.

(b) The purpose of the *metering register* is to facilitate:

(1) the registration of *connection points*, *metering points* and affected *Registered Participants*;

(2) the verification of compliance with the *Rules*; and

(3) the auditable control of changes to the registered information.

S7.1.2 Metering register information

Metering information to be contained in the *metering register* should include, but is not limited to the following:

(a) *Connection* and *metering point* reference details~~, including:~~

~~(1) agreed locations and reference details (eg drawing numbers);~~

~~(2) loss compensation calculation details;~~

~~(3) site identification names;~~

~~(4) details of *Market Participants* and *Local Network Service Providers* associated with the *connection point* and the *Embedded Network Manager* in relation to a *child connection point*;~~

~~(5) details of the *Metering Coordinator*; and~~

~~(6) transfer date for *Second Tier Customer* and *Non-Registered Second Tier Customer metering data* (i.e. to another *Market Customer*).~~

Commented [AEMO1]: S7.1.2 – Metering register information.

These proposed changes have resulted from the work undertaken by AEMO, in consultation with interested parties, on the MSATS Standing Data Review in 2020. AEMO identified several items currently included in the clause that are no longer relevant (e.g. the inclusion of a password field is related to legacy metering system designs). More generally, AEMO considers that the list should provide high level guidance that enables the metering information to adapt with evolving technologies and market needs. Within the MSATS Standing Data Review, feedback from interested parties indicated general agreement with AEMO's proposal to amend the clause (as proposed in the drafting).

(b) The identity and characteristics of *metering* equipment. ~~(ie *instrument transformers*, *metering installation* and *check metering installation*), including:~~

~~(1) serial numbers;~~

~~(2) *metering installation* identification name;~~

~~(3) *metering installation* types and models;~~

~~(4) *instrument transformer* ratios (available and connected);~~

~~(5) current test and calibration programme details, test results and references to test certificates;~~

~~(6) asset management plan and testing schedule;~~

~~(7) calibration tables, where applied to achieve *metering installation* accuracy;~~

~~(8) *Metering Provider*(s) and *Metering Data Provider*(s) details;~~

~~(9) summation scheme values and multipliers; and~~

~~(10) data register coding details.~~

(c) Data communication details. ~~, including:~~

~~(1) telephone number(s) for access to *energy data*;~~

~~(2) communication equipment type and serial numbers;~~

~~(3) communication protocol details or references;~~

~~(4) data conversion details;~~

~~(5) user identifications and access rights; and~~

~~(6) 'write' password (to be contained in a hidden or protected field).~~

(d) Data validation, substitution and estimation processes agreed between affected parties. ~~, including:~~

~~(1) algorithms;~~

~~(2) data comparison techniques;~~

~~(3) processing and alarms (eg *voltage* source limits; phase angle limits);~~

~~(4) *check metering* compensation details; and~~

~~(5) alternate data sources.~~

(e) Data processing prior to the *settlement* process. ~~, including algorithms for:~~

~~(1) *generation* half-hourly 'sent out' calculation;~~

~~(2) customer half-hourly *load* calculation; and~~

~~(3) *Local Retailer* net *load* calculation.~~

Schedule 7.2 Metering Provider

S7.2.1 General

(a) A *Metering Provider* must be accredited by and registered by *AEMO*. *AEMO* must accredit and register a *Metering Provider* only for the type of work the *Metering Provider* is qualified to provide.

(b) *AEMO* must establish a qualification process for *Metering Providers* that enables registration to be achieved in accordance with the requirements of this Schedule 7.2.

(c) A *Metering Provider* must have the necessary licences in accordance with appropriate State and Territory requirements.

(d) A *Metering Provider* must ensure that any *metering* equipment it installs is suitable for the range of operating conditions to which it will be exposed (e.g. temperature; impulse levels), and operates within the defined limits for that equipment.

S7.2.2 Categories of registration

(a) Registrations for *Metering Providers* in relation to the provision, installation and maintenance of *metering installation* types 1, 2, 3, 4 and 4A must be categorised in accordance with Tables S7.2.2.1, S7.2.2.2 and S7.2.2.3, or other procedures approved by *AEMO*.

(b) Registrations for *Metering Providers* in relation to the provision, installation and maintenance (unless otherwise specified) of *metering installation* types 5 and 6 must be categorised in accordance with Table S7.2.2.4 with the capabilities established in the *metrology procedures*.

(c) Registration for *Metering Providers* in relation to the provision, installation and maintenance of *small customer metering installations* must be categorised in accordance with Tables S7.2.2.2 and satisfy the requirements in clause S7.2.5.

(d) *AEMO* may establish *Accredited Service Provider categories* of registration for a *Metering Provider* in accordance with clause S7.2.6.

Table S7.2.2.1 Categories of registration for accreditation

Category	Competency
1C	Class 0.2 CTs with < 0.1% uncertainty.
1V	Class 0.2 VTs with < 0.1% uncertainty.
1M	Class 0.2 Wh meters with < 0.1/cosφ% uncertainty and class 0.5 varh meters with <0.3/sinφ uncertainty.
1A	Class 0.2 CTs, VTs, Wh meters; class 0.5 varh meters; the total installation to 0.5%. Wh with < 0.2% uncertainty at unity *power factor*; 1.0% for varh with <0.4% uncertainty at zero *power factor*.

Category	Competency
2C	Class 0.5 CTs with < 0.2% uncertainty.
2V	Class 0.5 VTs with < 0.2% uncertainty.
2M	Class 0.5 Wh meters with < 0.2/cosφ uncertainty and class 1.0 varh meters with <0.4/sinφ uncertainty.
2A	Class 0.5 CTs, VTs, Wh meters; class 1.0 varh meters; the total installation to 1.0%. Wh with < 0.4% uncertainty at unity *power factor*; 2.0% for varh with <0.5% uncertainty at zero *power factor*.

Table S7.2.2.2 Categories of registration for accreditation

Category	Competency
3M	Class 1.0 Wh meters with < 0.3/cosφ uncertainty and class 2.0 varh meters with <0.5/sinφ% uncertainty.
3A	Class 0.5 CTs, VTs; class 1.0 Wh meters; class 2.0% varh meters; the total installation to 1.5%. Wh with < 0.5% uncertainty at unity *power factor*; 3.0% for varh with <0.6% uncertainty at zero *power factor*.
4M	Class 1.0 Wh meters and class 1.5 Wh meters with <0.3/cosφ% uncertainty.
4A	Class 1.0 Wh meters and class 1.5 Wh meters with <0.3/cosφ% uncertainty.
4S	Class 1.0Wh meters and class 1.5 Wh meters with <0.3/cosφ% uncertainty.

Table S7.2.2.3 Categories of registration for accreditation

Category	Competency
L	Approved *communications interface* installer

Table S7.2.2.4 Categories of registration for accreditation

Category	Competency
5A Installation only	Class 1.0 and class 1.5 whole current Wh *meters* with <0.3/cosΦ% uncertainty.
6A Installation only	Class 1.5 whole current Wh *meters* with <0.3/cosΦ% uncertainty.
5B	Class 1.0 and class 1.5 whole current or CT connected Wh *meters* with <0.3/cosΦ% uncertainty.
6B	Class 1.5 whole current or CT connected Wh *meters* with 0.3</cosΦ% uncertainty.

S7.2.3 Capabilities of Metering Providers for metering installations types 1, 2, 3, 4 and 4A

Category 1A, 2A, 3A and 4M *Metering Providers* must be able to exhibit the following capabilities to the reasonable satisfaction of *AEMO*:

(a) Detailed design and specification of *metering* schemes, including:

(1) knowledge and understanding of this Chapter 7;

(2) knowledge of equipment (*meters*, *current transformers* and where applicable *voltage transformers*);

(3) design experience including knowledge of *current transformers* and where applicable *voltage transformers* and the effect of burdens on performance;

(4) ability to calculate summation scheme values, multipliers, etc; and

(5) ability to produce documentation, such as single line diagrams, panel layouts and wiring diagrams.

(b) Programming and certification requirements for *metering installations* to the required accuracy, including:

(1) licensed access to *metering* software applicable to all equipment being installed by the *Metering Provider*;

(2) ability to program requirements by setting variables in *meters*, summators, modems, etc;

(3) management of the testing of all equipment to the accuracy requirements specified in this Chapter 7;

(4) certifications that all calibration and other *meter* parameters have been set, verified and recorded prior to *meters*, and other components of the *metering installation* being released for installation;

(5) all reference/calibration equipment for the purpose of meeting test or inspection obligations must be tested to ensure full traceability to test certificates issued by a *NATA* accredited body or a body recognised by *NATA* under the International Laboratory Accreditation Corporation (**ILAC**) mutual recognition scheme and documentation of the traceability must be provided to *AEMO* on request; and

(6) compliance with ISO/IEC Guide 25 "General Requirements for the Competence of Calibration and Testing Laboratories" with regard to the calculation of uncertainties and accuracy.

(c) Installation and commissioning of *metering installations* and, where necessary, the *communications interface* to facilitate the *remote acquisition* of *metering data*, including:

(1) the use of calibrated test equipment to perform primary injection tests and field accuracy tests;

(2) the availability of trained and competent staff to install and test *metering installations* to determine that installation is correct; and

(3) the use of test procedures to confirm that the *metering installation* is correct and that *metering* constants are recorded and/or programmed correctly.

(d) Inspection and maintenance of *metering installations* and equipment, including:

(1) regular readings of the measurement device where external recording is used (6 monthly) and verification with *AEMO* records;

(2) approved test and inspection procedures to perform appropriate tests as detailed in this Chapter 7;

(3) calibrated field test equipment for primary injection and *meter* testing to the required levels of uncertainty; and

(4) secure documentation system to maintain *metering* records for all work performed on a *metering installation*, including details of the security method used.

(e) Verification of *metering data* and *check metering data*, as follows:

(1) on commissioning *metering data*, verification of all readings, constraints (adjustments) and multipliers to be used for converting raw data to consumption data; and

(2) on inspection, testing and/or maintenance, verification that readings, constants and multipliers are correct by direct conversion of *meter* readings and check against the *metering database*.

(f) Quality System as AS 9000 series standards, including:

(1) a quality system to AS/NZ ISO 9000 series applicable to the work to be performed:

Type 1 full implementation of AS/NZ ISO 9002;

Type 2 full implementation of AS/NZ ISO 9002;

Type 3 – implementation of AS/NZ ISO 9002 to a level agreed with *AEMO*;

Type 4 implementation of AS/NZ ISO 9002 to a level agreed with *AEMO*;

Type 4A – implementation of AS/NZ ISO 9002 to a level agreed with *AEMO*;

(2) the calculations of accuracy based on test results are to include all reference standard errors;

(3) an estimate of Testing Uncertainties which must be calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement"; and

(4) a knowledge and understanding of the appropriate standards and guides, including those in the *Rules*.

