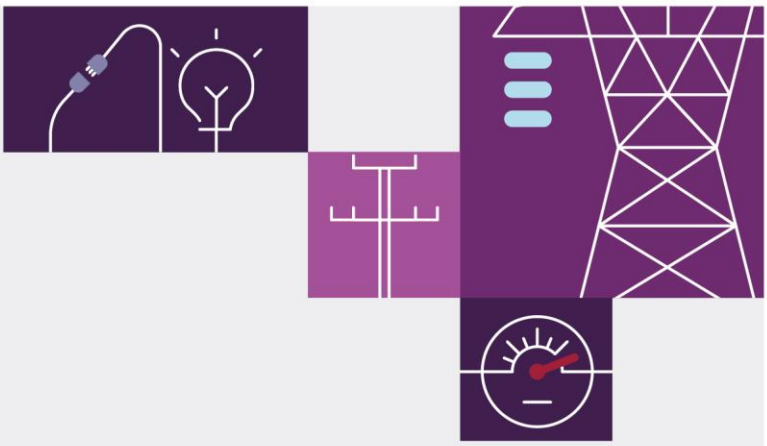
AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Proposed design for a Visibility Framework

September 2022

Consultation Paper

Proposed visibility arrangements to support off-market participation of aggregations of Distributed Energy Resources



Important notice

Purpose

The function of ensuring that the South West Integrated System operates in a secure and reliable manner for the purposes of *the Electricity Industry (Wholesale Electricity Market) Regulations 2004* is conferred on AEMO under clause 2.1A.1A of the *Wholesale Electricity Market Rules*. The purpose of this design paper is to enable consultation on the high-level design considerations of the Visibility Framework proposed by AEMO to facilitate this function, and to elicit feedback from stakeholders.

This publication is based on information available to AEMO at 6 September 2022 unless otherwise indicated.

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Version control

Version	Release date	Changes
1.0	12/09/2022	Final version for stakeholder feedback

AEMO acknowledges the Traditional Owners of country throughout Australia and recognises their continuing connection to land, waters and culture. We pay respect to Elders past, present and emerging.

Executive summary

AEMO is working with Energy Policy WA to develop arrangements for the integration and orchestration of aggregations of Distributed Energy Resources (DER) into the South West Interconnected System (SWIS) under market arrangements enabled by the Wholesale Electricity Market (WEM) Rules. As set out by Energy Policy WA's *DER Roadmap: DER Orchestration Roles and Responsibilities Information Paper* [1] aggregations of DER (with their associated technologies) will be able to participate in the WEM and provide related energy services over time.

In the short term however, aggregations of DER acting as Virtual Power Plants (VPPs) would likely participate through 'off-market' activities[2] and either be small or geographically spread across network Transmission Nodes to achieve a scale necessary to derive commercial benefit. In time, VPPs will likely proliferate across the SWIS as well as comprising tens of megawatts of capability.

Under the current rules, neither the VPP or the VPP Operator is required to register, meaning that AEMO cannot collect data in regard of a VPP's operating intentions or actual performance. Without the visibility that comes with registration, AEMO cannot operationally plan for (or dispatch 'around') the VPP's off-market activities. In addition, AEMO cannot determine the extent to which these activities might contribute a risk to power system security and reliability or whether remedial actions are needed to mitigate risk. These concerns are expected to increase as off-market participation increases and as forecasted low-load conditions[3] materialise.

Visibility of VPPs is therefore required to ensure that AEMO can continue to maintain power system security as these new actors develop at scale. As a result, AEMO is proposing a Visibility Framework and associated VPP Aggregation Guideline to clarify and provide guidance for investments in VPPs to establish expectations early and enable VPP development that is aligned to expected future WEM requirements.

AEMO has carefully considered the design of the proposed Visibility Framework, to ensure it coordinates with the WEM Rules to meet dual purposes. First, to support VPPs developing at scale, irrespective of whether they are providing market services, off-market services or a combination of both, while enabling visibility of any off-market arrangements. Second, to facilitate the development of VPP business models that will support the VPP's future participation in the market, so that early investments in visibility can contribute towards enabling access to future revenue opportunities from the WEM[4]. A staged approach to the implementation of the framework is proposed to achieve these two purposes.

In Stage 1, engagement with the framework will be voluntary for a VPP operator as AEMO builds experience in operating the framework while incorporating learnings from Project Symphony. It is proposed that Stages 2 and 3 will be enabled through the WEM Rules commencing 1 October 2023 with the intended outcome of generally enabling the expansion of VPPs over time.

[1] Energy Policy WA, https://www.wa.gov.au/system/files/2022-07/DER%20Orchestration%20Roles%20and%20Responsibilities%20information%20Paper.pdf

[2] Ibid.

[3] See AEMO (2022), 2022 Wholesale Electricity Market Statement of Opportunities, June, p.72 at https://aemo.com.au/-/media/files/electricity/wem/planning_and_forecasting/esoo/2022/2022-wholesale-electricity-market-esoo.pdf?la=en&hash=AF5B0EE73B9AAD4C0A246F264BC72AB6

[4] AEMO notes the full details of WEM participation are yet to be resolved through the implementation of DER Roadmap actions. See Energy Policy WA for further information at https://www.wa.gov.au/organisation/energy-policy-wa

Key to the operation of the Visibility Framework is an obligation on existing Rule Participants who operate a VPP of material size to provide visibility data to AEMO about the physical characteristics of the VPP and some minimal data about the VPP's activities. This 'obligation' would be voluntary in Stage 1. Further rule review, development and consultation will be required to embed the obligation in WEM Rules under Stage 2 and (as proposed for Stage 3 in future) to extend the obligation to new Rule Participants who operate a VPP of material size.

The Visibility Framework is enabled by a VPP Aggregation Guideline that specifies the Minimum Visibility Data Model and expectations for visibility data provision (including some further information on VPP behaviour that may be expected as VPPs expand and become more sophisticated) and update frequency, and by a data management framework for visibility data collection and use. The proposed Minimum Visibility Data model is set out in this paper for stakeholder comment.

AEMO's proposal for the Visibility Framework respects the System Size thresholds for Facility registration and uses those thresholds to guide when and how the requirements on providing visibility data would apply in respect of the specific characteristics of a VPP (which differs substantially from a conventional registered Facility). Consequently, a VPP whose size is estimated to be less than 5 MW will generally not be the subject of Minimum Visibility Data requirements.

The purpose of this design paper is to enable stakeholders to consider and respond to the high-level design considerations of the proposed Visibility Framework. While feedback is sought on any aspect of this paper, AEMO is particularly interested in receiving views on:

- The staged approach to the implementation of the Visibility Framework.
- The matters to be covered in the VPP Aggregation Guideline.
- The Minimum Visibility Data Model and requirements around data provision and update frequency.
- The proposed uses of the Minimum Visibility Data.
- The potential costs of providing the Minimum Visibility Data.

as this will help guide AEMO's preparation of the guideline. AEMO is seeking written feedback on this paper by **12 October 2022.** Feedback must be submitted by email to: WADERProgram@aemo.com.au.

AEMO has developed its proposed Visibility Framework in line with stakeholder discussions held on 15 March 2022 and 15 June 2022, and will again enable stakeholders to discuss this paper at AEMO's upcoming WA DER Market Participation Forum on 13 September 2022.

The feedback from this consultation will inform the development of the VPP Aggregation Guideline, which AEMO intends to complete by the end of 2022.

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1 Visibility

In this paper, 'visibility' refers to the ability of AEMO to access information about the existence and operation of 'off-market arrangements' comprising Virtual Power Plants with the capability to affect material movements of energy.

The DER Roadmap contemplates that controllable DER might first participate through services provided outside of the market defined by the WEM Rules, and coordinated as part of a Virtual Power Plant (VPP) spanning one or more Transmission Nodes. The rules commencing the new market arrangements on 1 October 2023 do not contemplate the registration of a VPP across several Transmission Nodes but do allow for an aggregation of DER at a single Transmission Node to be registered as a Facility (a Small Aggregation).

AEMO's *Renewable Energy Integration – SWIS Update report* (September 2021)[5] highlighted the need for measures to provide AEMO with sufficient visibility of resources that are contributing to system conditions, and the means to forecast their behaviour and response, to facilitate AEMO keeping the power system secure as the SWIS transitions to accommodate higher levels of renewable energy.

AEMO is therefore looking to obtain data in relation to material 'off-market arrangements' to understand their contribution to system conditions. This includes data on the activities of VPPs (aggregations of DER that are not registered under the WEM Rules) that are capable of moving material amounts of energy through activities that are outside of the scope of current WEM services or are not a service procured under the WEM Rules.

This paper uses the term 'VPP' to differentiate an unregistered aggregation from a 'Facility' which can be registered under the WEM Rules and because industry already has a general sense of what a VPP is. Importantly, a VPP is able to exercise control over its constituent assets through the use of technology. Where the whole of a VPP is not behind a single Transmission Node, the term 'VPP component' refers to that part of the VPP that is located behind a Transmission Node. The term 'VPP operator' means the person who owns, operates or controls the VPP, and 'off-market' denotes the services delivered by a VPP that are not offered into the wholesale market. The reference to 'material' or 'materially-sized' in this paper is in recognition of the fact that only a VPP of material size can affect a material movement of energy. Specifically, AEMO is only interested in gaining visibility of a small VPP (of an estimated size of at least 5 MW and up to 10 MW) or a large VPP (of an estimated size of at least 10 MW).

1.1 Need for visibility

The proposed Visibility Framework will enable AEMO to access basic information from the VPP operator about the physical characteristics of a VPP and the off-market services the VPP provides. As part of this framework, AEMO is proposing a VPP Visibility Guideline that will enable AEMO to obtain data about materially-sized VPPs and their activities in the SWIS. The guideline specifies is the 'Minimum Visibility Data' that AEMO may take into consideration when assessing system risks and taking action to keep the power system secure. AEMO intends to

[5] https://aemo.com.au/en/energy-systems/electricity/wholesale-electricity-market-wem/system-operations/integrating-utility-scale-renewables-and-distributed-energy-resources-in-the-swis

use this data to support improved co-ordination of generation and demand at the system level, such as in forecasting and operational planning. For example, Minimum Visibility Data could be used to:

- Facilitate AEMO's ability to accurately schedule energy. As any over or under-supply must be met in real-time through Regulation Raise and Regulation Lower, enhanced forecasting of material movements in energy will assist AEMO in scheduling energy more accurately and reducing quantities of regulation. This will promote both allocative and market efficiencies.
- Give AEMO visibility of VPPs that are being operated to change the demand profile, and when these VPPs are scheduled to effect this change. This could influence how often Emergency Solar Management (ESM) is triggered, as AEMO's lack of visibility might lead to unnecessary triggering of ESM.
- Enable AEMO to ascertain the need for, or likely effectiveness of, a service to be procured through the NCESS mechanism. At scale it is feasible that off-market arrangements from VPPs could negate the need for a NCESS service or compromise its effective delivery.

Consequently, AEMO is proposing to obtain visibility is respect of energy movements that cannot otherwise be forecast based on historical behaviour as the movements may be wholesale price sensitive or dependent on factors unknown to AEMO (such as a Market Participant balancing their energy portfolio). AEMO considers that seeking data to support visibility prior to the participation of aggregations of DER, including VPPs, in the WEM is consistent with the WEM Objective[6] –

> *… to promote the economically efficient, safe and reliable production and supply of electricity and electricity-related services in the SWIS'.*

In the initial stage the Framework proposes a voluntary arrangement with VPP operators who are existing Rule Participants. Clarifying visibility requirements 'up front' will enable VPPs to grow and plan for any obligations to provide visibility data that may apply in future, when one or more of the VPP's components are required to be registered under the WEM Rules. The framework prepares for this evolution by setting out stages beyond the initial arrangements. In taking this approach AEMO is seeking to avoid future needs to retrofit visibility obligations onto the VPP operator when it may be more onerous to adjust business models, systems and processes.

The Visibility Framework focusses on the activities of controlled aggregations of DER that would not be visible to AEMO under normal operations (i.e. 'off-market services'). AEMO's concern with understanding these services is that the resultant flows of energy have the potential to impact system operations and market outcomes. Examples of off-market services include the use of controlled aggregations of DER:

- by retailers adjusting load to manage wholesale market exposure;
- by network operators to defer network investment, or to increase system loads; and
- to meet requirements of performance-based leasing models or Power Purchase Agreements.

