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| **Published date:** | 14 July 2023 |
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| **Closing date:** | 5:00pm (AEST) 6 October 2023 |

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# Introduction

In October 2021, the Australian Energy Market Commission (AEMC) made its final rule determination on Efficient Management of System Strength on the Power System. This new system strength framework is intended to enable a more rapid connection of inverter-based resources (IBR) such as solar and wind, with solutions that achieve economies of scale. Under this framework, AEMO Victorian Planning (AVP) will be responsible for proactive provision of system strength services, as the Victorian System Strength Service Provider (SSSP), to facilitate efficient generator and storage connections.

Under the new framework, SSSP must meet the new power system standard comprising of:

* A minimum fault level requirement for power system security at each system strength node.
* A requirement for stable voltage waveforms at connection points to host levels of IBR forecast by AEMO (as the System Planner), also known as the efficient level of system strength, at each system strength node.

AVP is required to plan to meet the standard (both minimum and efficient levels) from 2 December 2025 onwards and is currently undertaking a Regulatory Investment Test – Transmission (RIT-T) for Victorian System Strength.

Responses to this Request for Information (RFI) will inform the development of AVP’s RIT-T for Victorian System Strength including the technical and economic assessment of credible options to meet AEMO’s system strength requirements over different time horizons. The RIT-T is a whole-of-market economic benefits test and optimisation; its conclusions will assess potential network and non-network solutions and identify the preferred option (or portfolio of options) that will maximise net market benefits.

It is anticipated that once the preferred option has been identified through the RIT-T process, AVP will run a competitive procurement process and/or commercial negotiations to deliver the required system strength services.

This Returnable Schedule should be read in conjunction with the RFI document.

1. Service Information

Respondent must supply the information required below in this section.

Responses should be in the form specified in this section with any additional information provided as attachments or appendices. Any assumptions made should be clearly stated in the Response. AVP reserves the right to verify claims made in any Response. Any material misstatement of experience or capability is likely to result in exclusion from any future procurement process.

## Service Information Schedule

#### Organisational information

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Applicable technology** | **Description** | **Response** |
| Company name | All | Name of the company submitting this RFI |  |
| ABN | All | ABN of the company submitting this RFI |  |
| Key contact name | All | Name of the key contact for this RFI |  |
| Contact email address | All | Email address for the key contact |  |
| Contact phone number | All | Phone number for the key contact |  |

Please also provide, in no more than three pages, evidence of capability and capacity to deliver the proposed service, including:

* experience in delivering system strength or related services;
* expected project delivery timeframes, where relevant; and
* evidence of technical maturity and economic feasibility (cost-effectiveness) of proposed solution.

#### Proposed service

Proposed service parameters are to be defined under Reference Conditions where relevant. For any parameter where Reference Conditions are unachievable, please state the value of the parameter and the accompanying alternative condition.

###### Reference Condition

|  |  |
| --- | --- |
| Condition | Description |
| Ambient dry bulb temperature | 50°C. |
| Relative humidity | As per local conditions - using one or more nearby BOM stations interpreting coincident humidity with high ambient dry bulb temperature in the past 30 years (Service Provider to justify). |
| System frequency | 50 Hz |
| Power factor | 0.93 |

#### Service Parameter

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Applicable technology** | **Unit** | **Description** | **Response** |
| Solution name / address | All | N/A | Name and/or address of the solution (or multiple units that form part of the solution) |  |
| Service Point of Connection (POC) | All | N/A | Connection point of the service on the Victorian declared shared network |  |
| Technology type | All | N/A | e.g. synchronous generator, grid forming battery, grid forming renewables, synchronous condenser |  |
| Rated capacity | All | MVA | Rated capacity of the solution |  |
| Number of units & unit size | All | N/A, MVA | Number of synchronous condensers/inverter and size of each unit  |  |
| Rated capacity | BESS | MWh | Energy storage capacity |  |
| Available date | All | N/A | Expected date for the proposed system strength service to be made available. For proposed new or modified project, this project must have completed construction, grid connection, testing and all commissioning activities and be available to provide the proposed system strength service. |  |
| Service start date | All | N/A | Proposed start date for providing system strength services |  |
| Service end date | All | N/A | Proposed end date for providing system strength services |  |
| Service contract operating model | All | N/A | Continuous/ on AEMO request/ other (please define) |  |
| Minimum service contract period | All | N/A | Minimum service contract period required by service |  |