(g) All of the capabilities relevant to that type of *metering installation* which are set out in the *Rules* and procedures authorised under the *Rules*.

S7.2.4 Capabilities of Metering Providers for metering installations types 5 and 6

Metering Providers, who apply for categories of *Metering Provider* accreditation of *metering installations* types 5 and/or 6, must be able to exhibit, to the reasonable satisfaction of *AEMO* all of the capabilities relevant to that type of *metering installation* which are set out in the *Rules* and procedures authorised under the *Rules*.

S7.2.5 Capabilities of Metering Providers for small customer metering installations

Category 4S *Metering Providers* must be able to exhibit, to the reasonable satisfaction of *AEMO*:

(a) all of the capabilities in S7.2.3; and

(b) the establishment of an appropriate security control management plan and associated infrastructure and communications systems for the purposes of preventing unauthorised local access or remote access to *metering installations*, services provided by *metering installations* and *energy data* held in *metering installations*.

S7.2.6 Capabilities of the Accredited Service Provider category

(a) The *Accredited Service Providers categories* established by *AEMO* under clause S7.2.2(d) may perform work relating to the installation of any types 1, 2, 3, 4, 4A, 5 or 6 *metering installations*.

(b) *AEMO* must include *Accredited Service Provider categories* in the accreditation guidelines prepared and *published* under clause 7.4.1(c).

(c) *AEMO* may determine:

(1) the competencies of a *Metering Provider* registered in each *Accredited Service Provider category* provided that those competencies are consistent with any capabilities established in the *metrology procedure* in respect of the work performed under paragraph (a); and

(2) different competencies for each *Accredited Service Provider category* for each *participating jurisdiction*.

Schedule 7.3 Metering Data Provider

S7.3.1 General

(a) A *Metering Data Provider* must be accredited by and registered by *AEMO*.

(b) *AEMO* must accredit and register a *Metering Data Provider* only for the type of work the *Metering Data Provider* is qualified to provide.

(c) *AEMO* must establish a qualification process for *Metering Data Providers* that enables registration to be achieved in accordance with the requirements of this Schedule 7.3.

S7.3.2 Categories of registration

Categories of registration are set out in Table S7.3.2.1.

Table S7.3.2.1 Categories of registration for accreditation

Metering installation **type**	**Categories of registration**	
1, 2, 3 and/or 4	Category 1D, 2D, 3D and/or 4D (for *remote acquisition*, processing and delivery of *metering data* for *connection points*)	Category 4S (for *small customer metering installations* in relation to *remote acquisition*, processing and delivery of *metering data* for *connection points*)
4A, 5 and/or 6	Category 4AC, 5C and/or 6C (for manual collection or *remote acquisition* of *metering data*)	Category 4AD, 5D and/or 6D (for manual collection, processing and delivery of *metering data* or for *remote acquisition*, processing and delivery of *metering data*)
7	Category 7D (for processing and delivery of *calculated metering data*)	

Commented [AEMO2]: Administrative change

S7.3.3 Capabilities of Metering Data Providers

Metering Data Providers must be able to exhibit to the reasonable satisfaction of *AEMO* the following capabilities, as applicable, for the categories of *Metering Data Provider* accreditation sought:

(a) Detailed understanding of the *Rules*, and all procedures authorised under the *Rules* including the relevant *service level procedures* relating to the function of a *Metering Data Provider* and the carrying out of *metering data services*.

(b) Detailed understanding of the participant role relationships and obligations that exist between the *Metering Data Provider*, *Metering Provider*, *financially responsible Market Participant*, *Local Network Service Provider*, *AEMO* and the *Metering Coordinator*.

(c) An understanding of *metering* arrangements, including knowledge of *metering* equipment (*meters*, *current transformers* and *voltage transformers*).

(d) Authorised access to *metering* software for the:

(1) collection of *metering data*;

(2) establishment, maintenance and operation of a *metering data services database* for the storage and management of *metering data* and *NMI Standing Data*; and

(3) the validation, substitution and estimation of *metering data*.

(e) Processes and systems for the collection of *metering data* including:

(1) knowledge of manual collection and *remote acquisition* of *metering data* (as applicable);

(2) collection technologies and methodologies; and

(3) *metering* protocols and equipment.

(f) Systems for the processing of *metering data* including:

(1) processes for the verification and commissioning of *metering data* and relevant *NMI Standing Data* pertaining to each *metering installation* into the *metering data services database*;

(2) processes for validation, substitution and estimation of *metering data*;

(3) processes for the storage, adjustment and aggregation of *metering data*; and

(4) the secure storage of historical data.

(g) Processes for the delivery of *metering data* and relevant *NMI Standing Data* to *Registered Participants* and *AEMO* including:

(1) delivery performance requirements for *metering data*; and

(2) an understanding of the relevant *metering data* file formats.

(h) The availability of trained and competent staff to:

(1) read or interrogate the *metering installation*;

(2) collect and process *metering data* into the *metering data services database*;

(3) validate, substitute or estimate *metering data* as the case may be;

(4) maintain the physical and logical security of the *metering data services database* and only allow access to *metering data* by those persons entitled to receive *metering data*; and

(5) ensure the ongoing performance and availability of the collection process and the *metering data services database* are maintained inclusive of necessary system supports for backup, archiving and disaster recovery.

(i) The establishment of a quality system which will:

(1) underpin all operational documentation, processes and procedures;

(2) facilitate good change control management of procedures, IT systems and software;

(3) provide audit trail management of *metering data* and *NMI Standing Data*;

(4) maintain a security control management plan;

(5) maintain security controls and data integrity; and

(6) maintain knowledge and understanding of the *Rules* and relevant procedures, standards and guides authorised under the *Rules*.

(j) Understanding of the required logical interfaces necessary to support the provision of *metering data services* including the interfaces needed to:

(1) access *AEMO's* systems for the management and delivery of *metering data*;

(2) support *B2B procedures*; and

(3) support *Market Settlement and Transfer Solution Procedures* for delivery and update of *NMI Standing Data*.

S7.3.4 Capabilities of Metering Data Providers for small customer metering installations

Category 4S *Metering Data Providers* must be able to exhibit, to the reasonable satisfaction of *AEMO*:

(a) all the capabilities in S7.3.3; and

(b) the establishment of an appropriate security control management plan and associated infrastructure and communications systems for the purposes of preventing unauthorised local access or remote access to *metering installations*, services provided by *metering installations* and *energy data* held in *metering installations*.

Schedule 7.4 Types and Accuracy of Metering installations

S7.4.1 General requirements

(a) ~~(a)~~ This Schedule 7.4 sets out the minimum requirements for *metering installations*.

(b) When extended range current transformers are used, the overall accuracy requirements at loads greater than 100% rated load must not exceed the overall accuracy requirements specified within the *Rules* for 100% rated load.

(c) Extended range current transformers must not to be used beyond the limits of their extended range.

~~(a)~~(d) For Type 4, 5 and 6 *metering installations* which are direct connected or have current transformer(s), the *Metering Provider* is permitted to demonstrate accuracy requirements of the *metering installation* by means of using a generic design. The generic design must consider the error limits for the class accuracy of the equipment and calculated or measured burden or loads to demonstrate compliance. Each generic design must include conditions under which it may be applied.

Formatted: Font: Italic

Commented [AEMO3]: S7.4.1 General requirements
The addition of these clauses is for clarification purposes and was recommended as part of a Meter Testing Review – AEMO in consultation with Metering Provider and Responsible Person representatives.

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

Commented [AEMO4]: S7.4.1 General requirements
The addition of this clause is for clarification purposes and results from recommendations of the Metering Working Group, chaired by AEMO and resourced with representatives of Metering Providers and Responsible Persons.

S7.4.2 Metering installations commissioned prior to 13 December 1998

(a) This clause provides conditions that are to apply to *metering installations* that were commissioned prior to 13 December 1998.

(b) The use of *metering* class *current transformers* and *voltage transformers* that are not in accordance with Table S7.4.3.1 are permitted provided that where necessary to achieve the overall accuracy requirements:

(1) *meters* of a higher class accuracy are installed; and/or

(2) calibration factors are applied within the *meter* to compensate for *current transformer* and *voltage transformer* errors.

(c) Protection *current transformers* are acceptable where there are no suitable *metering* class *current transformers* available and the overall accuracy and performance levels can be met.

(d) Where the requirements of paragraph (b) and (c) cannot be achieved then the *Metering Coordinator* is required to comply with transitional arrangements or obtain an exemption from *AEMO* or upgrade the *metering installation* to comply with this Schedule 7.4.

(e) The arrangements referred to in paragraph (d) may remain in force while the required accuracy and performance can be maintained within the requirements of the *Rules*.

(f) The purchase of new *current transformers* and *voltage transformers* must comply with the *Rules*.

S7.4.3 Accuracy requirements for metering installations

(a) The maximum allowable overall error (±%) at different loads and power factors is set out in Table S7.4.3.2 to Table S7.4.3.6.

(b) All measurements in Tables S7.4.3.2 – S7.4.3.6 are to be referred to 25 degrees Celsius.

(c) The method for calculating the overall error is the vector sum of the errors of each component part (that is, a + b + c) where:

(1) a = the error of the voltage transformer and wiring;

(2) b = the error of the current transformer and wiring; and

(3) c = the error of the meter.

(d) If compensation is carried out then the resultant metering data error shall be as close as practicable to zero.

(e) The maximum allowable error of a type 5 or type 6 *metering installation* may be relaxed in the *metrology procedure* to accommodate evolving technologies providing that such relaxation is consistent with any regulations published under the *National Measurement Act*.

Commented [AEMO5]: Repositioned text currently presented in **Item 6** and Notes to the bottom of the tables. Proposed to be repositioned as a lead-in to the section as it is important for the reader to understand this information prior to the table presentation for clarity.

Commented [AEMO6]: Sourced from Item 3b and 4b in section below tables:
Moved to improve clarity and interpretation of this section in general.