In proposing the Visibility Framework, AEMO is conscious of ensuring it is fit-for-purpose and does not impact the pursuit of innovative business models. Stakeholders are invited to consider the Minimum Visibility Data and the Framework with regards to cost and potential innovation impacts for the above, or other off-market services.

[6] WEM Rules clause 1.2.1(a).

1.2 DER Roadmap: Energy Policy WA's Roles and Responsibility paper

Energy Policy WA's DER *Roadmap:* DER *Orchestration Roles and Responsibilities Information Paper* (Information Paper) provides a view of the evolution of participation opportunities for aggregations of DER, which is illustrated in Figure 1 below. The first participation opportunity is likely to be 'off-market' services coordinated by the retailer / aggregator to provide value to the retailer, aggregator or customer. It does not require market registration of the retailer as an aggregator; however, it is contemplated that some visibility of the off-market services would be needed by system and network operators (i.e. AEMO and Western Power)[7].

The Information Paper also considers how visibility may be afforded to AEMO of aggregations of DER that have registered under the WEM Rules for market participation. It indicates that a large aggregation of DER with a System Size that is at least 10 MW would be required to comply with dispatch instructions and provide real-time visibility of the aggregated Facility to enable AEMO to monitor compliance[8]. A small aggregation of DER with a System Size that is less than 10 MW would require "some form of visibility" so AEMO can incorporate the aggregation's output into forecasting processes for more accurate dispatch outcomes, and to "facilitate monitoring of compliance with emergency directions"[9].

Importantly, an aggregation of DER that does not meet the monitoring requirements to provide energy and Essential System Services may provide services to the market when procured under an NCESS Contract, wherein performance and visibility requirements in regard of the service(s) will be stipulated in the NCESS Contract. The visibility requirements may be specific to the service and may be less onerous than the standard requirements for market services[10].

The Information Paper takes into consideration that visibility requirements serve different purposes depending on the Facility Class in which a Facility is registered (i.e. Non-Scheduled Facility, Semi-Scheduled Facility or Scheduled Facility). It was noted that, in the short-term, the entry of smaller aggregations of DER is more likely than larger aggregations of DER and that immediate to short-term effort might best be focused on facilitating the entry of aggregation by enabling their registration in the Non-Scheduled Facility class. More onerous requirements would apply to larger aggregations that are subject to dispatch compliance.

AEMO's proposed Visibility Framework aligns with Energy Policy WA's design for the market participation of aggregations of DER in the following important ways:

- AEMO's proposed staged approach to the implementation of the Visibility Framework takes into consideration Energy Policy WA's timings for the broader participation of aggregations of DER, which is expected to be 2025 for participation in market services.
- Stage 2 and Stage 3 of the Visibility Framework will apply to existing Rule Participants, which aligns with Energy Policy WA's view that the first opportunity for DER's participation is via 'off-market' services coordinated by the retailer / aggregator. Neither stage will require the registration of the retailer as an

[7] https://www.wa.gov.au/system/files/2022-07/DER%20Orchestration%20Roles%20and%20Responsibilities%20information%20Paper.pdf (Section 3.5, p.16. See Figure 9 - Potential future evolution of opportunities for aggregated DER)

[8] https://www.wa.gov.au/government/publications/distributed-energy-resources-der-roadmap-der-orchestration-roles-and-responsibilities-information-paper (Section 5.2.1)

[9] https://www.wa.gov.au/system/files/2022-07/DER%20Orchestration%20Roles%20and%20Responsibilities%20information%20Paper.pdf (p.42)

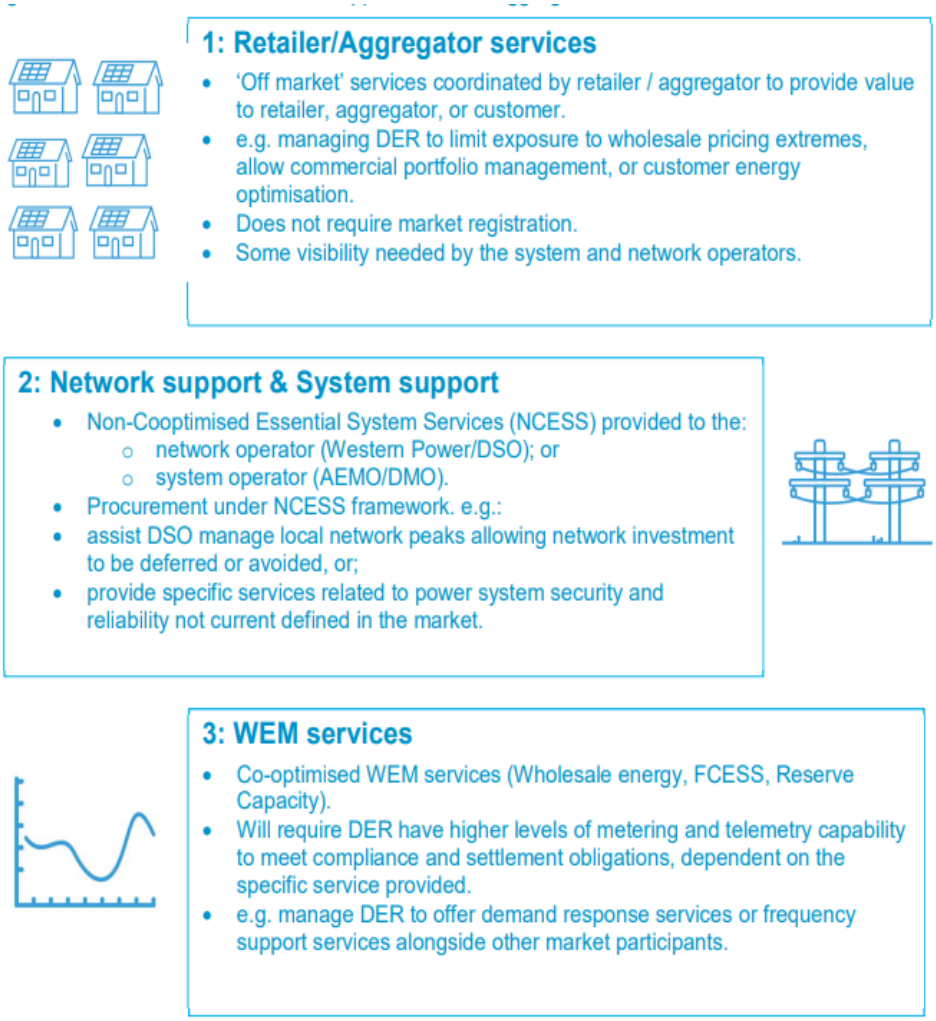
[10] https://www.wa.gov.au/system/files/2022-07/DER%20Orchestration%20Roles%20and%20Responsibilities%20information%20Paper.pdf (Section 5.2.1, p.42 and footnote 33)

‘aggregator’ or place additional requirements on the retailer in regard of Facility registration (i.e. in addition to those already applied under the WEM Rules registration regime).

- The framework respects the 5 MW and 10 MW System Size materiality thresholds that apply to a Facility under the WEM Rules registration regime (discussed in Section 4.3 below) and uses these size thresholds to inform what constitutes a materially-sized VPP, and therefore, when the VPP would be subject to visibility data requirements.
- The framework notionally leverages the 10 MW materiality threshold as the criterion that determines when a VPP transitions from being considered as small to being large, and therefore, the point at which the VPP should be fully exposed to Facility registration requirements under the WEM Rules and frameworks developed for market participation.
- Where the framework requires the registration of a VPP or a VPP component as a Facility as part of Stage 3, the VPP or a VPP component is to be registered in the Facility type and Facility Class that accords with Energy Policy WA’s proposed transition pathways for the market integration of aggregations of DER.

AEMO will continue to work with Energy Policy WA, who are leading the implementation of the DER Roadmap with respect to Distribution System Operator and Distribution Market Operator roles and responsibilities to support DER orchestration and participation in the market. Consequently, the proposed design of the Visibility Framework will need to take into account the outcomes of the roles and responsibilities work as part of the framework’s staged implementation.

Figure 1 **Energy Policy WA's view of the evolution of DER participation opportunities in the SWIS[11]**



[11] https://www.wa.gov.au/system/files/2022-07/DER%20Orchestration%20Roles%20and%20Responsibilities%20information%20Paper.pdf (Section 3.5, page 16. See Figure 9 - Potential future evolution of opportunities for aggregated DER)

2 Proposed Visibility Framework

The Visibility Framework supports the identification and collection of data aimed at giving AEMO visibility of 'off-market' arrangements, so that AEMO can make informed decisions when performing its function of keeping the power system secure.

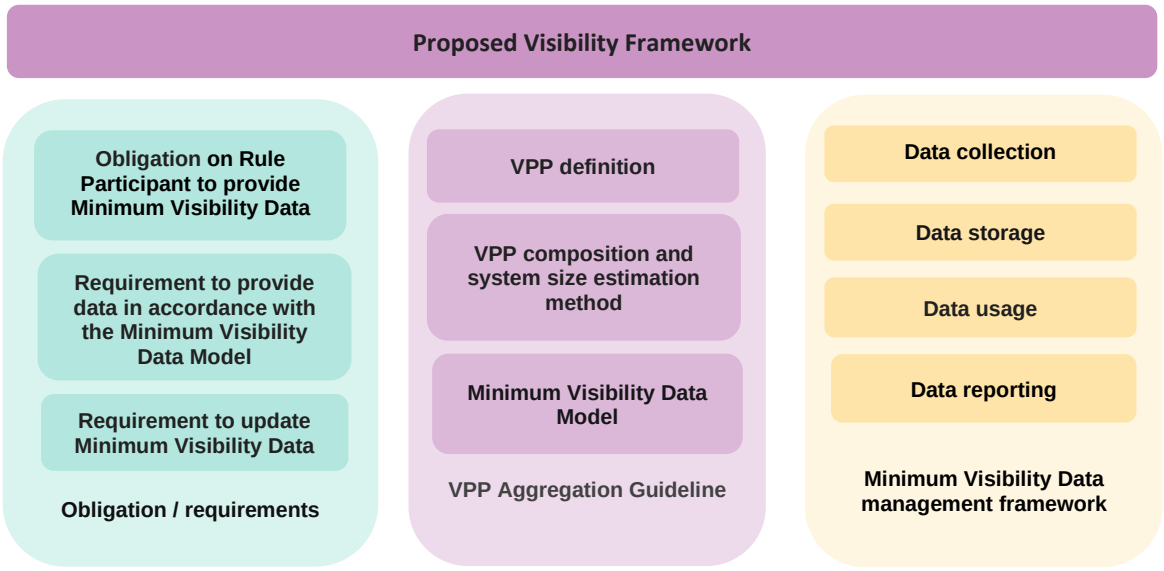
Where the activities of VPPs of material size are visible to AEMO, AEMO can manage system security 'around' their operation and act to prevent or minimise the impacts of any clashes between off-market services and market services (or market-based services such as those procured via a NCESS Contract).

Figure 2 below illustrates the key elements of the Visibility Framework proposed by AEMO including:

- An obligation on a Rule Participant to provide Minimum Visibility Data to AEMO relating to the VPP and the off-market services the Rule Participant is using.
- Requirements on a Rule Participant to provide data in accordance with the Minimum Visibility Data Model and to update that data as specified by the VPP Aggregation Guideline.
- VPP Aggregation Guideline to support the application of the Visibility Framework and its coordination with the WEM Rules registration framework. The guideline will specify when the obligation to provide Minimum Visibility Data to AEMO will apply to a Rule Participant and will set-out requirements in regard to the provision of that data.
- Mechanisms and processes enabled under the WEM Rules to manage the collection, storage, use and reporting of data derived from Minimum Visibility Data.

Note that until rule changes are made to embed the framework under the WEM Rules, AEMO would apply a voluntary arrangement for providing visibility data. Consequently, under Stage 1, obligations would only apply to the extent that the Framework is voluntarily entered into.

Figure 2 Overview of proposed Visibility Framework – key elements



2.1 Staged implementation

AEMO proposes that prior to the implementation of wider participation from October 2025[12], which will include participation under market arrangements, existing Rule Participants who are operating a VPP to provide an off-market service will be responsible for providing 'visibility data' to AEMO in relation to the VPP and its activities. In the first stage, voluntary arrangements will support the provision of visibility data by existing Rule Participants and the use of this data by AEMO. The second stage will see the collection and usage of Minimum Visibility Data, as operationalised by the Visibility Framework through the WEM Rules that enable the new market arrangements. It is proposed that this second stage commences after the New WEM Commencement Day (1 October 2023).