Table S7.4.3.1 ~~Overall~~ Accuracy Class Requirements of Metering Installation Components

Type	Volume limit per annum per connection point	~~Maximum allowable overall error (±%) at full load (Item 6)~~ ~~active~~	~~reactive~~	Minimum acceptable class or standard of components	Metering installation clock error (seconds) in reference to EST
1	greater than 1000GWh	~~0.5~~	~~1.0~~	0.2CT/VT/*meter* Wh 0.5 *meter* varh	±5
2	100 to 1000GWh	~~1.0~~	~~2.0~~	0.5CT/VT/*meter* Wh 1.0 *meter* varh	±7
3	0.75 to less than 100 GWh	~~1.5~~	~~3.0~~	0.5CT/VT 1.0 *meter* Wh 2.0 *meter* varh (Item 1)	±10
4	less than 750 MWh (Item 2)	~~1.5~~	~~n/a~~	Either 0.5 CT and 1.0 *meter* Wh; or whole current general purpose *meter* Wh: • meets requirements of clause 7.8.2(a)(9); and • meets the requirements of clause 7.10.7(a). (Item 1)	±20 (Item 2a)
4A	less than x MWh Item 3	~~1.5~~	~~3.0~~	Either 0.5 CT and 1.0 *meter* Wh; or whole current general purpose *meter* Wh: • meets the requirements of clause 7.8.2(a)(10); and • has the capability, if remote access is	±20 (Item 2a)

Commented [AEMO7]: Renamed to reflect amendments proposed in the table below.

Commented [AEMO8]: S7.4.3 Accuracy requirements for metering installations
The information in this column is replicated in later tables and is therefore superfluous here. Deletion will aid ease of understanding, remove the duplication and and by doing so, remove the risk of contradiction and confusion in the future.

Type	Volume limit per annum per connection point	~~Maximum allowable overall error (±%) at full load (Item 6)~~ ~~active~~	~~reactive~~	Minimum acceptable class or standard of components	Metering installation clock error (seconds) in reference to EST
				activated, of providing the services in table S7.5.1.1; and • meets the requirements of clause 7.10.7(d).	
5	less than x MWh (Item 3)	~~1.5~~ ~~(Item 3b)~~	~~n/a~~	Either 0.5 CT and 1.0 meter Wh; or whole current connected general purpose meter wh: • meets requirements of clause 7.8.2(a)(10); and • meets the requirements of clause 7.10.7(d). (Item 1)	'±/-20' (Item 3a)
6	less than y MWh (Item 4)	~~2.0~~ ~~(Item 4b)~~	~~n/a~~	CT or whole current general purpose *meter* Wh recording *accumulated energy data* only. Processes used to convert the *accumulated metering data* into *trading interval metering data* and *estimated metering data* where necessary are included in the *metrology procedure*. (Item 1)	(Item 4a)

Commented [AEMO8]: S7.4.3 Accuracy requirements for metering installations
The information in this column is replicated in later tables and is therefore superfluous here. Deletion will aid ease of understanding, remove the duplication and and by doing so, remove the risk of contradiction and confusion in the future.

Type	Volume limit per annum per connection point	~~Maximum allowable overall error (±%) at full load (Item 6)~~ ~~active~~ ~~reactive~~		Minimum acceptable class or standard of components	Metering installation clock error (seconds) in reference to EST
7	volume limit not specified (Item 5)	~~(Item 6)~~	~~n/a~~	No *meter*. The *metering data* is *calculated metering data* determined in accordance with the *metrology procedure*.	n/a

Commented [AEMO8]: S7.4.3 Accuracy requirements for metering installations
The information in this column is replicated in later tables and is therefore superfluous here. Deletion will aid ease of understanding, remove the duplication and and by doing so, remove the risk of contradiction and confusion in the future.

Item 1:

(a) For a type 3, 4, 4A and 5 and 6 *metering installation*, whole current *meters* may be used if the *meters* meet the requirements of the relevant *Australian Standards* and International Standards which must be identified in the *metrology procedure*.

(b) The *metering installation* types referred to in paragraph (a) must comply with any applicable specifications or guidelines (including any transitional arrangements) specified by the National Measurement Institute under the *National Measurement Act*.

Item 2: *High voltage* customers that require a VT and whose annual consumption is below 750 MWh, must meet the relevant accuracy requirements of Type 3 *metering* for *active energy* only.

Item 2a: For the purpose of clarification, the clock error for a type 4 and 4A *metering installation* may be relaxed in the *metrology procedure* to accommodate evolving whole current technologies.

Item 3: The following requirements apply in relation to a type 4A and type 5 *metering installation*:

(1) the value of "x" must be determined by each *Minister* of a *participating jurisdiction* and:

(i) the "x" value must be provided to *AEMO*; and

(ii) *AEMO* must record the "x" value in the *metrology procedure*;

(2) the maximum acceptable value of "x" determined under subparagraph (1) must be 750 MWh per annum; and

Item 3a: For the purpose of clarification, the clock error for a type 5 *metering installation* may be relaxed in the *metrology procedure* to accommodate evolving whole current technologies.

~~Item 3b: The maximum allowable error of a type 5 *metering installation* may be relaxed in the *metrology procedure* to accommodate evolving technologies providing that such relaxation is consistent with any regulations published under the *National Measurement Act*.~~

Commented [AEMO9]: Item 3b:
AEMO considers this clause, and the companion 'Item 4b' below, are better placed in the lead-in section to this clause in the Rules.

Item 4: The following requirements apply in relation to a type 6 *metering installation*:

(1) a *metrology procedure* must include a procedure relating to converting *active energy* into *metering data*;

(2) the value of "y" must be determined by each *Minister* of a *participating jurisdiction* and:

(i) the "y" value must be provided to *AEMO*; and

(ii) *AEMO* must record the "y" value in the *metrology procedure*;

(3) the maximum acceptable value of "y" determined under subparagraph (2) must be 750 MWh per annum;

(4) devices within the *metering installation* may record *accumulated energy data* in pre determined daily time periods where such time periods are contained in the *metrology procedure*.

Item 4a: Any relevant clock errors for a type 6 *metering installation* are to be established in the *metrology procedure*.

~~Item 4b: The maximum allowable error of a type 6 *metering installation* may be relaxed in the *metrology procedure* providing that such relaxation is consistent with any regulations *published* under the *National Measurement Act*.~~

Commented [AEMO10]: Item 4b:
See note regarding Item 3b above.

Item 5: (a) A type 7 *metering installation* classification applies where a *metering installation* does not require a *meter* to measure the flow of electricity in a power conductor and accordingly there is a requirement to determine by other means the *metering data* that is deemed to correspond to the flow of electricity in the power conductor.

(b) The condition referred to in paragraph (a) will only be allowed for *connection points* where *AEMO* in consultation with the *Metering Coordinator* determines:

(1) the *load* pattern is predictable;

(2) for the purposes of *settlements*, the *load* pattern can be reasonably calculated by a relevant method set out in the *metrology procedure*; and

(3) it would not be cost effective to meter the *connection point* taking into account:

(i) the small magnitude of the *load*;

(ii) the *connection* arrangements; and

(iii) the geographical and physical location.

(c) The *metrology procedure* must include arrangements for type 7 *metering installations* that have been classified as *market loads*.

(d) A *connection point* that meets the condition for classification as a type 7 *metering installation* does not prevent that *connection point* from being subject to *metering* in the future.

~~Item 6:~~ ~~The maximum allowable overall error (±%) at different *loads* and *power factors* is set out in Table S7.4.3.2 to Table S7.4.3.6.~~

Commented [AEMO11]: Item 6: Repositioned as a lead-in to the section – important for the reader to understand the information prior to the table presentation

Table S7.4.3.2 Type 1 Metering Installation Overall Accuracy Requirements – Annual Energy Throughput greater than 1,000 GWh

Commented [AEMO12]: Table S7.4.3.2 Type 1 Installation – Annual Energy Throughput greater than 1,000 GWh

"N/A" has been replaced with "not used" for clarification purposes and, where applicable, the values have been updated to reflect current industry practice.

Table title reworded to reflect amendments proposed in this section

% Rated Load	Power Factor					
	Unity	0.866 lagging		0.5 lagging		Zero
	active	active	reactive	active	reactive	reactive
10	1.0%	1.0%	2.0%	not used~~n/a~~	not used~~n/a~~	1.4%
50	0.5%	0.5%	1.4~~0~~%	0.7%	1.0~~4~~%	1.0%
100	0.5%	0.5%	1.0%	not used~~n/a~~	not used~~n/a~~	1.0%

Commented [AEMO13]: Changes proposed to values in the tables here and in tables below for technical accuracy

Table S7.4.3.3 Type 2 Metering Installation Overall Accuracy Requirements – Annual Energy Throughput between 100 and 1,000 GWh

Commented [AEMO14]: Table title reworded to reflect amendments proposed in this section

% Rated Load	Power Factor					
	Unity	0.866 lagging		0.5 lagging		Zero
	active	active	reactive	active	reactive	reactive
10	2.0%	2.0%	4.0%	not used~~n/a~~	not used~~n/a~~	2.8%
50	1.0%	1.0%	3~~2~~.0%	1.5%	2~~3~~.0%	2.0%
100	1.0%	1.0%	2.0%	not used~~n/a~~	not used~~n/a~~	2.0%

Table S7.4.3.4 Type 3 Metering Installation Overall Accuracy Requirements – Annual Energy Throughput from 0.75 GWh to less than 100 GWh and Type 4 Category 4S and Type 4A Installation - Annual Energy Throughput less than 0.75 GWh

% Rated Load	Power Factor					
	Unity	0.866 lagging		0.5 lagging		Zero
	active	active	reactive	active	reactive	reactive
10	2.5%	2.5%	5.0%	not used~~n/a~~	not used~~n/a~~	4.0%
50	1.5%	1.5%	4~~3~~.0%	2.5%	3~~5~~.0%	3.0%
100	1.5%	1.5%	3.0%	not used~~n/a~~	not used~~n/a~~	3.0%

Table S7.4.3.5 Type 4 (other than Category 4S) or 5 Metering Installation Overall Accuracy Requirements – Annual Energy Throughput less than 0.75 GWh

% Rated Load	Power Factor		
	Unity	0.866 lagging	0.5 lagging
	Active	active	active
10	2.5%	2.5%	not used~~n/a~~
50	1.5%	1.5%	2.5%
100	1.5%	1.5%	not used~~n/a~~

Table S7.4.3.6 Type 6 Metering Installation Overall Accuracy Requirements – Annual Energy Throughput less than 0.75 GWh

% Rated Load	Power Factor		
	Unity	0.866 lagging	0.5 lagging
	Active	active	active
10	3.0%	not used~~n/a~~	not used~~n/a~~
50	2.0%	not used~~n/a~~	3.0%
100	2.0%	not used~~n/a~~	not used~~n/a~~

~~Note:~~

Commented [AEMO15]: Table S7.4.3.4
Since Type 4A and Type 4 Category S meters have the same technical requirements under the NER, this change (and the below) is to make clear to participants that Table S7.4.3.4 applies also to meters under clause S7.2.5, and that Table S7.4.3.5 applies to all other Type 4 meters.

Table title reworded to reflect amendments proposed in this section

Commented [AEMO16]: Table S7.4.3.5
Refer to comment above regarding the heading for Table S7.4.3.4

Commented [AEMO17]: Table title reworded to reflect amendments proposed in this section

~~All measurements in Tables S7.4.3.2 – S7.4.3.6 are to be referred to 25 degrees Celsius.~~

~~(a) The method for calculating the overall error is the vector sum of the errors of each component part (that is, a + b + c) where:~~

~~a = the error of the *voltage transformer* and wiring;~~

~~b = the error of the *current transformer* and wiring; and~~

~~c = the error of the *meter*.~~

~~(b) If compensation is carried out then the resultant *metering data* error shall be as close as practicable to zero.~~

Commented [AEMO18]: Note:
Repositioned as a lead-in to the section – important for the reader to understand the information prior to the table presentation

S7.4.4 Check metering

(a) *Check metering* is to be applied in accordance with the following Table:

Metering Installation Type in accordance with Table S7.2.3.1	Check Metering Requirements
1	*Check metering installation*
2	Partial *check metering*
3	No requirement
4, 4A, 5 and 6	No requirement

(b) A *check metering installation* involves either:

(1) the provision of a separate *metering installation* using separate *current transformer* cores and separately fused *voltage transformer* secondary circuits, preferably from separate secondary windings: or

(2) if in *AEMO*'s absolute discretion it is considered appropriate, in the case of a *metering installation* located at the *facility* at one end of the *two-terminal link*, a *metering installation* located at the *facility* at the other end of a *two-terminal link*.

(c) Where the *check metering installation* duplicates the *metering installation* and accuracy level, the average of the two validated data sets will be used to determine the *energy* measurement.

(d) Partial *check metering* involves the use of other *metering data* or operational data available to *AEMO* in 30 min electronic format as part of a validation process in accordance with the *metrology procedure*.

(e) The physical arrangement of partial *check metering* shall be agreed between the *Metering Coordinator* and *AEMO*.

(f) *Check metering installations* may be supplied from secondary circuits used for other purposes and may have a lower level of accuracy than the *metering installation*, but must not exceed twice the level prescribed for the *metering installation*.

S7.4.5 Resolution and accuracy of displayed or captured data

Programmable settings available within a *metering installation* or any peripheral device, which may affect the resolution of displayed or stored data, must:

(a) meet the requirements of the relevant *Australian Standards* and International Standards which must be identified in the *metrology procedure*; and

(b) comply with any applicable specifications or guidelines (including any transitional arrangements) specified by the National Measurement Institute under the *National Measurement Act*.

S7.4.6 General design standards

S7.4.6.1 Design requirements

Without limiting the scope of detailed design, the following requirements must be incorporated in the design of each *metering installation*:

(a) For *metering installations* greater than 1000 GWh pa per *connection point*, the *current transformer* core and secondary wiring associated with the *meter*(s) shall not be used for any other purpose unless otherwise agreed by *AEMO*.

(b) For *metering installations* less than 1000 GWh pa per *connection point* the *current transformer* core and secondary wiring associated with the *meter*(s) may be used for other purposes (e.g. local *metering* or protection) provided the *Metering Coordinator* demonstrates to the satisfaction of *AEMO* that the accuracy of the *metering installation* is not compromised and suitable procedures/measures are in place to protect the security of the *metering installation*.

(c) Where a *voltage transformer* is required, if separate secondary windings are not provided, then the *voltage* supply to each *metering installation* must be separately fused and located in an accessible position as near as practical to the *voltage transformer* secondary winding.

(d) Secondary wiring must be by the most direct route and the number of terminations and links must be kept to a minimum.

(e) The incidence and magnitude of burden changes on any secondary winding supplying the *metering installation* must be kept to a minimum.

(f) *Meters* must:

(1) meet the requirements of relevant *Australian Standards* and International Standards which must be identified in the *metrology procedure*; and

(2) have a valid pattern approval issued under the authority of the National Measurement Institute or, until relevant pattern approvals exist, a valid type test certificate.

(g) New *instrument transformers* must:

(1) meet the requirements of relevant *Australian Standards* and International Standards which must be identified in the *metrology procedure*; and

(2) have a valid pattern approval issued under the authority of the National Measurement Institute or, until relevant pattern approvals exist, a valid type test certificate.

(h) Suitable *isolation* facilities are to be provided to facilitate testing and calibration of the *metering installation*.

(i) Suitable drawings and supporting information, detailing the *metering installation*, must be available for maintenance and auditing purposes.

S7.4.6.2 Design guidelines

In addition to the above design requirements, the following guidelines should be considered for each *metering installation*:

(a) The provision of separate secondary windings for each *metering installation* where a *voltage transformer* is required.

(b) A *voltage* changeover scheme where more than one *voltage transformer* is available.

Schedule 7.5 Requirements of minimum services specification

S7.5.1 Minimum services specification

A *metering installation* meets the *minimum services specification* if it:

(a) subject to paragraph (d), is capable of providing the services listed in table S7.5.1.1 in accordance with the procedures made under clause 7.8.3;

(b) is connected to a *telecommunications network* which enables remote access to the *metering installation*;

(c) achieves the maximum allowable overall error (±%) at rates not exceeding the rates set out in table S7.4.3.4; and

(d) in relation to a *metering installation* that is connected to a *current transformer*, is capable of providing the services listed in items (c) to (f) in table S7.5.1.1 in accordance with procedures made under clause 7.8.3.

Table S7.5.1.1 Minimum Services Specification – services and access parties

1.	Service	2. Description	3. Access Party
(a)	remote *disconnection* service	The remote *disconnection* of a *small customer's* premises via the *metering installation*.	*Local Network Service Provider* *financially responsible Market Participant*
(b)	remote *reconnection* service	The remote *reconnection* of a *small customer's* premises via the *metering installation*.	*Local Network Service Provider* *financially responsible Market Participant* *Incoming Retailer*

1.	Service	2. Description	3. Access Party
(c)	remote on-demand *meter* read service	The remote retrieval of *metering data* including quality flags for a specified point or points in time and the provision of such data to the requesting party. The service includes the retrieval and provision of: • *reactive energy metering data* and/or *active energy metering data* (for imports and/or exports of *energy* measured by the *meter*); • *interval metering data* and cumulative total *energy* measurement for the *metering installation*; and • *accumulated metering data* at the start and the end of the period specified in the request.	*Registered Participants* with a financial interest in the *metering installation* or the *energy* measured by that *metering installation* A person to whom a *small customer* has given its consent under clause 7.15.4(b)(3)(ii)
(d)	remote scheduled *meter* read service	The remote retrieval of *metering data* including quality flags on a regular and ongoing basis and the provision of such data to the requesting party. The service includes the retrieval and provision of: • *reactive energy metering data* and/or *active energy metering data* (for imports and/or exports of *energy* measured by the *meter*); • *interval metering data* and cumulative total *energy* measurement for the *metering installation*; and	*Registered Participants* with a financial interest in the *metering installation* or the *energy* measured by that *metering installation* A person to whom a *small customer* has given its consent under clause 7.15.4(b)(3)(ii)

1. Service	2. Description	3. Access Party
	• *accumulated metering data* at the start and the end of the period specified in the request.	
(e) *metering installation* inquiry service	The remote retrieval of information from, and related to, a specified *metering installation* and the provision of such information to the requesting party. The *metering installation* must be capable of providing the following information, as a minimum, when requested: • the status of the switch used to effect the *disconnection* and *reconnection* services; • the *voltage* as measured by the *metering installation*, with a date and *time stamp* for that reading; • the current as measured by the *metering installation*, with a date and *time stamp* for that reading; • the power (watts) as measured by the *metering installation*, with a date and *time stamp* for that reading; • the supply frequency (Hertz) as measured by the *metering installation*, with a date and *time stamp* for that reading; • the average *voltage* and current over a nominated *trading interval* for one or more	*Local Network Service Provider* *financially responsible Market Participant* A person to whom a *small customer* has given its consent under clause 7.15.4(b)(3)(ii)

1. Service	2. Description	3. Access Party
	nominated *trading intervals*; and • events that have been recorded in *meter* log (or logs) including recorded information in the tamper detection alarm, reverse energy flow alarm and *metering* device temperature alarm.	
(f) advanced *meter* reconfiguration service	The remote setting of the operational parameters of the *meter*. The operational parameters that must be capable of being set are, as a minimum, the following: • the activation or deactivation of a data stream or data streams; and • altering the method of presenting *energy data* and associated information on the *meter* display.	*Local Network Service Provider* *financially responsible Market Participant*

Schedule 7.6 Inspection and Testing Requirements

S7.6.1 General

(a) The *Metering Coordinator* must ensure that equipment comprised in a purchased *metering installation* has been tested to the required class accuracy with less than the uncertainties set out in Table S7.6.1.1.

(b) The *Metering Coordinator* must ensure appropriate test certificates of the tests referred to in paragraph (a) are retained.

(c) The *Metering Coordinator* (or any other person arranging for testing) must ensure that testing of the *metering installation* is carried out:

(1) in accordance with clause 7.9.1 and this Schedule 7.6; or

(2) in accordance with an asset management strategy that defines an alternative testing practice (other than time based) determined by the *Metering Coordinator* and approved by *AEMO*,

and:

(3) in accordance with a test plan which has been registered with *AEMO*;

(4) to the same requirements as for new equipment where equipment is to be recycled for use in another site; and

(5) so as to include all data storage and processing components included in the *metrology procedure*, including algorithms used to prepare agreed *load* patterns.

(d) *AEMO* must review the prescribed testing requirements in this Schedule 7.6 every 5 years in accordance with equipment performance and industry standards.

(e) The testing intervals may be increased if the equipment type/experience proves favourable.

(f) The maximum allowable level of testing uncertainty (±) for all *metering* equipment must be in accordance with Table S7.6.1.1.