In a future third stage, the Visibility Framework may also apply to VPP operators who are not (or not yet) Rule Participants in alignment with the timings for wider DER participation. In this stage, the responsibility of providing Minimum Visibility Data to AEMO will also fall to a VPP operator who is a new Rule Participant that has registered either their VPP, or a component part of their VPP, as a Facility.

The staged implementation approach is summarised below, with further details provided in the sections following.

- Stage 1: Visibility Framework will apply voluntarily to existing Rule Participants through the voluntary provision of visibility data.
- Stage 2: Visibility Framework will apply under WEM Rules to existing Rule Participants who operate a VPP of at least 5 MW in estimated size. The Rule Participant will be required to provide Minimum Visibility Data to AEMO in respect of their VPP.
    - The Rule Participant will need to comply with the Facility registration requirements under the WEM Rules i.e. to register or otherwise seek an exemption from registration the VPP or VPP component (whatever is at the Transmission Node) in accordance with the exemption provisions.
- Stage 3: the Visibility Framework will apply under WEM Rules to an existing or new Rule Participant who operates a VPP of at least 5 MW in estimated size. The Rule Participant will be required to provide Minimum Visibility Data to AEMO in respect of their VPP.
    - For a small VPP (at least 5 MW but less than 10 MW in estimated size) - the VPP operator must register as a Rule Participant and register, as a Facility, the VPP or VPP component (whatever is at a Transmission Node) that is at least 5 MW in System Size at a Transmission Node.
    - For a large VPP (at least 10 MW in estimated size) - the VPP operator must register as a Rule Participant and register, as a Facility, the VPP at the Transmission Node (if the whole of the VPP is at the Transmission Node) or every VPP component at each relevant Transmission Node (whether or not the VPP component is at least 5MW in System Size).

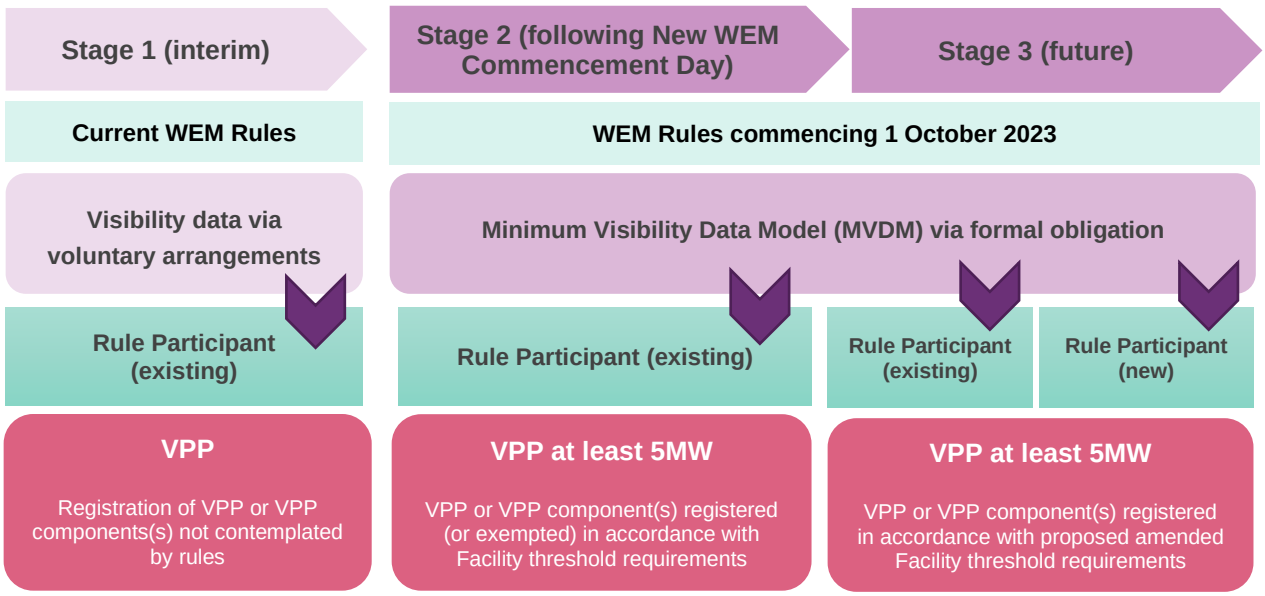
AEMO's proposed design for the Visibility Framework and staged implementation approach supports the 'translation' of off-market aggregations of DER into the market participation framework. For example, where registered as a Facility, the VPP or VPP component will a be able to provide WEM services where the market service requirements are met. This means that a VPP with some or all of its components registered will be able to provide market services as well as off-market services if there are no adverse power system security and

[12] Energy Policy WA - DER Orchestration Roles & Responsibilities Information Paper, Table 1 Timeframes for DER Aggregation, p.7.

reliability implications. For this reason, the Visibility Framework (or aspects of it) may endure beyond the DER Roadmap reforms to ensure that adverse implications can be identified and mitigated where necessary.

AEMO's staged approach to implementing the proposed Visibility Framework is illustrated in Figure 3 below.

Figure 3 Overview of staged implementation of the proposed Visibility Framework



2.1.1 Stage 1 – Voluntary visibility arrangements for existing Rule Participants

Stage 1 has two areas of focus. The first area of focus is establishing visibility in the short term, in the absence of rule changes. AEMO proposes that relevant Rule Participants who are VPP operators voluntarily provide information that is available to them, or could otherwise be made available to them without too much impost.

The second area of focus is undertaking foundational activities to enable the inclusion of the Visibility Framework in the new market arrangements, via the WEM Rules commencing 1 October 2023. This would include further stakeholder consultation and drawing on guidance and learnings from Project Symphony[13] and other relevant trials will contribute timely and important inputs to the finalisation of the data model.

The extent to which the proposed Visibility Framework can be enabled under the WEM Rules will depend on the arrangements enabled under the WEM Rules commencing 1 October 2023, and Energy Policy WA's progress of the DER Roadmap.

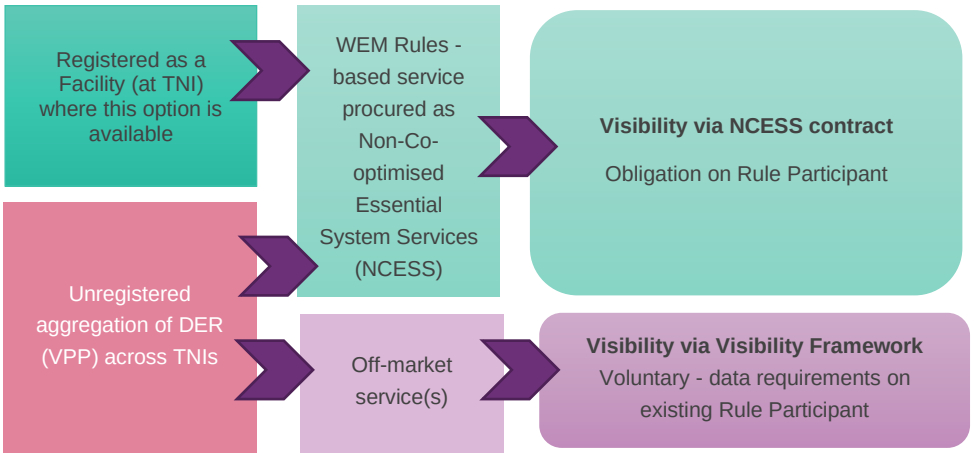
Figure 4 below indicates that in the interim to the NEW WEM Commencement Day (1 October 2023), AEMO's visibility of aggregations of DER or VPPs will be enabled via:

- An obligation on a Rule Participant who is providing a service under an NCESS contract made under the WEM Rules.

[13] https://aemo.com.au/initiatives/major-programs/wa-der-program/project-symphony

- A Rule Participant who registers, as a Facility, the VPP or VPP component at a Transmission Node in order to participate in the market through the provision of a WEM service, where this option is available.
- A (voluntary) obligation on an existing Rule Participant to provide visibility data to AEMO in regard of a materially-sized VPP and its off-market activities.

Figure 4 Visibility arrangements interim to WEM Rules commencing 1 October 2023 – Stage 1



2.1.2 Stage 2 – Visibility Framework under WEM Rules for existing Rule Participants

Stage 2 is proposed to start after the start of new market arrangements under the WEM Rules commencing 1 October 2023. While this stage retains the focus on existing Rule Participants, the Visibility Framework would be more formally enabled under rules-based arrangements developed under Stage 1.

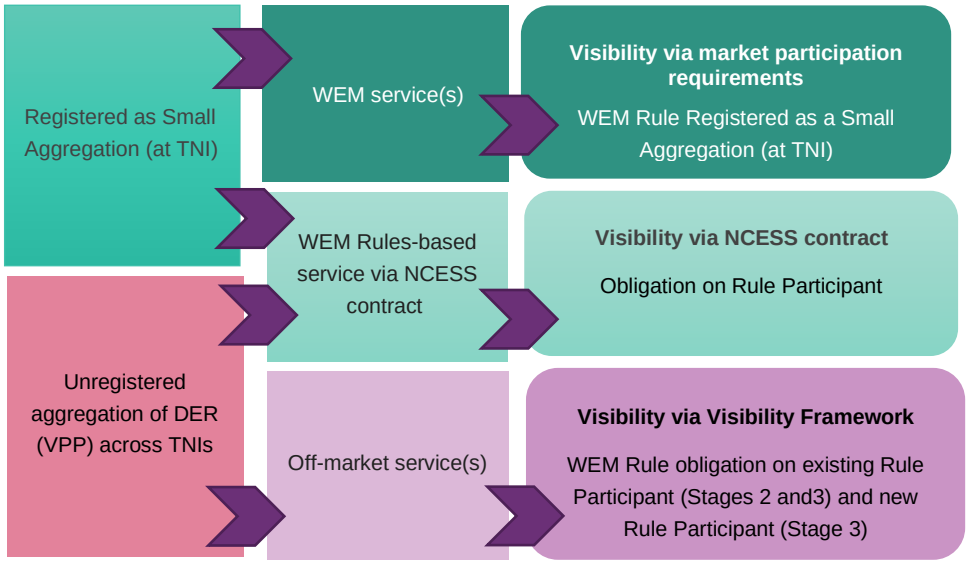
During Stage 2 AEMO expects that any Rule Participant who is operating a VPP of an estimated size of at least 5 MW or more will be required to provide Minimum Visibility Data. Those Rule Participants will also need to comply with any relevant Facility registration requirements imposed by the WEM Rules. For example, where the VPP or VPP component is at least 5 MW in System Size or at least 10 MW in System Size at a Transmission Node, the Rule Participant will be required to register the VPP or VPP component as a Facility, or seek an exemption from registering the VPP or VPP component in accordance with the exemption provisions that are applicable to the relevant System Size.

Where an exemption from Facility registration is not granted, or where the existing Rule Participant choses to register the VPP or a VPP component, the existing Rule Participant will be required to comply with the WEM Rules in terms of the information that must be provided to AEMO for the registered Facility.

Figure 5 below illustrates how AEMO will be afforded visibility of aggregations of DER and VPPs under the WEM Rules through the obligations applied to:

- An existing Rule Participant operating a materially-sized VPP and its off-market activities.
- A Rule Participant who registers, as a Facility, the VPP or VPP component at a Transmission Node in order to participate in the market through the provision of WEM services (coordinated with other registration requirements).
- A Rule Participant who is using an aggregation of DER to provide a service under an NCESS contract made under the WEM Rules.

Figure 5 Visibility arrangements under WEM Rules commencing 1 October 2023 – Stages 2 and 3



An important piece of work to be completed in advance of the implementation of Stage 2 is how the method for calculating System Size that would apply to a VPP or VPP component at a Transmission Node, so it can be determined whether the VPP or VPP component has triggered the Facility registration requirement. This matter will be covered in the VPP Aggregation Guideline.

Stage 2 provides AEMO with the opportunity to collect and utilise Minimum Visibility Data under the WEM Rules and identify whether refinements are necessary to the Visibility Framework to ensure its effective operation under the new market arrangements. Learnings from Stage 1 will help inform any uplift requirements to manage visibility data. Section 6.2 provides more detail on the potential uses of the Minimum Visibility Data, such as an input to operational planning, reporting and AEMO's market publications.

2.1.3 Stage 3 – Future extension of Visibility Framework to 'new' Rule Participants

Under the proposed Stage 3 AEMO is seeking to address the circumstances where the configuration of a materially-sized VPP (that is, how the VPP is spread across Transmission Nodes) could avoid registration requirements under the WEM Rules (that is, the registration of a Rule Participant and Facility).

Where a VPP operator of a materially-sized VPP avoids registration as a Rule Participant, an obligation cannot be placed on the VPP operator to provide the Minimum Visibility Data to AEMO. During Stage 3 AEMO would still be afforded visibility (as per Figure 5), with the difference being that the Facility registration requirements are amended to ensure that materially-sized VPPs are 'captured' by the Market Registration regime. The following principles are proposed to support changes:

- An exemption from registration would not be granted for a VPP or a VPP component that was at least 5 MW in System Size at a Transmission Node. Although 5 MW represents a VPP's minimum System Size, when that VPP's other (unregistered) components are also taken into consideration, the VPP is likely to be much larger than 5 MW in size. Additionally, as a VPP is not a unitary Facility in the traditional sense, VPPs have the potential to grow quickly through the enrolment of many more DER that are capable of generating or consuming electricity.

- Where a VPP is of an estimated size of at least 10 MW, each VPP component at the relevant Transmission Node must be registered as a Facility, irrespective of the System Size of the VPP or VPP component at each Transmission Node. This will place a definitive cap on the maximum estimated size a VPP can achieve without triggering Facility registration thresholds.
- Where a registration threshold is triggered AEMO proposes that all the components of a VPP would become visible to AEMO as a registration requirement.
- An operator of a small or large VPP would be required to become a Rule Participant, where not already registered as a Rule Participant. Should the Rule Participant engage the services of a 'third-party' to facilitate the coordination of VPP, the obligation to provide Minimum Visibility Data to AEMO would still fall to Rule Participant as the operator of the VPP under the WEM Rules.

AEMO acknowledges that Stage 3 looks ahead to higher levels of DER aggregation in the SWIS. To facilitate Stage 3 AEMO is also open to revision of the Visibility Framework depending on learnings from Stages 1 and 2 and related trials (for example the method for calculating System Size could be reviewed as part of Stage 3).

Questions

- **Is the staged approach to the implementation of the Visibility Framework reasonable, particularly in regard to -**
  - **The proposed timings of the stages?**
  - **How the framework interacts with the Facility registration thresholds in each stage?**
  - **Impacts or benefits to business models or VPP costs?**
- **In addition to the Visibility Framework's key elements, what other things (i.e. obligations / requirements, prescription, documentation, processes or frameworks etc) are necessary to support the efficient and effective operation of the framework?**

3 Minimum Visibility Data Obligation

Key to the operation of the Visibility Framework is an obligation on a Rule Participant who operates a VPP of material size to provide 'Minimum Visibility Data' to AEMO about the VPP and the VPP's intended activities.

AEMO is not afforded powers under the WEM Rules to collect information from a VPP operator who is unregistered (not a Rule Participant) in regard of a VPP that is not registered (as a Facility or several Facilities) and the services the VPP is providing outside of the market. Furthermore, the WEM Rules cannot place an obligation on any party, including a VPP operator, who is not a Rule Participant to provide information to AEMO.

Consequently, AEMO proposes that Stage 1 of the Visibility Framework apply on a voluntary basis to any existing Rule Participant who is operating a VPP of an estimated size of at least 5 MW that is agreeable to providing visibility data to AEMO. It is anticipated that in Stage 2, changes to the WEM Rules may be used to implement arrangements for the collection of visibility data from existing Rule Participants. For example, to place such an obligation on any existing Rule Participant who is operating a VPP to provide Minimum Visibility Data to AEMO in accordance with the VPP Aggregation Guideline. It is proposed that in Stage 3, the Visibility Framework could be extended to new Rule Participants.

The key parameters for establishing whether an obligation to provide AEMO with visibility data should apply includes the estimated size of the VPP and how the configuration of the VPP interacts with the registration framework. As these two matters are yet to be addressed in the WEM Rules, the extent of rule changes needed to implement Stages 2 and 3 will largely be informed by the findings from the practical operation of the previous stage.

3.1 VPP estimated size and Facility registration thresholds

AEMO is proposing to collect information in relation to VPPs that are capable of material movements of energy, which is likely only achievable where the size of the VPP is also material. Therefore, AEMO is proposing a definition for VPP (in the VPP Aggregation Guideline) that will reflect a size that is material. On that point, AEMO has also been guided by the WEM Rules and the System Size thresholds that will apply under the new registration framework from the New WEM Commencement Day of 1 October 2023.

From that date, System Size thresholds for Facility registration will apply at an Electrical Location (a Transmission Node). At a System Size of 5 MW or more, the Facility at the Transmission Node must either be registered or an exemption from registration must be sought for that Facility. In general, where a Facility exceeds 10 MW it must be registered (although AEMO may determine to apply an exemption subject conditions).

Consequently, whether a VPP will be the subject of Minimum Visibility Data requirements will depend on how the Facility registration thresholds under the WEM Rules are applied to the VPP at the relevant Transmission Node(s) under Stages 2 and 3.

The practical outworking of Stage 3 is that a small VPP spanning several Transmission Nodes will likely have some registered components and some unregistered components. This is a consequence of the design of the

Market Registration framework, which contemplates a Facility as being located either at a connection point, or a number of connection points that are 'co-located' in respect of a single Transmission Node. Effectively, the registration framework does not allow for a VPP with components at more than one Transmission Node to be registered as a single Facility. Instead, each component of a VPP that is located at a Transmission Node would need to be registered as a Facility.

Depending on the VPP's configuration, its interaction with Market Registration framework could see the VPP registered as a single Facility, or see each VPP component registered as a separate Facility, or result in the VPP having some registered components and some unregistered components. The registered elements of the VPP will be exposed to the market participation requirements specified in the WEM Rules as those requirements apply to the Facility type and Facility Class in which the VPP or VPP component was registered.

The following sub-sections set-out AEMO's proposal as to how the registration framework could be used to apply the Visibility Framework based on a VPP's estimated size - very small (less than 5 MW), small (at least 5 MW and less than 10 W) or large (at least 10 MW) - under Stage 2 and Stage 3.

3.1.1 Very small VPP (less than 5 MW in estimated size)

AEMO proposes that a very small VPP (of an estimated size of less than 5 MW) will not be subject to the Visibility Framework, as neither the VPP or a VPP component will be at least 5 MW at a Transmission Node. This proposal reflects that under the WEM Rules, a person who owns, operates or controls a facility that is less than 5 MW is not required to register themselves as a Rule Participant or to register their Facility.

It may be the case that a VPP operator will elect to register as a Rule Participant and register the VPP or each VPP component as a Facility (whichever is located behind a Transmission Node), as this will enable the VPP or VPP component to participate in market services. Where the VPP is also providing 'off-market' services, the Rule Participant may be obligated to provide the Minimum Visibility Data to AEMO where AEMO determines that the data provided in respect of the registered VPP or VPP component does not provide sufficient visibility of the VPP's off-market activities, for example, to help mitigate against clashes with market services dispatched by AEMO.

AEMO notes that under the Visibility Framework the proliferation of very small VPPs controlled by a single operator may occur without triggering the 5 MW threshold. Should this eventuate AEMO proposes that revisions are considered to how this threshold is applied in Stage 3.

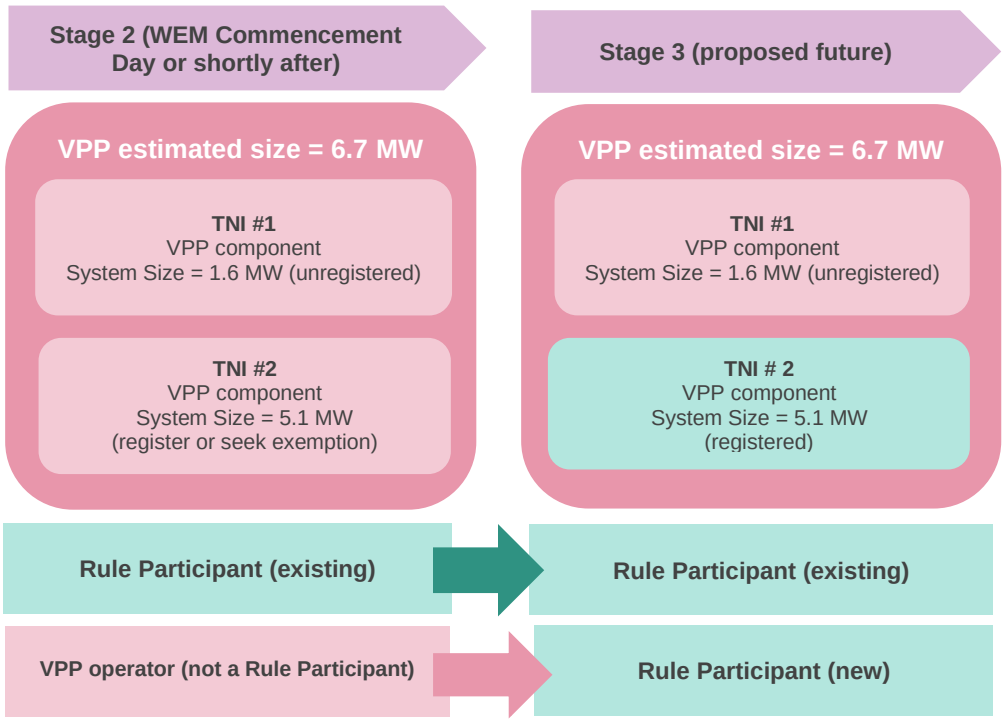
3.1.2 Small VPP (at least 5 MW and less than 10 MW in estimated size)

AEMO proposes that in Stage 2, where there is an existing Rule Participant, a small VPP will be subject to visibility data requirements. Furthermore, where the VPP or VPP component has a System Size of at least 5 MW at a Transmission Node, the existing Rule Participant would be required to either register the VPP or VPP component as a Facility, or to seek an exemption from Facility registration in accordance with the exemption provisions applicable to the Facility's System Size.

It is proposed that in future under Stage 3, a small VPP would be subject to visibility data requirements where there is either an existing Rule Participant, or where a VPP operator has registered as a Rule Participant as a result of registering the VPP or VPP component as a Facility (i.e. as an exemption cannot be granted).

Figure 6 below illustrates how a small VPP will be treated in regard of the 5 MW Facility registration threshold in Stages 2 and 3.

Figure 6 Treatment of a small VPP with respect to 5 MW Facility registration threshold - Stages 2 and 3



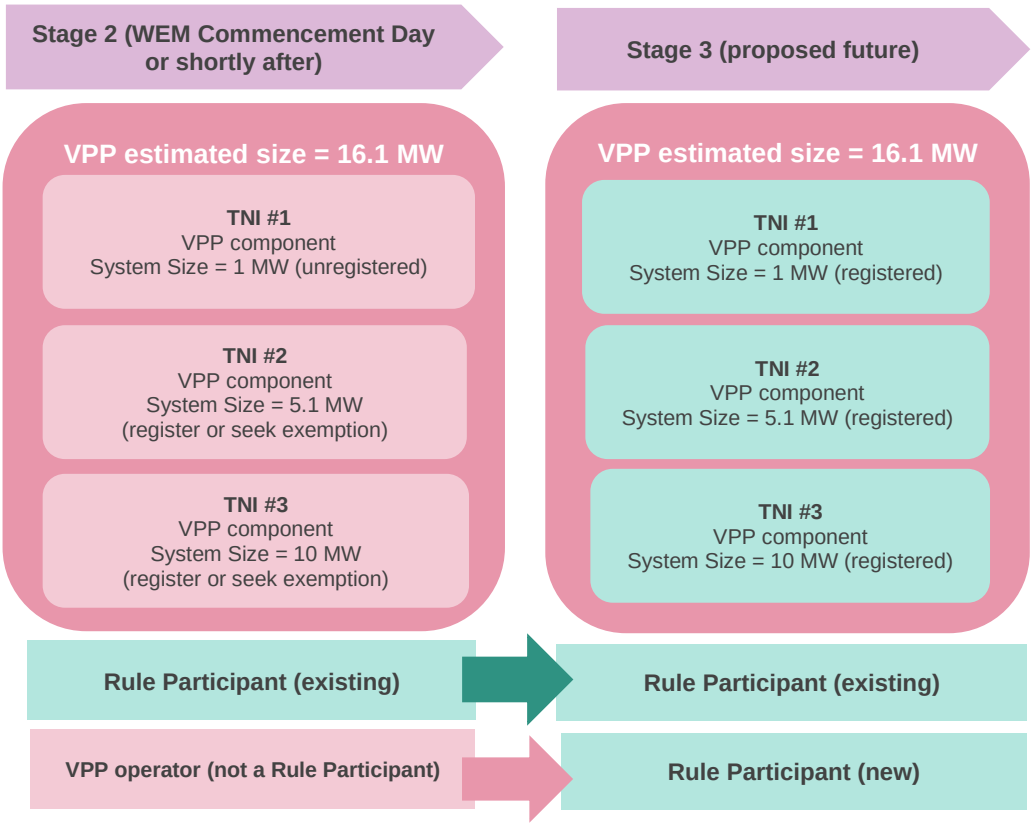
3.1.3 Large VPP (10 MW or more in estimated size)

AEMO proposes that in Stage 2, where there is an existing Rule Participant, a large VPP will be subject to visibility data requirements. Furthermore, where the VPP or VPP component has a System Size of at least 10 MW at a Transmission Node (and not otherwise registered), the existing Rule Participant will be required to register the VPP or VPP component as a Facility, unless an exemption from registration is granted in accordance with the exemption provisions applicable for that System Size. For example, AEMO may determine to grant an exemption from registration subject to appropriate conditions; a potential condition might be that the existing Rule Participant provides Minimum Visibility Data to AEMO in relation to their large VPP.