Table S7.6.1.1 Maximum Allowable Level of Testing Uncertainty (±)

Description		Metering Equipment Class				
		Class 0.2	Class 0.5	Class 1.0	General Purpose	Class 2.0
In Laboratory	CTs ratio phase	0.05% 0.07 crad	0.1% 0.15 crad	n/a	n/a	n/a
	VTs ratio Phase	0.05% 0.05 crad	0.1% 0.1 crad	n/a	n/a	n/a
	Meters Wh	0.05/cosφ%	0.1/cosφ%	0.2/cosφ%	0.2/cosφ%	n/a
	Meters varh	n/a	0.2/sinφ%	0.3/sinφ%	n/a	0.4/sinφ%
In Field	CTs ratio Phase	0.1% 0.15 crad	0.2% 0.3 crad	n/a	n/a	n/a
	VTs ratio Phase	0.1% 0.1 crad	0.2% 0.2 crad	n/a	n/a	n/a
	Meters Wh	0.1/cosφ%	0.2/cosφ%	0.3/cosφ%	0.3/cosφ%	n/a
	Meters varh	n/a	0.3/sinφ%	0.4/sinφ%	n/a	0.5/sinφ%

Where cosφ is the *power factor* at the test point under evaluation.

Table S7.6.1.2 Maximum Period Between Tests

Unless the *Metering Coordinator* has developed an asset management strategy that defines practices that meet the intent of this Schedule 7.6 and is approved by *AEMO*, the maximum period between tests must be in accordance with this Table S7.6.1.2.

Description	Metering Installation Type				
	Type 1	Type 2	Type 3	Type 4 & 4A	Types 5 & 6
CT	10 years	10 years	10 years	10 years	10 years
VT	10 years	10 years	10 years		n/a
Burden tests	When *meters* are tested or when changes are made				
CT connected Meter (electronic)	5 years	5 years	5 years	5 years	5 years
CT connected Meter (induction)	2.5 years	2.5 years	5 years	5 years	5 years
Whole current Meter	The testing ~~and inspection~~ requirements must be in accordance with an asset management strategy. Guidelines for the development of the asset management strategy must be recorded in the *metrology procedure*.				

Table S7.6.1.3 Period Between Inspections

Unless the *Metering Coordinator* has developed an asset management strategy that meets the intent of this Schedule 7.6 and is approved by *AEMO*, the period between inspections must be in accordance with this Table S7.6.1.3.

Description	Metering Installation Type			
	Type 1	Type 2	Type 3	Type 4, 4A, 5 & 6
Metering installation equipment inspection (other than whole current)	2.5 years	12 months (2.5 years if *check metering installation* installed)	~~> 210 GWh:~~ 2.5 years ~~2≤ GWh ≤ 10: 3 years~~ ~~<2 GWh: when *meter* is tested.~~	~~When *meter* is tested.~~5 years

Commented [AEMO19]: Table S7.6.1.2 Maximum Period Between Tests
Since Table S7.6.1.2 refers to "Maximum Period Between Tests" and Table S7.6.1.3 refers to "Period Between Inspections", AEMO has moved the inspection requirements to the below table for clarity and ease of reading.

Commented [AEMO22]: Inspection requirements for Type 4, 4A, 5 & 6 metering installations
The inspection requirements are proposed to be aligned with the requirements for testing in Table S7.6.1.2 above. The section in this table is rightly specific to CT connected metering installations only; all type 4, 4A, 5 and 6 whole current connected metering installations are covered by the proposed addition to the table, below (and consistent with the current wording in table S7.6.1.2). These proposals do not limit Metering Coordinators from developing an asset management strategy as provided for in the lead-in section to this table.

Commented [AEMO20]: Table S7.6.1.3 Period Between Inspections
Proposal to simplify the table and to reflect standard industry practice.

Commented [AEMO21]: Simplification of requirements for Type 3 metering installations
The requirements have been simplified to both reflect current market practice and to remove ambiguity. This proposal does not limit Metering Coordinators from developing an asset management strategy as provided for in the lead-in section to this table.

Description	Metering Installation Type			
	Type 1	Type 2	Type 3	Type 4, 4A, 5 & 6
Whole current *metering installation*	The inspection requirements must be in accordance with an asset management strategy. Guidelines for the development of the asset management strategy must be recorded in the *metrology procedure*.			

Commented [AEMO23]: Table S7.6.1.3 Period Between Inspections
Addition to provide clarity in alignment with corrections proposed to Table S7.6.1.2.

S7.6.2 Technical Guidelines

(a) *Current transformer* and *voltage transformer* tests are primary injection tests or other testing procedures as approved by *AEMO*.

(b) The calculations of accuracy based on test results are to include all reference standard errors.

(c) An "estimate of testing uncertainties" must be calculated in accordance with the ISO "Guide to the Expression of Uncertainty for Measurement".

(d) Where operational *metering* is associated with *settlements metering* then a shorter period between inspections is recommended.

(e) For sinφ and cosφ refer to the ISO "Guide to the Expression of Uncertainty in Measurement", where cosφ is the *power factor*.

(f) A typical inspection may include:

(1) check the seals;

(2) compare the pulse counts;

(3) compare the direct readings of *meters*;

(4) verify *meter* parameters and physical connections; and

(5) *current transformer* ratios by comparison.

Schedule 7.7 Embedded Network Managers

S7.7.1 General

(a) An *Embedded Network Manager* must be accredited and registered by *AEMO*.

(b) *AEMO* must establish a qualification process for *Embedded Network Managers* that enables accreditation and registration to be achieved in accordance with the requirements of this schedule 7.7.

(c) An *Embedded Network Manager* must ensure that *embedded network management services* are carried out in accordance with the *Rules* and procedures authorised under the *Rules*.

S7.7.2 Capabilities of Embedded Network Managers

Embedded Network Managers must be able to exhibit to the reasonable satisfaction of *AEMO* the following capabilities:

(a) detailed understanding of the *Rules* including this Chapter 7, and all procedures authorised under the *Rules* including the *ENM service level procedures*.

(b) detailed understanding of:

(1) the terms and conditions on which the *AER* grants exemptions under section 13 of the *National Electricity Law* to persons who engage in the activity of owning, controlling or operating *embedded networks*; and

(2) any related guidelines developed and issued by the *AER* under clause 2.5.1.

(c) detailed understanding of the participant role relationships and obligations that exist between *Embedded Network Managers*, *Metering Data Providers*, *Metering Providers*, *financially responsible Market Participants*, *Local Network Service Providers*, *AEMO* and *Metering Co-ordinators*.

(d) the establishment of a system which will:

(1) underpin all operational documentation, processes and procedures;

(2) facilitate good change control management of procedures, IT systems and software;

(3) provide audit trail management of *EN wiring information*;

(4) maintain security controls and data integrity; and

(5) maintain knowledge and understanding of the *Rules* and relevant procedures, standards and guides authorised under the *Rules*.

(e) understanding of the required logical interfaces necessary to support the provision of *embedded network management services* including the interfaces needed to:

(1) access *AEMO*'s systems; and

(2) support the *metrology procedure*, *B2B Procedures*, *service level procedures*, *ENM service level procedures* and *Market Settlement and Transfer Solution Procedures*.

10. Glossary

rated load

A *rated load* is:

(a) for a *connection point* metered with an *instrument transformer*, the rating of the *current transformer* tap-selected.

(b) for a whole current *meter*, the value of the current in accordance with which the relevant performance of the *meter* is fixed (i.e. the basic current).

Commented [AEMO24]: Rated load definition

"Rated load" is a term that is currently used in various tables in clause S7.3.4 but a definition is not given in the NER. To improve clarity, AEMO proposes that this term should be defined and has offered a definition for the AEMC's consideration.

Appendix D: Current rules (NER version 181) – clauses relevant to rule changes

7.5 Role and Responsibility of AEMO

7.5.1 Responsibility of AEMO for the collection, processing and delivery of metering data

(a) Where the *Metering Coordinator* at a *connection point* or proposed *connection point* on a *transmission network* is the *Local Network Service Provider*, *AEMO* is responsible for:

(1) the collection of *metering data* with respect to the *metering installation*, the processing of that data, the delivery of the processed data to the *metering database* and the provision of *metering data* in accordance with the *Rules* and procedures authorised under the *Rules*; and

(2) the appointment of the *Metering Data Provider* to provide the *metering data services* in accordance with paragraph (b).

(b) In performing its role under paragraph (a), *AEMO* must:

(1) subject to the limitation on that choice imposed by paragraph (d), permit the *financially responsible Market Participant* to appoint a *Metering Data Provider* of its choice to perform the obligations of a *Metering Data Provider* with respect to the *metering installation* under this Chapter 7;

(2) where a *financially responsible Market Participant* has not appointed a *Metering Data Provider* in accordance with subparagraph (1), appoint a *Metering Data Provider* to perform the obligations of a *Metering Data Provider* with respect to the *metering installation* under this Chapter 7; and

(3) comply with the processes for the collection, processing and delivery of *metering data* from the *metering installation* to the *metering database* and the provision of *metering data* to the persons who may receive *metering data* under clause 7.10.3(a) in accordance with the procedures authorised under the *Rules*, and may establish additional processes if necessary in order to fulfil that role.

(c) If any additional processes are established by *AEMO* for the purpose of fulfilling its obligations under subparagraph (b)(3), and those processes impact on other persons, the relevant parts of those processes that impact on those persons must be incorporated in the *service level procedures*.

(d) Where a *financially responsible Market Participant* chooses to appoint a *Metering Data Provider* under subparagraph (b)(1), it must:

(1) only appoint a *Metering Data Provider* who can fully accommodate any special site or technology related conditions described in the document *published* under clause 7.8.12(c)(1); and

Note

This subparagraph is classified as a tier 1 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(2) clarify any matters with *AEMO* in order to choose a *Metering Data Provider* for that *metering installation* that is mutually suitable to all parties.

7.5.2 AEMO's costs in connection with metering installation

When *AEMO* is required to undertake functions associated with a *metering installation* in accordance with the requirements of the *metrology procedure* (which could include the preparation and application of a profile), *AEMO's* cost is to be recovered through *Participant fees* in accordance with a budget prepared under clause 2.11.3(b)(3) unless the *metrology procedure* specifies an alternative method of cost recovery in which case *AEMO* must not recover the costs through *Participant fees*.

7.5A Role and Responsibility of Embedded Network Managers

7.5A.1 Responsibility of Embedded Network Managers for management services

The provision of *embedded network management services* must be carried out only by an *Embedded Network Manager*.

Note

This clause is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

7.5A.2 EN information

An *Embedded Network Manager* must:

(a) maintain information about the types and configuration of *metering installations* at the *parent connection point* and all *child connection points* on the *Embedded Network Manager's embedded network* and about the subtractive or other arrangements used in respect of those *metering installations* relevant to *settlements*; and

(b) in accordance with the *B2B Procedures*, make that information available on request to:

(1) the *financially responsible Market Participant* for any *child connection point* on the *embedded network* or that *Market Participant's Metering Coordinator*;

(2) any *Incoming Retailer* or its *Metering Coordinator*; or

(3) the *Exempt Embedded Network Service Provider* of the relevant *embedded network*.

Note

Schedule 4 of the *National Electricity Amendment (Expanding Competition in metering and related services) Rule 2015 No.12* inserts a definition for *Incoming Retailer*.

7.6 Appointment of Metering Coordinator

7.6.4 Type 7 metering installations and non-contestable unmetered load

(a) The *financially responsible Market Participant* must appoint the *Local Network Service Provider* as the *Metering Coordinator* in respect of a *connection point* which has a type 7 *metering installation* or *non-contestable unmetered load* connected to, or proposed to be connected to, the *Local Network Service Provider's network*.

(b) The *Local Network Service Provider* may provide the *financially responsible Market Participant* with a standard set of terms and conditions on which it will agree to act as the *Metering Coordinator* for a type 7 *metering installation* or *non-contestable unmetered load*.

(c) Where the *Local Network Service Provider* has not provided the *financially responsible Market Participant* with a standard set of terms and conditions referred to in paragraph (b), the *financially responsible Market Participant* must request an offer from the *Local Network Service Provider* to act as the *Metering Coordinator* pursuant to paragraph (a).

Note

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(d) The *Local Network Service Provider* must, within 15 *business days* of receipt of the request under paragraph (c), make an offer to the *financially responsible Market Participant* setting out the terms and conditions on which it will agree to act as the *Metering Coordinator*.

(e) The terms and conditions of an offer made under paragraph (b) or (d) must:

(1) be fair and reasonable; and

(2) not have the effect of unreasonably discriminating between *financially responsible Market Participants*, or between customers of a *financially responsible Market Participant*.

(f) A *financially responsible Market Participant* must accept an offer on the standard terms and conditions of appointment provided by the *Local Network Service Provider* under paragraph (b) or (d), unless the *financially responsible Market Participant* and *Local Network Service Provider* agree other terms and conditions to apply to the appointment of the *Local Network Service Provider* as the *Metering Coordinator* under paragraph (a).

(g) For the avoidance of doubt, any *Metering Coordinator* appointed under paragraph (a) must comply with Chapter 2 of the *Rules*, including the requirement that a *Metering Coordinator* be registered with *AEMO* as a *Metering Coordinator* under clause 2.4A.1(a).

7.8 Metering installation arrangements

7.8.2 Metering installation components

(a) A *Metering Provider* must, in accordance with the *Rules* and procedures authorised under the *Rules*, ensure that a *metering installation* (other than a type 7 *metering installation*):

(1) contains a device that has either a visible or an equivalently accessible display of the cumulative total *energy* measured by that *metering installation* (at a minimum);

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(2) is accurate in accordance with clause 7.8.8;

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(3) in the case of *metering installations* types 1, 2, 3, or 4, has *electronic data transfer* facilities from the *metering installation* to the *metering data services database*;

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(4) includes a *communications interface* to meet the requirements of clause 7.3.2(e)(4);

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(5) is secure in accordance with rule 7.15;

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(6) records *energy data* in a manner that enables *metering data* to be collated in accordance with clause 7.10.5;

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(7) is capable of separately recording *energy data* for *energy* flows in each direction where bi-directional *active energy* flows occur or could occur;

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(8) has a *measurement element* for *active energy* and if required in accordance with Schedule 7.4 a *measurement element* for *reactive energy*, with both measurements to be recorded;

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(9) includes facilities for storing *interval energy data* for a period of at least 35 *days* if the *metering installation* is registered as a type 1, 2, 3 or 4 *metering installation*;

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(10) includes facilities for storing *interval energy data* for a period of at least 200 *days* or such other period as specified in the *metrology procedure* if the *metering installation* is registered as a type 4A or type 5 *metering installation*; and

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(11) in the case of a type 6 *metering installation*, includes facilities capable of continuously recording, the total accumulated *energy* supplied through it by a visible display in accordance with subparagraph (1), over a period of at least 12 months.

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(a1) *AEMO* may exempt a *Metering Provider* at a *connection point* from complying with the data storage requirements under subparagraph (a)(9) for:

(1) types 1, 2, and 3 *metering installations*; and

(2) type 4 *metering installations* referred to in clause 7.8.2(b1),

installed prior to 1 July 2021. *AEMO* may only grant an exemption under this clause where it is reasonably satisfied that the *Metering Provider* will be able to otherwise satisfy the requirements of Chapter 7.

(a2) *AEMO* must establish, maintain and *publish* a procedure setting out the requirements for applying for an exemption under paragraph (a1).

(b) A *metering installation* may consist of combinations of:

(1) a *current transformer*;

(2) a *voltage transformer*;

(3) secure and protected wiring from the *current transformer* and the *voltage transformer* to the *meter*;

(4) *communications interface* equipment such as a modem, isolation requirements, telephone service, radio transmitter and data link equipment;

(5) auxiliary electricity supply to the *meter*;

(6) an alarm circuit and monitoring facility;

(7) a facility to keep the *metering installation* secure from interference;

(8) test links and fusing;

(9) summation equipment; and

(10) several *metering points* to derive the *metering data* for a *connection point*.

(b1) Any type 4 *metering installation* at a:

(1) *transmission network connection point*; or

(2) *distribution network connection point* where the relevant *financially responsible Market Participant* is a *Market Generator* or *Market Small Generation Aggregator*,

must be capable of recording and providing, and configured to record and provide, *trading interval energy data*.

(c) Subject to paragraph (ea), the *financially responsible Market Participant* at a *connection point* must:

(1) apply to the *Local Network Service Provider* for a *NMI*; and

(2) provide the *Metering Coordinator* with the *NMI* for the *metering installation* within 5 *business days* of receiving the *NMI* from the *Local Network Service Provider*.

(d) The *Local Network Service Provider* must:

(1) issue a unique *NMI* for each *metering installation* on its *network* to the *financially responsible Market Participant*; and

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(2) register the *NMI* with *AEMO* in accordance with procedures from time to time specified by *AEMO*.

Note

This subparagraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(e) The *Metering Coordinator* must ensure that *AEMO* is provided with the relevant details of the *metering installation* as specified in Schedule 7.1 within 10 *business days* of receiving the *NMI* under subparagraph (c)(2).

(ea) An *Embedded Network Manager* at a *child connection point* on an *embedded network* for which it is the *Embedded Network Manager* must:

(1) apply to *AEMO* for a *NMI* for a *metering installation* at a *child connection point*;

(2) provide the *Metering Coordinator*, *financially responsible Market Participant* and the *Exempt Embedded Network Service Provider* with the *NMI* for the *metering installation* within *5 business days* of receiving the *NMI* from *AEMO*; and

(3) register the *NMI* with *AEMO* in accordance with procedures from time to time specified by *AEMO*.

Note

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(eb) The obligation in paragraph (ea) does not apply to the extent a *metering installation* at a *child connection point* already has a *NMI*.

(ec) *AEMO* must issue for each *metering installation* at a *child connection point* a unique *NMI* to the *Embedded Network Manager*.

Requirements for metering installations for non-market generating units

(f) In addition to the requirements in paragraphs (a) to (e), the *Metering Coordinator* at a *connection point* for a *non-market generating unit* must ensure that the *metering installation*:

(1) where payments for the purchase of electricity *generated* by that unit are based on different rates according to the time of the day, is capable of recording *interval energy data*;

(2) where a *current transformer*, a *voltage transformer* or a *measurement element* for *reactive energy* is installed, meets the requirements in Schedule 7.4 for the type of *metering installation* appropriate to that *connection point*;

(3) for units with a *nameplate rating* greater than 1 MW, meets:

(i) the accuracy requirements specified in Schedule 7.4; and

(ii) the measurement requirements in subparagraph (a)(8);

(4) in relation to new accumulation *metering* equipment for units with a *nameplate rating* equal to or less than 1 MW, meets the minimum standards for *active energy* class 1.0 watt hour or 2.0 watt hour *meters* in accordance with clause S7.4.6.1(f);

(5) for units with a *nameplate rating* of equal to or less than 1 MW that are capable of recording *interval energy data*, meets the minimum standards of accuracy for the *active energy meter* in accordance with Schedule 7.4 for a type 3 or 4 *metering installation* which is based on projected sent out annual *energy* volumes; and

(6) if reasonably required by the *Distribution Network Service Provider* (where such a request must be in writing and with reasons), after taking into account the size of the *generating unit*, its proposed role and its location in the *network*, has the *active energy* and *reactive energy* measured where the unit has a *nameplate rating* of less than 1 MW.

Requirements for metering installations for a small generating unit classified as a market generating unit

(g) In addition to the requirements for *metering installations* for *non-market generating units* in paragraph (f), the *Metering Coordinator* for a *small generating unit* classified as a *market generating unit* must ensure that a *metering installation*:

(1) is classified as a type 1, 2, 3 or 4 *metering installation*; and

(2) is capable of recording *interval energy data* relevant to *settlements*.

7.8.2A New or replacement metering installations

The *Metering Coordinator* at a *connection point* must ensure that all new or replacement *metering installations* are capable of recording and providing, and configured to record and provide, *trading interval energy data*.

Note

Additional requirements with respect to new and replacement *metering installations* at *small customer connection points* are set out in clause 7.8.3.

7.8.3 Small customer metering installations

(a) Except as specified in clause 7.8.4, a *Metering Coordinator* must ensure that any new or replacement *metering installation* in respect of the *connection point* of a *small customer* is a type 4 *metering installation* that meets the *minimum services specification*.

Note

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(b) *AEMO* must establish, maintain and *publish* procedures relating to the *minimum services specification* that set out for each service specified in the *minimum service specification*:

(1) minimum service levels, including service availability and completion timeframes; and

(2) minimum standards, including completion rates against the service levels and accuracy requirements.

(c) The procedures established under paragraph (b) may also include technical requirements of one or more of the services specified in the *minimum services specification*.

7.8.4 Type 4A metering installation

No existing telecommunications network

(a) *AEMO* may exempt a *Metering Coordinator* from complying with clause 7.8.3(a) in respect of a *connection point* for a period of up to 5 years if the *Metering Coordinator* demonstrates to *AEMO's* reasonable satisfaction that there is no existing *telecommunications network* which enables remote access to the *metering installation* at that *connection point*.