It is proposed that in future under Stage 3, a large VPP may be subject to visibility data requirements where there is either an existing Rule Participant, or where a VPP operator has registered as a Rule Participant as the result of registering, as a Facility, the VPP or every VPP component (as applicable) at the relevant Transmission Node(s). The Rule Participant will be required to provide visibility data to the extent that visibility of the VPP's off-market activities cannot be obtained from the data collected in respect of all of the registered VPP components.

Figure 7 below illustrates how a large VPP will be treated in regard of the 10 MW Facility registration threshold in Stage 2 and Stage 3.

Figure 7 Treatment of a large VPP with respect to 10 MW Facility registration threshold - Stages 2 and 3



Questions

- **Is treating a VPP as very small (under 5 MW), small (at least 5 MW and less than 10 MW) or large (at least 10 MW) a reasonable approach to applying the Visibility Framework?**
- **Will the proposal for Stage 3 for Facility registration in regard to the application of the 5 MW and 10 MW thresholds provide an effective measure in ensuring that off-market arrangements do not grow too large before they are made visible?**

3.2 VPPs and Facility type

Revised market registration arrangements will be established in the WEM Rules commencing 1 October 2023. These rules will enable an aggregation of DER to register as a Small Aggregation, which is a type of Facility under clause 2.29.1B. Crucially, the definition of Small Aggregation requires that the aggregation of DER contains devices that are co-located at the same Transmission Node -

> **Small Aggregation**: One or more Facilities connected to the distribution system and located at the same Electrical Location.

Due to the requirement for co-location of the devices, the definition cannot be applied (nor was it intended to apply) to a VPP spanning more than one Transmission Node.

However, it could apply where a VPP is wholly located behind a single Transmission Node and/or to a VPP component at a single Transmission Node. Consequently, Small Aggregation as a registration object can be usefully leveraged to facilitate the application of the Visibility Framework.

Consistent with the reformed Market Registration regime, Stages 2 and 3 of the Visibility Framework propose the registration of the VPP or its components once they reach a reasonable scale and trigger the Market Registration thresholds under the WEM Rules.

To enable the registration of a VPP of a scale established to provide off-market services, AEMO is proposing that if a small VPP or its components are under 10 MW in System Size, the VPP or its components may be registered as a Small Aggregation in the Non-Scheduled Facility Class. This approach intends to minimise the number and scope of market obligations that the VPP operator (as a Rule Participant) would need to comply with, while enabling access to the market and power system security arrangements commensurate with Facility size[14].

Further work is still required to develop additional Facility registration arrangements for DER aggregations, such as for those proving essential system services to the WEM, or those registering in the Scheduled or Semi-Schedule Facility Classes[15].

Question

- **Do stakeholders have a view of how Facility Class should apply to VPPs?**

[14] It also allows access to those market processes enabled through participation as a Small Aggregation Facility, such as the treatment of the VPP or VPP component at the Transmission Node as a single aggregated facility in settlement (rather than as multiple facilities where each MNI enrolled with the VPP is settled individually).

[15] See Energy Policy WA (2022), *DER Roadmap: DER Orchestration Roles & Responsibilities Information Paper*, May, pp.41 – 43 at https://www.wa.gov.au/government/publications/distributed-energy-resources-der-roadmap-der-orchestration-roles-and-responsibilities-information-paper

4 VPP Aggregation Guideline

The purpose of the VPP Aggregation Guideline is to facilitate the transition of the WEM/SWIS to a highly distributed energy future by enabling the foundational arrangements needed to support the immediate participation of DER in the SWIS, and the future participation of DER in the WEM, while keeping the power system secure.

To support the operation of the Visibility Framework, AEMO will develop a 'VPP Aggregation Guideline' to facilitate an understanding among VPP operators of visibility expectations that AEMO will apply when they achieve scale. To achieve this, the guideline will include a definition for 'VPP', a method for estimating a VPP's size and guidance on how the Visibility Framework interacts with the registration regime. The latter will help the VPP operator determine whether its VPP (or a VPP component) is of sufficient scale to trigger Facility registration under the WEM Rules. The guideline will also set-out the Minimum Visibility Data model which serves as a reference for the data to be provided to AEMO, the process for determining what data is to be provided and the requirements for updating data. AEMO expects that the guideline will be published by the end of 2022.

The VPP Aggregation Guideline is designed to facilitate the transition of the SWIS to a high DER future while keeping the power system secure by:

- Supporting AEMO's ability to maintain power system security as off-market arrangements develop at scale;
- Enabling a transition pathway for VPPs to participate in market services via Facility registration of the VPP's components; and
- Clarifying how the visibility framework interacts with Facility registration requirements in the WEM Rules.

Importantly, as the VPP Aggregation Guideline will provide clarity on how the Visibility Framework interacts with new market arrangements, this will support transparency for investment decisions by parties whose business models include a VPP. This early guidance is critical for ensuring that investment decisions made now will facilitate (and effectively translate into) participation over the longer term.

4.1 VPP definition

The term 'VPP' has been selected to differentiate this type of aggregation from a registered Facility under the WEM Rules. It has generally come to mean a notional entity comprising aggregated and managed DER, such that the entity has the capability of providing generation and managing load movements to provide energy and other energy-related services. This design paper has been using the term 'VPP' in this general sense.

However, the Visibility Framework requires a more specific definition for VPP to support the application of an obligation on a Rule Participant to provide visibility data in regard of a materially-sized VPP. Consequently, the VPP Aggregation Guideline will include a definition for VPP that leverages some critical features that, when considered together, are representative of the entity that AEMO is seeking to gain visibility of. These critical features are size, composition, location and centralisation of control.

The following working definition for VPP has been developed by AEMO for the purposes of the guideline -

> **Virtual Power Plant (VPP)**: An aggregation of DER comprising at least 5 MW of DER of the type represented on the DER Register, located behind one or more Transmission Nodes and centrally controlled by a person via an orchestration system.

To support the definition of 'VPP', the guideline will clarify concepts such as 'centrally controlled' and 'orchestration system', as well as how the defined WEM Rules terms of DER Register and Transmission Nodes will apply in the context of the Visibility Framework.

4.1.1 Size and composition

AEMO is proposing that the definition of VPP is reflective of some minimal size, to capture VPPs of at least 5 MW. In contemplation of the fact that a VPP will likely comprise DER that are defined in the WEM Rules as a Small Generating Unit, it is proposed that the DER Register is used as a proxy in terms of the types of devices that should be considered in the estimation of a VPP's size.

The register currently captures Small Generating Units such as solar PV systems and Storage Works with an export capacity of less than 5 MW (including non facility-scale batteries), and there are plans under Energy Policy WA's Electric Vehicle (EV) Strategy[16] to include information on electric vehicle charging equipment on the DER Register as well. The VPP's estimated size is expected to be strongly correlated with its composition, and both characteristics should be contained in the DER Register (as per WEM Rules section 3.24).

It should be noted that the VPP Aggregation Guideline will be distinct from, and separate to, the aggregation rules under the revised WEM Rules (section 2.30), as the aggregation rules do not currently contemplate their application to Small Aggregations.

4.1.2 Location

The Visibility Framework has been developed in recognition that VPPs would likely be geographically dispersed across several network Transmission Nodes to achieve a scale necessary to derive commercial benefit. This is reflected in the definition AEMO has developed for VPP.

4.1.3 Centrally controlled

The Visibility Framework conceptualises a VPP as a geographically distributed resource comprising many DER that are brought together and managed as a whole. Consequently, the term 'centrally controlled' within the definition of VPP refers to the actions of a Rule Participant (who is the VPP operator) to actively coordinate the Injection or Withdrawal of DER that are electrically connected to a distribution system.

The term 'orchestration system' refers to the mechanism (for example, the technology platform) or group of mechanisms that a person uses to centrally control a VPP.

[16] https://www.wa.gov.au/service/environment/environment-information-services/electric-vehicle-strategy

Questions

- **Do stakeholders agree with AEMO's proposed definition for a VPP and if not, what alternatives could be used?**
- **What terms should be further clarified, or other terms explained, in the VPP Aggregation Guideline?**

4.2 VPP size estimation

To assist a VPP operator's determination of whether the Visibility Framework will apply to the VPP they are operating, the VPP Aggregation Guideline will include a method for estimating the VPP's size. This method is separate (and different) from that which is used to determine the System Size of a Facility as prescribed by the WEM Rules relating to market registration.

AEMO recognises that the VPP operator should be well positioned to understand the capabilities of its VPP, based on its technology composition and number of DER that have joined onto the VPP. To standardise the method used to estimating a VPP's size, AEMO proposes to use the DER Register as a proxy in terms of the DER that should be considered in size estimation.

Potentially, the VPP size method could simply involve the VPP operator summing together the capabilities of the VPP with respect to each type of Small Generating Unit that will be captured by the DER Register – PV systems, batteries and EV chargers.

Questions

- **Are there other DER types or capabilities that should be included within the method for calculating a VPP's estimated size?**
- **How should the calculation of a VPP's estimated size be made?**

4.3 Translating the VPP or VPP component to a Facility under the market registration regime

The participation of an aggregation of DER in the market will require a transition from the device-based fundamentals of VPPs to the facility-based fundamentals of market participation and requirements placed on Facilities via the Market Registration regime (under which an aggregation of DER may be registered as a Facility).

Entry to the market of the Facility, and of the person who 'owns, operates or controls' that Facility, is required when System Size thresholds are met. A Facility containing an Energy Producing System[17] with a System Size that equals or exceeds 5 MW is considered material and must register (unless it is granted an exemption from registration), while a Facility with a System Size that equals or exceeds 10 MW will be required to register unless

[17] One or more electricity producing units, such as generation systems or Electric Storage Resources, located behind a single network connection point or electrically connected behind two or more shared network connection points. See Chapter 10 (Glossary), WEM Rules.

AEMO determines to exempt that Facility from registration (some conditions may apply). A Facility with a System Size that is less than 5 MW is generally exempt from registration requirements, unless a Rule Participant elects to register it.

As noted above, the implementation of Stages 2 and 3 will establish the application of System Size thresholds to VPPs. Hence the method for calculating System Size will be fundamental to transitioning a VPP to a Facility under the Market Registration regime.

4.4 Minimum Visibility Data requirements

Where a Rule Participant is subject to the obligation to provide the Minimum Visibility Data to AEMO, the Rule Participant will be required to provide the data in accordance with the Minimum Visibility Data Model to be detailed in the VPP Aggregation Guideline. The Rule Participant will also be required to update the data as set-out in the guideline.

AEMO expects the benefit from the collection of the Minimum Visibility Data will accrue over time with the receipt of new and updated data. At a minimum, the data would provide some transparency on the scale of VPP participation and service offerings in the SWIS, in the lead up to the integration of aggregations of DER in the wholesale market and on an ongoing basis.

Section 5 below sets out the Minimum Visibility Data model in more detail.

Question

- **Will the matters to be covered in the VPP Aggregation Guideline afford VPP operators with sufficient clarity of whether they will be exposed to an obligation to provide visibility data to AEMO?**

5 Minimum Visibility Data model

The Minimum Visibility Data Model will be a key element of the VPP Aggregation Guideline and describes the minimum set of data that a VPP operator will potentially be required to give AEMO about the physical characteristics of a VPP that is of material size and the off-market services to be provided by the VPP.

The set of data that AEMO will be seeking from a Rule Participant in respect of a VPP will be determined on a case-by-case basis. With the exception of Static Information, there will be scope for negotiating what is to be provided based on the VPP's size and/or its activities, or whether there have been any changes to these things over the VPP's life cycle. The negotiation process will be covered in the VPP Aggregation Guideline.

5.1 Types of information required for visibility

AEMO considered what data would be useful to collect from a VPP operator to inform AEMO about the physical characterises of a VPP and its off-market activities and has determined that the data could generally fall into one of three information types – Static, Operational and Dynamic.

Static Information

This includes some basic VPP-specific information which is analogous to the Standing Data prescribed in Appendix 1 of the WEM Rules. It includes:

- The NMIs joined onto the VPP and the date those NMIs joined onto / were removed from the VPP.
- The VPP operator's estimation of the VPP's size and the site(s) across which the VPP is being operated.
- A brief description of the VPP's service(s) and the technology used to coordinate the NMIs joined onto the VPP to provide service(s).

AEMO considers that the data provided as Static Information is the most fundamental type of Minimum Visibility Data. Therefore, the VPP operator will be required, at the very least, to provide Static Information.

Operational Information

AEMO may determine from the Static Information it receives that, in the absence of more specific or timely information about the VPP's intended activity, there may be a risk to power system security and reliability. In such a case, the VPP operator will be required to provide the Operational Information that was agreed through negotiation.

This type of information represents a future view of the intentions of the VPP operator in controlling the VPP. It is analogous to data provided to AEMO to support the Projected Assessment of System Adequacy (PASA) processes and enables a pathway to providing Medium Term PASA equivalent projections. Where Operational Information is shared with AEMO this will allow AEMO to manage the impacts of VPP movements on market dispatch. It includes data on (some or all of) the following:

- Basic information on the (contracted) terms of the service, such as the standing profile of service(s).
- A forward schedule that is sufficient to enable the service to be included in AEMO's forecasting, and if necessary, pre-dispatch processes where the service(s) is not delivered to a standing profile.
- Historical data about the VPP's past activity.

Dynamic Information

Where AEMO determines that the Operational Information is insufficient to mitigate a risk to power system security and reliability, that is, the nature of the service being delivered cannot be reasonably reflected as Operational Information, the VPP operator may be required to provide Dynamic Information. This type of information would provide real-time, or close to real-time, confirmation of the intended activity of the VPP.

AEMO expects the requirement to provide this type of information would be met by a VPP that has achieved scale and a higher level of sophistication. AEMO proposes to work with VPP operator to understand what data (and in what format the data) is available for sharing, such that there will be scope to negotiate and agree what is provided.

Dynamic Information that AEMO may require could include either (or both) of the following:

- Close to real-time notification that the VPP will be activated to provide service(s), and then deactivated, where the service(s) is not delivered to a standing profile.
- Where VPP activity is highly variable (i.e. responsive to a price signal) and cannot easily be expressed as a standing profile or deviation from a standing profile, AEMO may require close to real-time information sufficient to enable the service to be included in AEMO's forecasting, and if necessary, pre-dispatch processes.

Questions

- **Is type of information suggested for collection as Static, Operational and Dynamic Information sufficient to provide a good indication of a VPP's physical characteristics and the VPP's intended activities?**
- **What other type(s) of information could be provided to facilitate visibility of a VPP and its intended activities?**

5.2 Minimum Visibility Data required to be provided by Rule Participant

The Minimum Visibility Data Model specifies the data items expected to be collected that are of the Static, Operational and Dynamic Information types. When developing the Minimum Visibility Data Model, AEMO drew from relevant existing data models (such as that for Project Symphony and the DER Register[18]), to maintain consistency with the type, scope, frequency and granularity of data that AEMO can access in regard to DER and their technical capabilities. AEMO also took into consideration the data it will collect in regard of Non-Scheduled Facilities as part of Standing Data under the WEM Rules (Appendix 1) and for its PASA processes, to ensure that

[18] See AEMO WEM DER Register Information Procedure at https://aemo.com.au/-/media/files/electricity/wem/procedures/der-register-information-procedure-wem-1july2020.pdf?la=en&hash=94137C3600BEECF3546E47EE6DF2D219

the data requirements imposed with respect to unregistered VPPs are less onerous than those that apply to registered Non-Scheduled Facilities.

The Minimum Visibility Data Model is specified in Table 1 below. In general, AEMO proposes that Static Information would be a common requirement. Whether a Rule Participant is also required to provide Operational Information and/or Dynamic Information will be determined by AEMO once it has received the Static Information and has discussed the VPP's activities with the Rule Participant. AEMO will take into consideration the VPP's likely impact on the power system and market, based on its size, location(s), technology composition, capability and service intentions. AEMO will also take into consideration what information will be provided in relation to any VPP component that is registered as a Facility under the WEM Rules. These discussions would also identify the extent to which information (especially Operational and Dynamic Information) can or should be aggregated at the VPP component (i.e. TNI) level.

Figure 8 below shows how the Minimum Visibility Data requirements might apply to VPPs of various estimated sizes. With the exception of Static Information, it can be seen that VPPs of similar estimated size may also be required to provide Dynamic Information and/or Operational Information as their activities may differ substantially.

Figure 8 Examples of how the Minimum Visibility Data requirements might apply to VPPs of different estimated sizes

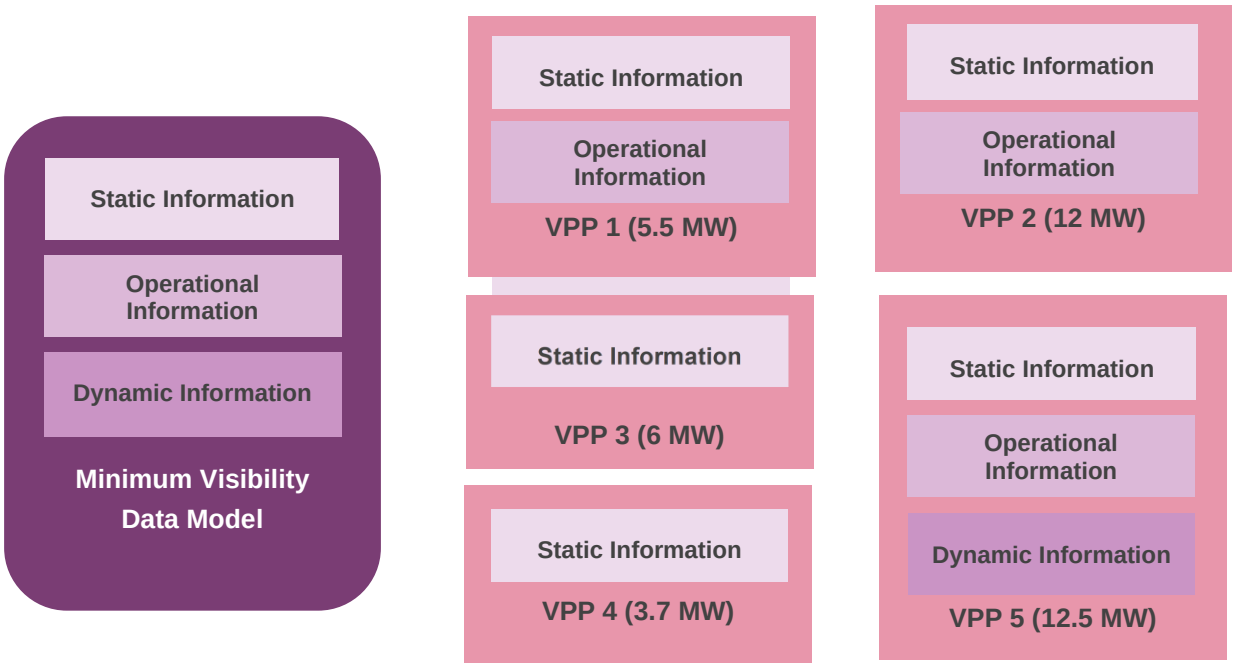


Table 1 details the individual Static, Operational and Dynamic data items of the proposed Minimum Visibility Data Model, as explained in more detail below.

Static data items

- NMIs: the list of NMIs at each connection point that are joined onto the VPP.
- NMI joining date / removal date: the date at which each NMI joined the VPP (or removed from) the VPP.

- VPP estimated size: the Rule Participant's estimation of the VPP's size, as calculated in accordance with the methodology set-out in the VPP Aggregation Guideline.
- VPP service(s) type: the Rule Participant's description of each service provided by the VPP.
- Orchestration System: description of the technology, platform(s) or software used to co-ordinate the DER behind the NMIs which are joined onto the VPP.
- Control capability – MW change: the minimum and maximum value of the energy in MW that is available to the VPP from its joined on NMIs that can be controlled to provide service(s).
- Device Identity: unique identifier for the devices providing the service behind the NMI, in accordance with the DER Register.

Operational data items

- Standing profile – controlled MW (per service): for each Trading Interval, the expected change in energy in MW that is available to the VPP from its joined on NMIs for control to provide a service.
- Deviation from standing profile (per service): for each Trading Interval, the expected deviation in MW from a standing profile.
- Actual net change in controlled MW (per service): for each Market Interval, the actual change in energy in MW that was achieved by the VPP to deliver a service.

Dynamic data items

- Notification of service activation / deactivation: a close to real-time communication to AEMO, including via email from the VPP operator to confirm that the service will be activated (for a period of time) and/or has been deactivated.
- Forecast net change in controlled MW associated with VPP: for each Market Interval, a close to real-time forecast of the expected change in energy in MW that is available to the VPP from its joined on NMIs for control to provide the service.

Table 1 below summarises the individual data items of the Static, Operational and Dynamic data types that comprise the proposed Minimum Visibility Data Model. The table includes indicative identifiers for each data item and the update frequency for each data item, which is addressed in Section 5.3 below.

Table 1 Proposed Minimum Visibility Data Model – data provided by Rule Participant

Data item	Information type	Provision requirement (Stages 2 and 3)	Indicative identifier (and format)	Description summary	Update frequency
NMIs joined onto the VPP	Static	Must be provided	NMI (number)	List of NMIs currently included in the VPP	Small VPP – Quarterly Large VPP – Monthly
NMI joining date	Static	Must be provided	ASSOC (date)	Date NMI was included as part of the VPP	Small VPP – Quarterly Large VPP – Monthly
NMI removal date	Static	Must be provided	DEASSOC (date)	Date NMI was removed from the VPP	Small VPP – Quarterly Large VPP – Monthly

Data item	Information type	Provision requirement (Stages 2 and 3)	Indicative identifier (and format)	Description summary	Update frequency
VPP estimated size	Static	Must be provided	ESTMW (number)	As per method set-out in the VPP Aggregation Guideline	Small VPP – Quarterly Large VPP – Monthly
VPP service(s) type	Static	Must be provided	SERVICE1, SERVICE2 … (text)	Examples might include site optimisation, load shifting, voltage management, reducing IRCR exposure	Small VPP – Quarterly Large VPP – Monthly
Orchestration System	Static	Must be provided	ORCHS (text)	Description of the technology used to coordinate VPP assets to support service delivery	Small VPP – Quarterly Large VPP – Monthly
Control capability - MW change	Static	Must be provided	MWCH (number)	Rule Participant's estimation of the VPP's MW capability (up and down, in total)	Small VPP – Quarterly Large VPP – Monthly
Device identity	Static	Must be provided if available	DEVIDENTITY (number)	Unique identifier for the device(s) actively controlled by the VPP	Small VPP – Quarterly Large VPP – Monthly
Standing profile - controlled MW change	Operational	Must be provided if required by AEMO	MWCHTI (number)	Expected MW change per Trading Interval, per service	Small VPP – Quarterly Large VPP – Monthly
Deviation from standing profile	Operational	Must be provided if required by AEMO	MWCHTIDEV (number)	Expected MW change per Trading Interval, per service	Small VPP – Quarterly Large VPP – Monthly
Actual net change in controlled MW	Operational	Must be provided if required by AEMO	ACTNETMWCH (number)	Actual MW change per Trading Interval, per service	Small VPP – Quarterly Large VPP – Monthly
Notice of service activation / deactivation	Dynamic	Negotiated	(Not applicable - email or other communication)	Close to real-time confirmation of service activation / de-activation	Close to real-time
Forecast net change in controlled MW	Dynamic	Negotiated	FORNETMWCH (number)	Close to real-time forecast of MW change per Trading Interval	Close to real-time

Questions

- **Is the data proposed for the Minimum Visibility Data Model sufficient to provide visibility of the VPP and the VPP's intended activities?**
- **It is reasonable for a Rule Participant (as the VPP operator) to provide this data, or are there high costs and/or barriers to doing so?**
- **What data collected in accordance with the Minimum Visibility Data Model should be provided as part of market data?**
- **What data should be confidential?**

5.3 Minimum Visibility Data update frequency

Unlike traditional generating units, a VPP can more easily change its size, technology / fuel sources and location(s) with some frequency over its life cycle, and therefore the services it can offer. AEMO expects that Static Information for a VPP will change with greater frequency than data provided by a Registered Facility as part of Standing Data under the WEM Rules (Appendix 1) and maintained by AEMO under clause 2.34.1.