(b) Where the *Metering Coordinator* is exempt under paragraph (a) from complying with clause 7.8.3(a) in respect of a *connection point*, the *Metering Coordinator* must ensure that any new or replacement *metering installation* in respect of that *connection point*

including, for the avoidance of doubt, a *metering installation* at a *new connection*, is a type 4A *metering installation* that has the capability, if remote access is activated, of providing the services in table S7.5.1.1.

(c) Subject to the reapplication of paragraph (a), on and from the date that an exemption under paragraph (a) ceases to apply in respect of a *connection point*, the *Metering Coordinator* must ensure that the *metering installation* at that *connection point* is a type 4 *metering installation* that meets the *minimum services specification*.

Small customer refusal

(d) A *Metering Coordinator* is not required to comply with clause 7.8.3(a), or to ensure that the remote access capabilities of an installed type 4 *metering installation* remain active, where:

(1) in the *Metering Coordinator's* reasonable opinion, the *small customer* has communicated its refusal to the proposed installation of a type 4 *metering installation*, or to the continued use of an installed type 4 *metering installation*, at a *connection point* in accordance with paragraph (e); and

(2) the *financially responsible Market Participant* has notified the *Metering Coordinator* that the *financially responsible Market Participant* has provided the following information to the *small customer*, and provided a copy of that information to the *Metering Coordinator*:

(i) information on the similarities and differences between a type 4 *metering installation* and a type 4A *metering installation*; and

(ii) information on the upfront charges and indicative ongoing charges associated with a type 4A *metering installation* that will be payable by the *small customer* in the circumstances described, as applicable, in paragraph (h)(1) or (h1)(1); and

(3) the *Metering Coordinator* accepts the *small customer* refusal.

(e) For the purposes of paragraph (d) a *small customer* refusal to the proposed installation of a type 4 *metering installation*, or to the continued use of an installed type 4 *metering installation*, must be communicated:

(1) verbally, in writing or by conduct; and

(2) to the *financially responsible Market Participant*, *Metering Coordinator* or *Metering Provider*.

(f) If the *small customer* communicates its refusal under paragraph (e) to the *financially responsible Market Participant* or *Metering Provider*, the *financially responsible Market Participant* or *Metering Provider* (as the case may be) must promptly provide written notice of the refusal to the *Metering Coordinator* which must include:

(1) the date of the refusal;

(2) how the refusal was communicated; and

(3) details of the *NMI* at the relevant *connection point*.

Note

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(g) If a *Metering Coordinator* accepts a *small customer* refusal under paragraph (d), the *Metering Coordinator* must keep the following records for at least 2 years:

(1) a written record of the refusal; and

(2) the notice and information provided by the *financially responsible Market Participant* in relation to that *small customer* under paragraph (d)(2).

Note

This paragraph is classified as a tier 2 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(h) Where the conditions in paragraph (d) have been met for new *metering installations*, or for the replacement of *metering installations* other than where paragraph (h1) applies:

(1) the *Metering Coordinator* must ensure that the new or replacement *metering installation* installed at that *connection point* is a type 4A *metering installation*; and

(2) clause 7.8.3(a) will apply to any subsequent installation of a new or replacement *metering installation* at that *connection point*, subject to the reapplication of paragraph (d).

Note

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(h1) Where the conditions in paragraph (d) have been met in respect of the continued use of an installed type 4 *metering installation*:

(1) the *Metering Coordinator* must ensure that the installed type 4 *metering installation* at that *connection point* is replaced with a type 4A *metering installation*, which may be done by deactivating the remote access capabilities of the installed type 4 *metering installation*; and

(2) clause 7.8.3(a) will apply to any subsequent installation of a new or replacement *metering installation* at that *connection point*, subject to the reapplication of paragraph (d).

Note

This paragraph is classified as a tier 3 civil penalty provision under the National Electricity (South Australia) Regulations. (See clause 6(1) and Schedule 1 of the National Electricity (South Australia) Regulations.)

(i) Nothing in paragraphs (h) or (h1) prevents a Metering Coordinator from, at any time, activating or reactivating the remote access capabilities of a metering installation with the consent of the small customer at the connection point.

7.16 Procedures

7.16.6 Requirements of the service level procedures

(a) *AEMO* must establish, maintain and *publish* the *service level procedures* that will apply to the relevant categories of registration that apply to *Metering Providers* and *Metering Data Providers*, in accordance with this Chapter 7 and this clause 7.16.6.

(b) *AEMO* must establish, maintain and *publish* the *service level procedures* in accordance with clause 7.16.1.

(c) The *service level procedures* must include:

(1) the requirements for the provision, installation and maintenance of *metering installations* by *Metering Providers*;

(2) requirements for the systems and processes for the collection, processing and delivery of *metering data* by *Metering Data Providers*;

(3) the performance levels associated with the collection, processing and delivery of *metering data*;

(4) the data formats that must be used for the delivery of *metering data*;

(5) the requirements for the management of relevant *NMI Standing Data*;

(6) the requirements for the processing of *metering data* associated with *connection point* transfers and the alteration of *metering installations* where one or more devices are replaced;

(7) other matters in the *Rules* required to be included in the *service level procedures*; and

(8) information to ensure consistency in practice between the *service level procedures* and other documents developed and *published* by *AEMO*, including the practices adopted in the *Market Settlement and Transfer Solutions Procedures*.

(d) The *service level procedures* must include requirements for accreditation, and for *Metering Providers* and *Metering Data Providers* (the '**service providers**'), may include requirements relating to, without limitation:

(1) cooperation with *AEMO*;

(2) the confidentiality of information collected by the service providers;

(3) the resolution of disputes between *AEMO* and the service providers, including disputes associated with a breach of the *Rules* and procedures authorised under the *Rules*;

(4) the access of *AEMO* to and the inspection and audit by *AEMO* of any equipment or database maintained by the service providers;

(5) the insurance which must be taken out by or on behalf of the service providers;

(6) subcontracting by the service providers;

(7) the software and systems that are used by the service providers;

(8) maintenance of quality systems accreditation;

(9) the ownership of intellectual property that is developed or used by the service providers; and

(10) the delivery up to *AEMO* of data, works, material and other property that *AEMO* has the right to in the event of the deregistration of a service provider.

Schedule 7.2 Metering Provider

S7.2.2 Categories of registration

(a) Registrations for *Metering Providers* in relation to the provision, installation and maintenance of *metering installation* types 1, 2, 3, 4 and 4A must be categorised in accordance with Tables S7.2.2.1, S7.2.2.2 and S7.2.2.3, or other procedures approved by *AEMO*.

(b) Registrations for *Metering Providers* in relation to the provision, installation and maintenance (unless otherwise specified) of *metering installation* types 5 and 6 must be categorised in accordance with Table S7.2.2.4 with the capabilities established in the *metrology procedures*.

(c) Registration for *Metering Providers* in relation to the provision, installation and maintenance of *small customer metering installations* must be categorised in accordance with Tables S7.2.2.2 and satisfy the requirements in clause S7.2.5.

(d) *AEMO* may establish *Accredited Service Provider categories* of registration for a *Metering Provider* in accordance with clause S7.2.6.

Table S7.2.2.1 Categories of registration for accreditation

Category	Competency
1C	Class 0.2 CTs with < 0.1% uncertainty.
1V	Class 0.2 VTs with < 0.1% uncertainty.
1M	Class 0.2 Wh meters with < 0.1/cosφ% uncertainty and class 0.5 varh meters with <0.3/sinφ uncertainty.
1A	Class 0.2 CTs, VTs, Wh meters; class 0.5 varh meters; the total installation to 0.5%. Wh with < 0.2% uncertainty at unity *power factor*; 1.0% for varh with <0.4% uncertainty at zero *power factor*.
2C	Class 0.5 CTs with < 0.2% uncertainty.
2V	Class 0.5 VTs with < 0.2% uncertainty.
2M	Class 0.5 Wh meters with < 0.2/cosφ uncertainty and class 1.0 varh meters with <0.4/sinφ uncertainty.
2A	Class 0.5 CTs, VTs, Wh meters; class 1.0 varh meters; the total installation to 1.0%. Wh with < 0.4% uncertainty at unity *power factor*; 2.0% for varh with <0.5% uncertainty at zero *power factor*.

Table S7.2.2.2 Categories of registration for accreditation

Category	Competency
3M	Class 1.0 Wh meters with < 0.3/cosφ uncertainty and class 2.0 varh meters with <0.5/sinφ% uncertainty.
3A	Class 0.5 CTs, VTs; class 1.0 Wh meters; class 2.0% varh meters; the total installation to 1.5%. Wh with < 0.5% uncertainty at unity *power factor*; 3.0% for varh with <0.6% uncertainty at zero *power factor*.
4M	Class 1.0 Wh meters and class 1.5 Wh meters with <0.3/cosφ% uncertainty.
4A	Class 1.0 Wh meters and class 1.5 Wh meters with <0.3/cosφ% uncertainty.
4S	Class 1.0Wh meters and class 1.5 Wh meters with <0.3/cosφ% uncertainty.

S7.2.2 Categories of registration

(a) Registrations for *Metering Providers* in relation to the provision, installation and maintenance of *metering installation* types 1, 2, 3, 4 and 4A must be categorised in accordance with Tables S7.2.2.1, S7.2.2.2 and S7.2.2.3, or other procedures approved by *AEMO*.

(b) Registrations for *Metering Providers* in relation to the provision, installation and maintenance (unless otherwise specified) of *metering installation* types 5 and 6 must be categorised in accordance with Table S7.2.2.4 with the capabilities established in the *metrology procedures*.

(c) Registration for *Metering Providers* in relation to the provision, installation and maintenance of *small customer metering installations* must be categorised in accordance with Tables S7.2.2.2 and satisfy the requirements in clause S7.2.5.

(d) *AEMO* may establish *Accredited Service Provider categories* of registration for a *Metering Provider* in accordance with clause S7.2.6.

Table S7.2.2.1 Categories of registration for accreditation

Category	Competency
1C	Class 0.2 CTs with < 0.1% uncertainty.
1V	Class 0.2 VTs with < 0.1% uncertainty.
1M	Class 0.2 Wh meters with < 0.1/cosφ% uncertainty and class 0.5 varh meters with <0.3/sinφ uncertainty.
1A	Class 0.2 CTs, VTs, Wh meters; class 0.5 varh meters; the total installation to 0.5%.