AEMO considered an approach to updating visibility information that prescribed a set of criteria or materiality thresholds to help determine when each data item should be updated, and whether different criteria or threshold were needed to respect the size of a VPP. It was determined that such an approach has the potential for unnecessary complexity in its application, even in terms of Static Information. For example, the *Rule Participant* would be required to remain vigilant to changes in its VPP's operations and how this relates to its Minimum Visibility data obligation, and likely result in the provision of data on an ad hoc basis. This would make the data provision an onerous process, creating potential for non-compliance. Furthermore, a data collection process that promotes non-provision of data, or its irregular or inconsistent provision, diminishes the potential efficiency benefit to the WEM and consumers.

Despite these challenges, for visibility data to be a useful input to AEMO's forecasting and operational planning processes, it needs to be reasonably reflective of the capabilities and operating intentions of the VPPs. Therefore, to ensure that visibility data is current and provided in a timely way, it is proposed that small VPPs refresh their Static and Operational data items every quarter (three months), and that large VPPs refresh such data once a month. It is proposed that Dynamic data items are updated close to real-time.

Questions

- **Is AEMO's assumption that a VPP's Static data will change with greater frequency than data provided by a Registered Facility as Standing Data correct?**
- **Is the proposed requirement to update Minimum Visibility Data, in regard of the update frequency, reasonable?**

6 Minimum Visibility Data management

The benefits from the formal collection of the Minimum Visibility Data will likely be realised over time as AEMO accrues updated visibility data from existing Rule Participants and with the receipt of visibility data from new Rule Participants.

Minimum Visibility Data management refers to AEMO's proposal for collecting, storing and using data, and reporting that data in AEMO's publications and as part of market information.

6.1 Data collection

AEMO proposes the use of manual data collection processes to support the voluntary provision of the visibility data under Stage 1. As experience and learnings develop from Stage 1, and from the operation of Project Symphony, a more detailed design for visibility data provision and collection can be developed for implementation in Stage 2. The options include leveraging (and potentially amending) existing data collection processes, or developing alternative (or new) data collection mechanism. These options are explored in more detail in the following sections.

6.1.1 Leveraging existing data collection processes

The most relevant data collection processes to include in an assessment are those that most Rule Participants are currently exposed to:

- Standing Data (in Appendix 1).
- Operational planning and forecasting i.e. processes relating to PASA.
- Communications and control to allow for real-time data provision.

The assessment will help determine whether minimal (or no) changes to WEM Rules and/or WEM Procedures would be required or if more onerous amendments will be necessary to enable Minimum Visibility Data to be collected via one or more of these existing processes. Another matter for consideration is the extent to which systems changes will be necessary to capture and enable the use of Minimum Visibility Data within these processes.

While the DER Register and NCESS rules enable the collection of data, they cannot be leveraged to collect Minimum Visibility Data. In the case of the DER Register, register data is primarily collected from the Network Operator (a Rule Participant) and then deposited on the register via a B2B exchange. It is likely that system changes, and potentially rule and procedure changes, would be required to enable AEMO and Rule Participants to utilise processes designed to support the operation of the DER Register for visibility data. For example, the DER Register is designed to hold data that is static in nature and would require further augmentation to manage Operational and Dynamic data sets. Furthermore, changes may be necessary to allow the information collected for the DER Register to be shared with parties other than the Network Operator.

In the case of the NCESS rules, it should be noted that these rules already provide for visibility, including where services procured under an NCESS Contract is provided by an unregistered aggregation of DER. However, the visibility requirements under the NCESS rules cannot be more broadly applied to parties outside of the NCESS process.

6.1.2 Alternative data collection mechanism

An alternative mechanism for collecting Minimum Visibility Data that avoids process and systems changes (and their associated costs) is preferred. Creating a dedicated visibility procedure for the collection and use of Minimum Visibility Data, potentially under a new Head of Power in the WEM Rules, could provide a solution to support Stages 2 and 3. The procedure could impose an obligation on a Rule Participant to provide Minimum Visibility Data and authorise AEMO to collect and use the data in a way that did not require AEMO to uplift systems. For example, the data could initially be captured in a way that suits its manual integration into existing processes where this would provide an expected benefit.

AEMO expects that the volume of data provided as Minimum Visibility Data will be low, at least initially, in any case because:

- The Minimum Visibility Data Model is not onerous and does not require a large amount of data to be shared with AEMO.
- VPPs will likely be small in size when they initially start operating, such that they will likely only be required to supply Static data.
- Most of the data supplied as Minimum Visibility Data will be required to be updated quarterly or monthly, depending on the size of the VPP.

Consequently, AEMO proposes that consideration should not be given to automating systems for collecting Minimum Visibility Data until such time that AEMO can determine efficiency gains from doing so (i.e. manual processes look to become too onerous). Despite this, AEMO will consider the use of existing systems to store or manage Minimum Visibility Data where this can be easily done, and at very low or no cost.

Future frameworks for participation of aggregations of DER may see materially sized VPPs registered as a single Facility, to enable their participation in market services. Where this is the case, the future market participation frameworks could implement visibility arrangements under processes enabled by the WEM Rules to enable visibility of both market and off-market services, which might replace some or all aspects of the Visibility Framework.

6.2 Use of visibility data

There are three distinct ways in which AEMO may use and report Minimum Visibility Data; to inform the design of improvements to the operation of the system and market, for incorporation in operational processes (including operational planning and forecasting) or to improve the on-going utility of the DER Register and Visibility Framework itself. The potential uses of data collected in accordance with the Minimum Visibility Data Model are detailed below.

6.2.1 Energy system and market development

Data collected to enable visibility will primarily assist with providing an understanding of how the technology mix within the SWIS is changing and the likely implications for market design of the uptake of new technologies and business models. The subsections below explore how Minimum Visibility Data may be used, on its own or in combination with other data sources, to help inform this understanding.

Inform changes in the generation mix - leveraging the DER Register

The data gathered under this framework could be used in combination with that held in in the DER Register to inform a better understanding of the changing generation mix in the SWIS. For example, once the Rule Participant provides the NMIs joined onto the VPP and VPP estimated size (as part of the Static Data), AEMO could use the DER Register to:

- Associate VPPs with data contained in the DER Register: AEMO could use the Minimum Visibility Data provided by a VPP operator to associated NMI-level data records in the DER Register with the VPP. The purpose of making this linkage is so that AEMO can understand which NMIs will be coordinated to affect the movement of energy and the technology types comprising the VPP, which provides AEMO with a view of the VPP's likely capabilities.
    - Data pertaining to the VPP location and actual size could be added to the Minimum Visibility Data provided by the Rule Participant to complete the description of the physical characteristics of the VPP. Sufficiently anonymised, this information could be used to inform the development of AEMO's ESOO and as part of developing scenarios in Energy Policy WA's *Whole of System Plan* (WOSP).
- Validate the VPP Location: AEMO could determine the Transmission Node(s) relevant to the VPP, meaning that this is one piece of information that the Rule Participant will not be required to provide and update as part of Static data.
    - AEMO could use the locational information to understand the geographical diversity of a VPP in specifics, and VPPs generally, and use this as a useful input into scenarios and analysis undertaken for the development of AEMO's ESOO and Energy Policy WA's WOSP.
- Validate the VPP size: AEMO could calculate the VPP's actual size using the technical information on each VPP-controlled DER device that was originally collected for the DER Register when the device was connected to the network.
    - There is potential to combine NMIs joined onto the VPP and updates to this data, with DER Register data about equipment, to develop an understanding of whether and how quickly a VPP's size, composition and capabilities are changing. If anonymised this information could be reported on the DER Register dashboard or on the Market Information dashboard.

Questions

- **Is the use of data collected for the DER Register to complete VPP characteristic information a suitable use of DER Register data?**
- **Should the DER Register be used in future to hold Minimum Visibility Data - Static data?**

Inform new market participation models – leveraging Project Symphony

Where AEMO is able to collect the VPP service(s) type and Control capability - MW change (as part of Static data) and the Standing profile - controlled MW change and/or the Deviation from standing profile and the Actual net change in controlled MW (per service) (as part of Operational data), and updates to this data, AEMO can form a better understanding of what VPP capabilities are being developed. Specifically, whether VPP capability is being generalised to support the delivery of many services or is being tailored to target the delivery of specialised services.

The visibility data could be used, in combination with findings from technology pilots such as Project Symphony, to inform the design of new market participation models for DER-based services and the requisite performance and compliance requirements that should apply. It could also be used to flag the readiness of VPPs to access and deliver on the provision of market services and whether any changes to the registration nomenclature may be required to enable market participation.

Facilitating the future implementation of interoperability requirements

Where AEMO receives data about the Orchestration System a VPP is using, the VPP's Control capability – MW change and potentially the VPP service(s) type (as part of Static data) then, over time, AEMO can develop an understanding of what technologies are being used (or preferenced) by VPP operators to support their capability and service offerings. By having a view of what systems are being used, AEMO and new entrants and decision-makers (where this information is published) can determine what impost might be associated with transitioning wholly off-market arrangements into partial or full market participation in terms complying with Market Registration requirements (i.e. in regard of communications and interoperability).

Data about orchestration systems may inform how quickly updated standards (communications and inter-operability) are being adopted and/or inform the need for any future alignment or changes.

6.2.2 Forecasting and operational planning

As noted in Section 5.1 above, where AEMO determines from the Static Information it receives that, in the absence of more specific or timely information about the VPP's intended activity, there will be an impact on the accuracy of operational forecasting (and therefore dispatch and the use of ESS) or a risk to power system security and reliability, the VPP operator will be required to provide Operational Information and/or Dynamic Information. Consequently, the requirements to provide and update the Operational data and Dynamic data, as described in the Minimum Visibility Data Model, have been designed to afford flexibility in their application.

Operational data represents a future view of the intentions of the VPP operator in controlling the assets within the VPP. Therefore, where AEMO receives the Standing profile - controlled MW change or the Deviation from standing profile (as part of Operational data) and updates to this data, AEMO could incorporate this data as an input to its forecasting processes and, if necessary, its Medium Term and/or Short Term PASA processes (as relevant).

Dynamic data represents a future view of the intentions of the VPP operator in regard to the activity of a VPP that cannot be reasonably reflected as Operational Information, for example, if VPP activity is a response to a price signal.

Where AEMO receives the Forecast net change in controlled MW, this data could be at least used as an input into the Short Term PASA processes. More usually, however, Dynamic data including the Forecast net change in controlled MW and/or the Notice of service activation / deactivation would be used to ensure that there would be no adverse effects on power system security and reliability from a VPP's activity occurring coincidently with AEMO's dispatch of Essential System Services or the deployment of Emergency Solar Management or a service procured via NCESS with off-market services.

6.2.3 Evolving the Visibility Framework and DER Register

The Minimum Visibility Data provided by Rule Participants can be used to facilitate the ongoing utility of the Visibility Framework, and potentially the DER Register as well. For example, updates to NMIs joined onto the VPP, Device Identifiers, NMI joining date and NMI removal date (as part of the Static Information) can be used by AEMO to:

- Validate the DER Register.
    - The presence of gaps would suggest that the processes used to collect DER Register data require review.
    - Inconsistencies between Static Data (i.e. NMI, Device Identifiers) and the DER Register might suggest a source of error in the processes underlying the collection of data supporting the Visibility Framework and/or the DER Register.
- Accurately calculate the VPP's actual size using the technical specifications recorded on the DER Register.
    - AEMO could compare its calculation with the estimate made by the Rule Participant, to determine whether the method for estimating VPP size set-out in the VPP Aggregation Guideline requires amendment to more accurately align the estimation with the actual.
    - On-going disparities between the Rule Participant's estimation and AEMO's calculation may support, in future, giving access to the DER Register to Rule Participants who are VPP operators (in respect of information associated with their NMIs).
    - AEMO's calculation could also inform whether the VPP operator needs to keep providing Minimum Visibility Data to AEMO where a VPP has substantially reduced in size, or whether Operational Information or Dynamic Information is required (to the extent not already provided) in respect of a VPP that has substantially increased in size and control capability.

Data pertaining to the NMIs joined onto the VPP and Control capability - MW change (as part of Static data) and the Standing profile - controlled MW change and/or the Deviation from standing profile (as part of Operational data), could be used in conjunction with VPP location and VPP actual size data calculated by AEMO to determine whether:

- VPP size thresholds at which Minimum Visibility Data requirements should be revised upward or downward as VPPs proliferate.
- The Facility registration thresholds as they apply to a VPP should be revised upward or downward, or whether different thresholds should apply at different Transmission Nodes as VPPs proliferate.

Questions

- **Do stakeholders agree with AEMO's proposed uses of the Minimum Visibility Data for energy system and market development, forecasting and operational planning, and evolving the Visibility Framework and DER Register?**
- **What other uses might there be for Minimum Visibility Data?**
- **Should Minimum Visibility Data be published as part of market data?**
    - **If so, what data would be of most benefit to Rule Participants to publish?**
- **What information should be kept confidential?**

7 Next steps

AEMO is keen to receive industry's feedback on the proposed Visibility Framework in terms of any potential implications that should be addressed or if there are any 'gaps' or inconsistencies in the proposed design.

Feedback from consultation on this paper will inform the development of the VPP Aggregation Guideline, which AEMO intends to complete by the end of 2022.

Written responses may be submitted to WADERProgram@aemo.com.au

Stakeholders may wish to consider to, or be guided by, the questions set-out in the paper. For convenience, the key questions are reiterated below, along with some further considerations that stakeholders may wish to respond to:

Topic	Key questions	Further considerations
Staged implementation	*Is the Visibility Framework, including a staged approach to its implementation reasonable, particularly in regard to the proposed timings of the stages, how the framework interacts with the Facility registration thresholds in each stage, and impacts or benefits to business models or VPP costs?*	• In addition to the Visibility Framework's key elements, what other things (i.e. obligations / requirements, prescription, documentation, processes or frameworks etc) are necessary to support the efficient and effective operation of the framework? • Is treating a VPP as very small (under 5 MW), small (at least 5 MW and less than 10 MW) or large (at least 10 MW) a reasonable approach to applying the Visibility Framework? • Will the proposal for Stage 3 for *Facility* registration in regard to the application of the 5 MW and 10 MW thresholds provide an effective measure in ensuring that off-market arrangements do not grow too large before they are made visible? • Do stakeholders have a view of how *Facility Class* should apply to VPPs?
VPP Aggregation Guideline	*Will the matters to be covered in the VPP Aggregation Guideline provide sufficient clarity to VPP operators of whether they will be required to provide visibility data to AEMO?*	• Do stakeholders agree with AEMO's proposed definition for a VPP and if not, what alternatives could be used? • What terms should be further clarified, or other terms explained, in the VPP Aggregation Guideline? • Are there other DER types or capabilities that should be included within the method for calculating a VPP's estimated size? • How should the calculation of a VPP's estimated size be made?

Topic	Key questions	Further considerations
Minimum Visibility Data Model	*Is it reasonable for a Rule Participant (as the VPP operator) to provide data as per the Minimum Visibility Data Model or are there high costs and/or barriers to doing so?*	• Is type of information suggested for collection as Static, Operational and Dynamic Information sufficient to provide a good indication of a VPP's physical characteristics and the VPP's intended activities? • What other type of information could be provided to facilitate visibility of a VPP and its intended activities? • Is AEMO's assumption that a VPP's Static data will change with greater frequency than data provided by a Registered Facility as Standing Data correct? • Is the proposed requirement to update Minimum Visibility Data, in regard of the update frequency, reasonable?
Use of visibility data	*Do you agree with AEMO's proposed uses of the Minimum Visibility Data for energy system and market development, forecasting and operational planning, and evolving the Visibility Framework and DER Register?*	• Is the use of data collected for the *DER Register* to complete VPP characteristic information a suitable use of *DER Register* data? • Should the DER Register be used in future to hold Minimum Visibility Data - Static data? • Do you agree with AEMO's proposed uses of the Minimum Visibility Data for energy system and market development, forecasting and operational planning, and evolving the Visibility Framework and *DER Register*? • What other uses might there be for Minimum Visibility Data?
Publication of visibility data	*What data collected in accordance with the Minimum Visibility Data Model should be published as part of market data, and what data should be confidential?*	• Should Minimum Visibility Data be published as part of market data? • If so, what data would be of most benefit to *Rule Participants* to publish? • What information should be kept confidential?

Glossary

In this paper, terms have the same meaning as the corresponding terms in the *WEM Rules* – Consolidated Companion Version February 2022 or otherwise have the meaning given in this Glossary. Italicised terms in the table below are defined under the WEM Rules and may be subject to further change. Capitalised terms are those used in this paper and are defined below.

Term	Definition
DER Generation Information	Standing data in relation to: (a) a Small Generating Unit; or (b) Storage Works with an export capacity of less than 5 MW.
DER Register	The register established and maintained by AEMO in accordance with clause 3.24.
DER Register Information	Information contained in the DER Register.
Dynamic Data	Dynamic information as specified in the Minimum Visibility Data Model.
Dynamic Information	Real-time, or close to real-time, information provided by the VPP operator to AEMO in confirmation of the intended activity of a VPP.
EV	Electric Vehicle
Electrical Location	The zone substation at which the Transmission Loss Factor for a Registered Facility is defined.
Electric Storage Resource	A system or resource capable of receiving and storing energy for later production of electric energy.
Energy Producing System	One or more electricity producing units, such as generation systems or Electric Storage Resources, located behind a single network connection point or electrically connected behind two or more shared network connection points.
ESOO	Electricity Statement of Opportunities Report for the WEM, is a report prepared in accordance with clause 4.5.13 presenting the results of the Long Term PASA study, including a statement of required investment if Power System Security and Power System Reliability are to be maintained.
Facility	Has the meaning given in clause 2.29.1B, which can be an unregistered facility or Registered Facility.
Facility Class	Any one of the classes of Facility specified in clause 2.29.1A.
Individual Capacity Requirement	The MW quantity determined by AEMO in respect of a Market Participant, in accordance with clause 4.28.7 and, if applicable, as revised in accordance with clause 4.28.11A.
Injection	The quantity of power or energy sent into a Network, as measured at: (a) for a Registered Facility with a single defined network connection point, the network connection point; (b) for a Registered Facility with multiple network connection points with the same Electrical Location, the Electrical Location; and (c) for a Registered Facility with network connection points at more than one Electrical Location, the Reference Node, which is measured in instantaneous MW unless specified as MWh over a time period, and represented as a positive number or zero.
Long Term PASA	A Projected Assessment of System Adequacy study conducted in accordance with clause 4.5.
Market Participant	A Rule Participant that is registered in accordance with section 2.28.
Medium Term PASA	A Projected Assessment of System Adequacy study covering the period in clause 3.16.1(a)
Minimum Visibility Data	Minimal information provided to AEMO by a Rule Participant about the physical characteristics of the VPP and the off-market services the VPP is providing to the Rule Participant.
Minimum Visibility Data Model	Data to be provided to AEMO by a Rule Participant as defined in the VPP Aggregation Guideline.
NCESS	Non-Co-Optimised Essential System Service.
NCESS Contract	A contract procured by AEMO or a Network Operator for the provision of an NCESS.

Term	Definition
NEM	National Electricity Market
New WEM Commencement Day	The date and time specified by the Minister as the New WEM Commencement Day, as published in the Government Gazette
Non-Co-Optimised Essential System Service	An Essential System Service procedure under section 3.11B.
Non-Scheduled Facility (NSF)	A Facility that can be self-scheduled by its operator (with the exception that AEMO can direct it to decrease its output subject to its physical capabilities), and which is registered as such in accordance with clause 2.29.4G.
Operational Data	Operational information as specified in the Minimum Visibility Data Model.
Operational Information	More specific or timely information about the VPP's intended activity to be provided by the VPP operator as determined by AEMO.
Power System Reliability	Means the safe scheduling, operation and control of the SWIS in accordance with the Power System Reliability Principles.
Power System Security	Means the safe scheduling, operation and control of the SWIS in accordance with the Power System Security Principles.
Project Symphony	The DER orchestration pilot delivering Actions 22 and 23 of the DER Roadmap, scheduled to complete in July 2023.
PV	Photo Voltaic system
Registered Facility	In respect of a Rule Participant, a Facility registered by that Rule Participant with AEMO in a Facility Class under Chapter 2.
Regulation Lower	Has the meaning defined in clause 3.9.3.
Regulation Raise	Has the meaning defined in clause 3.9.2.
Rule Participant	Any person registered as a Rule Participant in accordance with Chapter 2 and AEMO.
Scheduled Facility	A Facility that can respond to a Dispatch Target from AEMO such that it can maintain its Injection or Withdrawal within its Tolerance Range for a specified period and is registered as such in accordance with clauses 2.29.4G and 2.29.4I.
Semi-Scheduled Facility	A Facility that can reduce the value of its Injection or increase the value of its Withdrawal to comply with a Dispatch Cap issued by AEMO and is registered as such in accordance with clauses 2.29.4G and 2.29.4I.
Short Term PASA	A Projected Assessment of System Adequacy study covering the period in clause 3.16.1(b)
Small Aggregation	One or more Facilities connected to the distribution system and located at the same Electrical Location.
Small Generating Unit	An Energy Producing System which has a rated capacity of less than 10MW.
Static Data	Static information as specified in the Minimum Visibility Data Model.
Static Information	Mandatory basic VPP-specific information that is to be provided by the VPP operator to AEMO that is analogous to the Standing Data prescribed in Appendix 1 of the WEM Rules.
Statement of Opportunities Report	A report prepared in accordance with clause 4.5.13 presenting the results of the Long Term PASA study, including a statement of required investment if Power System Security and Power System Reliability are to be maintained.
System Size	Means, in respect of a Facility being a quantity equalling the sum of: (a) the minimum of: i. the Declared Sent Out Capacity of the Facility; and ii. the sum over all energy producing equipment comprising the Energy Producing System at the Facility (calculated for each individual piece of energy equipment), of each energy producing equipment's maximum MW output; and (b) if the Facility contains no Electric Storage Resource, then zero, otherwise the minimum of: i. the Contract Maximum Demand in MW of the Facility, where the Contract Maximum Demand is a positive quantity; and ii. negative one multiplied by the sum over all Electric Storage Resources in the Energy Producing System at the Facility (calculated for each individual Electric Storage Resource), of each Electric Storage Resource's maximum MW consumption quantity (where that consumption quantity is negative).

Term	Definition
SWIS	South West interconnected system: Has the meaning given in the Electricity Industry Act 2004.
Trading Interval	A period of 30 minutes commencing on the hour or half-hour during a Trading Day.
Transmission Node	A location on a transmission system identified for the purposes of aggregating transfer of electricity through that part of the transmission system.
Transmission Node Identifier	Transmission Node Identifier: The code identifying the relevant Transmission Node.
WEM Procedure	The procedures developed by AEMO, the Economic Regulation Authority, the Coordinator and a Network Operator, as applicable, in accordance with section 2.9 as amended in accordance with the Procedure Change Process.
WEM Rules	These rules relating to the Wholesale Electricity Market and to the operation of the SWIS.
Western Power	The body corporate established by section 4(1)(b) of the Electricity Corporations Act.
Withdrawal	The quantity of power or energy received from a Network, as measured at: (a) for a Registered Facility with a single defined network connection point, the network connection point; (b) for a Registered Facility with multiple network connection points with the same Electrical Location, the Electrical Location; and (c) for a Registered Facility with network connection points at more than one Electrical Location, the Reference Node, which is measured in instantaneous MW unless specified as MWh over a time period, and is represented as a negative number or zero.
Whole of System Plan (WOSP)	The plan as prepared and published by the Coordinator in accordance with section 4.5A.
VPP	Virtual Power Plant: An aggregation of DER comprising at least 5 MW of DER of the type represented on the DER Register, located behind one or more Transmission Nodes and centrally controlled by a person via an orchestration system.
Visibility Framework	Framework to support the identification and collection of information that will give AEMO visibility of 'off-market' arrangements to facilitate AEMO in making informed decisions when performing its function of keeping the power system secure.
VPP Aggregation Guideline	Key element of the Visibility Framework that is designed to facilitate the transition of the SWIS to a high DER future while keeping the power system secure by – • Supporting AEMO's ability to maintain security as off-market arrangements develop at scale. • Enabling a transition pathway for VPPs to participate in market services via the Facility registration of its components. • Clarifying how the visibility framework interacts with Facility registration requirements in the WEM Rules.