Category	Competency
	Wh with < 0.2% uncertainty at unity *power factor*; 1.0% for varh with <0.4% uncertainty at zero *power factor*.
2C	Class 0.5 CTs with < 0.2% uncertainty.
2V	Class 0.5 VTs with < 0.2% uncertainty.
2M	Class 0.5 Wh meters with < 0.2/cosφ uncertainty and class 1.0 varh meters with <0.4/sinφ uncertainty.
2A	Class 0.5 CTs, VTs, Wh meters; class 1.0 varh meters; the total installation to 1.0%. Wh with < 0.4% uncertainty at unity *power factor*; 2.0% for varh with <0.5% uncertainty at zero *power factor*.

Table S7.2.2.2 Categories of registration for accreditation

Category	Competency
3M	Class 1.0 Wh meters with < 0.3/cosφ uncertainty and class 2.0 varh meters with <0.5/sinφ% uncertainty.
3A	Class 0.5 CTs, VTs; class 1.0 Wh meters; class 2.0% varh meters; the total installation to 1.5%. Wh with < 0.5% uncertainty at unity *power factor*; 3.0% for varh with <0.6% uncertainty at zero *power factor*.
4M	Class 1.0 Wh meters and class 1.5 Wh meters with <0.3/cosφ% uncertainty.
4A	Class 1.0 Wh meters and class 1.5 Wh meters with <0.3/cosφ% uncertainty.
4S	Class 1.0Wh meters and class 1.5 Wh meters with <0.3/cosφ% uncertainty.

S7.2.3 Capabilities of Metering Providers for metering installations types 1, 2, 3, 4 and 4A

Category 1A, 2A, 3A and 4M *Metering Providers* must be able to exhibit the following capabilities to the reasonable satisfaction of *AEMO*:

(a) Detailed design and specification of metering schemes, including:

(1) knowledge and understanding of this Chapter 7;

(2) knowledge of equipment (*meters*, *current transformers* and where applicable *voltage transformers*);

(3) design experience including knowledge of *current transformers* and where applicable *voltage transformers* and the effect of burdens on performance;

(4) ability to calculate summation scheme values, multipliers, etc; and

(5) ability to produce documentation, such as single line diagrams, panel layouts and wiring diagrams.

(b) Programming and certification requirements for *metering installations* to the required accuracy, including:

(1) licensed access to metering software applicable to all equipment being installed by the *Metering Provider*;

(2) ability to program requirements by setting variables in *meters*, summators, modems, etc;

(3) management of the testing of all equipment to the accuracy requirements specified in this Chapter 7;

(4) certifications that all calibration and other *meter* parameters have been set, verified and recorded prior to *meters*, and other components of the *metering installation* being released for installation;

(5) all reference/calibration equipment for the purpose of meeting test or inspection obligations must be tested to ensure full traceability to test certificates issued by a *NATA* accredited body or a body recognised by *NATA* under the International Laboratory Accreditation Corporation (**ILAC**) mutual recognition scheme and documentation of the traceability must be provided to *AEMO* on request; and

(6) compliance with ISO/IEC Guide 25 "General Requirements for the Competence of Calibration and Testing Laboratories" with regard to the calculation of uncertainties and accuracy.

(c) Installation and commissioning of *metering installations* and, where necessary, the *communications interface* to facilitate the *remote acquisition* of *metering data*, including:

(1) the use of calibrated test equipment to perform primary injection tests and field accuracy tests;

(2) the availability of trained and competent staff to install and test *metering installations* to determine that installation is correct; and

(3) the use of test procedures to confirm that the *metering installation* is correct and that metering constants are recorded and/or programmed correctly.

(d) Inspection and maintenance of *metering installations* and equipment, including:

(1) regular readings of the measurement device where external recording is used (6 monthly) and verification with *AEMO* records;

(2) approved test and inspection procedures to perform appropriate tests as detailed in this Chapter 7;

(3) calibrated field test equipment for primary injection and *meter* testing to the required levels of uncertainty; and

(4) secure documentation system to maintain metering records for all work performed on a *metering installation*, including details of the security method used.

(e) Verification of *metering data* and *check metering data*, as follows:

(1) on commissioning *metering data*, verification of all readings, constraints (adjustments) and multipliers to be used for converting raw data to consumption data; and

(2) on inspection, testing and/or maintenance, verification that readings, constants and multipliers are correct by direct conversion of *meter* readings and check against the *metering database*.

(f) Quality System as AS 9000 series standards, including:

(1) a quality system to AS/NZ ISO 9000 series applicable to the work to be performed:

Type 1 full implementation of AS/NZ ISO 9002;

Type 2 full implementation of AS/NZ ISO 9002;

Type 3 – implementation of AS/NZ ISO 9002 to a level agreed with *AEMO*;

Type 4 implementation of AS/NZ ISO 9002 to a level agreed with *AEMO*;

Type 4A – implementation of AS/NZ ISO 9002 to a level agreed with *AEMO*;

(2) the calculations of accuracy based on test results are to include all reference standard errors;

(3) an estimate of Testing Uncertainties which must be calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement"; and

(4) a knowledge and understanding of the appropriate standards and guides, including those in the *Rules*.

(g) All of the capabilities relevant to that type of *metering installation* which are set out in the *Rules* and procedures authorised under the *Rules*.

S7.2.5 Capabilities of Metering Providers for small customer metering installations

Category 4S *Metering Providers* must be able to exhibit, to the reasonable satisfaction of *AEMO*:

(a) all of the capabilities in S7.2.3; and

(b) the establishment of an appropriate security control management plan and associated infrastructure and communications systems for the purposes of preventing unauthorised local access or remote access to *metering installations*, services provided by *metering installations* and *energy data* held in *metering installations*.

Schedule 7.3 Metering Data Provider

Schedule 7.3 Metering Data Provider

S7.3.1 General

(a) A *Metering Data Provider* must be accredited by and registered by *AEMO*.

(b) *AEMO* must accredit and register a *Metering Data Provider* only for the type of work the *Metering Data Provider* is qualified to provide.

(c) *AEMO* must establish a qualification process for *Metering Data Providers* that enables registration to be achieved in accordance with the requirements of this Schedule 7.3.

S7.3.2 Categories of registration

Categories of registration are set out in Table S7.3.2.1.

Table S7.3.2.1 Categories of registration for accreditation

Metering installation **type**	**Categories of registration**	
1, 2 3 and/or 4	Category 1D, 2D, 3D and/or 4D (for *remote acquisition*, processing and delivery of *metering data* for *connection points*)	Category 4S (for *small customer metering installations* in relation to *remote acquisition*, processing and delivery of *metering data* for *connection points*)
4A, 5 and/or 6	Category 4AC, 5C and/or 6C (for manual collection or *remote acquisition* of *metering data*)	Category 4AD, 5D and/or 6D (for manual collection, processing and delivery of *metering data* or for *remote acquisition*, processing and delivery of *metering data*)
7	Category 7D (for processing and delivery of *calculated metering data*)	

S7.3.3 Capabilities of Metering Data Providers

Metering Data Providers must be able to exhibit to the reasonable satisfaction of *AEMO* the following capabilities, as applicable, for the categories of *Metering Data Provider* accreditation sought:

(a) Detailed understanding of the *Rules*, and all procedures authorised under the *Rules* including the relevant *service level procedures* relating to the function of a *Metering Data Provider* and the carrying out of *metering data services*.

(b) Detailed understanding of the participant role relationships and obligations that exist between the *Metering Data Provider*, *Metering Provider*, *financially responsible Market Participant*, *Local Network Service Provider*, *AEMO* and the *Metering Coordinator*.

(c) An understanding of metering arrangements, including knowledge of metering equipment (*meters*, *current transformers* and *voltage transformers*).

(d) Authorised access to *metering* software for the:

(1) collection of *metering data*;

(2) establishment, maintenance and operation of a *metering data services database* for the storage and management of *metering data* and *NMI Standing Data*; and

(3) the validation, substitution and estimation of *metering data*.

(e) Processes and systems for the collection of *metering data* including:

(1) knowledge of manual collection and *remote acquisition* of *metering data* (as applicable);

(2) collection technologies and methodologies; and

(3) metering protocols and equipment.

(f) Systems for the processing of *metering data* including:

(1) processes for the verification and commissioning of *metering data* and relevant *NMI Standing Data* pertaining to each *metering installation* into the *metering data services database*;

(2) processes for validation, substitution and estimation of *metering data*;

(3) processes for the storage, adjustment and aggregation of *metering data*; and

(4) the secure storage of historical data.

(g) Processes for the delivery of *metering data* and relevant *NMI Standing Data* to *Registered Participants* and *AEMO* including:

(1) delivery performance requirements for *metering data*; and

(2) an understanding of the relevant *metering data* file formats.

(h) The availability of trained and competent staff to:

(1) read or interrogate the *metering installation*;

(2) collect and process *metering data* into the *metering data services database*;

(3) validate, substitute or estimate *metering data* as the case may be;

(4) maintain the physical and logical security of the *metering data services database* and only allow access to *metering data* by those persons entitled to receive *metering data*; and

(5) ensure the ongoing performance and availability of the collection process and the *metering data services database* are maintained inclusive of necessary system supports for backup, archiving and disaster recovery.

(i) The establishment of a quality system which will:

(1) underpin all operational documentation, processes and procedures;

(2) facilitate good change control management of procedures, IT systems and software;

(3) provide audit trail management of *metering data* and *NMI Standing Data*;

(4) maintain a security control management plan;

(5) maintain security controls and data integrity; and

(6) maintain knowledge and understanding of the *Rules* and relevant procedures, standards and guides authorised under the *Rules*.

(j) Understanding of the required logical interfaces necessary to support the provision of *metering data services* including the interfaces needed to:

(1) access *AEMO's* systems for the management and delivery of *metering data*;

(2) support *B2B procedures*; and

(3) support *Market Settlement and Transfer Solution Procedures* for delivery and update of *NMI Standing Data*.

S7.3.4 Capabilities of Metering Data Providers for small customer metering installations

Category 4S *Metering Data Providers* must be able to exhibit, to the reasonable satisfaction of *AEMO*:

(a) all the capabilities in S7.3.3; and

(b) the establishment of an appropriate security control management plan and associated infrastructure and communications systems for the purposes of preventing unauthorised local access or remote access to *metering installations*, services provided by *metering installations* and *energy data* held in *metering installations*.

Schedule 7.6 Inspection and Testing Requirements

See Appendix C.