#### Technical Parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Applicable technology** | **Unit** | **Description** | **Response** |
| Fault current contribution & duration at POC  | All | MVA | Level of three phase, line to line and single line to ground fault contribution in MVA at the connection point and duration of sustained fault level contribution (up to a minimum of 3s). Eg:

|  |  |  |  |
| --- | --- | --- | --- |
| Duration (s) | 3 phase fault level (MVA) | Line to line fault level (MVA) | Single phase to ground fault level (MVA) |
| xx | XXXX | XXXX | XXXX |
| yy | YYYY | YYYY | YYYY |

 |  |
| Continuous reactive power capability at POC  | All | MVAr | Range of reactive power capability of service offered at the connection point. (steady state reactive capability diagram showing POC voltage vs POC reactive power). |  |
| Short term reactive power capability at POC  | All | MVAr | Range of reactive power capability of service offered at the connection point. (short term reactive capability diagram showing p.u. overload vs. time) |  |
| Overload capacity & duration  | All | MVA or %, s | The overload capacity of the plant in MVA or percent of Rated Capacity and duration of this capacity as measured at the connection point. (short-term overload capability graph (p.u. overload vs. time)) |  |
| Low and high voltage ride through capabilities | All |  | Capability of service to ride through low and high voltage |  |
| Minimum stable operating level  | All | MW | Minimum stable operating level of each unit in MW |  |
| Active-reactive power capability curve at POC  | All | MW/ MVAr | Active-Reactive Power Capability Curve at 0.9, 1.0 and 1.1 p.u voltage at the connection point. |  |
| Impedance of the machine | All | p.u. | Synchronous, transient and sub transient impedance of the machine in per unit with MVA base clearly indicated |  |
| Impedance of the transformer  | All | p.u. | Impedance of the transformer, in per unit with MVA base clearly indicated |  |
| Vector group of the transformer | All | N/A | For example, Star/Delta, Delta/Star, Star/Delta/Delta etc.  |  |
| Line impedance  | All | p.u. | An estimate of line impedance to the point of connection of the transmission network |  |
| Control & communication signals | All | N/A | Dispatch communications protocol with AEMO |  |
| Inertia contribution | All | MW.s | Inertia or synthetic inertia contribution of the solution (if flywheel is proposed as an option then inertia with and without flywheel should be noted) |  |
| Asset life | All | Years | Anticipated asset life that is capable of delivering the service |  |
| Compliance with Voluntary Grid-Forming Inverter Specification | Grid -forming solutions | N/A |  |  |

Please also provide :

* confirmation of compliance with Minimum Requirement as set out in C.2.1 of the RFI document;
* any relevant, general arrangement, site plan and single line diagram (SLD) associated with the service;
* PSS®E (version 34.5 or later) model and PSCADTM (version 5) model that accurately represent the service at scale and how it will operate, and that are compliant with AEMO’s Dynamic Model Acceptance Test (DMAT) Guideline requirements; and
* associated Releasable User Guide, manual, library files and list compatible of Intel Fortran compiler versions.

#### Operational capability

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Applicable technology** | **Unit** | **Description** | **Response** |
| Service annual availability | All | % | Annual availability of the solution to provide system strength services, represented as a percentage of a year |  |
| Start-up time | All | Hours/ minutes | Expected time following a request for enablement before the solution can provide contracted system strength services |  |
| Shut down time | All | Hours/ minutes | Expected time following a request for disablement before the solution can cease o provide contracted system strength services |  |
| Continuous running time | All | Hours | Maximum period of time the solution can be run continuously when providing system strength services |  |
| Annual maintenance duration  | All | Hours/ % | Duration of a year in which the solution would be offline for maintenance |  |
| Periods of unavailability  | All | N/A | Likely month/day/time that the solution will be unavailable to provide contracted system strength services (if any) |  |
| Frequency & duration of maintenance | All | Number & hour per year  | Number of major & minor maintenance period per year and the associated unavailability duration. |  |

#### Economic and commercial

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Applicable technology** | **Unit** | **Description** | **Response** |
| Project status | All | N/A | Please select one of the following:* Existing
* Existing with non-committed modifications (please expand on proposed modification)
* Existing with committed modifications (please expand on proposed modification)
* Committed project
* Non-committed project

Will the proposed system strength services be provided by assets that meet the definition of ‘committed project’ under the AER’s RIT-T Application Guidelines, using the following criteria:a) The proponent has obtained all required planning consents, construction approvals and licenses, including completion and acceptance of any necessary environmental impact statementb) Construction has either commenced or a firm commencement date has been setc) The proponent has purchased/settled/acquired land (or commenced legal proceedings to acquire land) for the purposes of constructiond) Contracts for supply and construction of the major components of the necessary plant and equipment (such as generators, turbines, boilers, transmission towers, conductors, terminal station equipment) have been finalised and executed, including any provisions for cancellation paymentse) The necessary financing arrangements, including any debt plans, have been finalised and contracts executed. |  |
| Capital Cost | Non- committed project | $,000 | Total capital cost (regardless of ownership)[[1]](#footnote-2) for the proposed solution, including costs of plant/equipment, land, civil works, grid connection assets and development costs. If possible, please reflect the actual spend profile for the project (otherwise, lump sum). These costs must exclude a rate of return on capital, and should not subtract any: * Expected payments from AEMO
* Expected payments or revenues from energy (and related) markets
* External funding contributions (e.g. grants)

Existing or committed assets are considered to have zero capital cost (i.e. are a sunk cost). However, capital costs associated with modifying or upgrading existing facilities to provide system strength services should be included.  |  |
| Fixed operating cost | All | $,000 | Annual fixed operation and maintenance (FOM) costs of the underlying resource |  |
| Variable operational Cost | All | $,000 per MWh or hour | Expected running costs of the underlying resource, including fuel costs and variable operations and maintenance (VOM) at minimum stable operating level. |  |
| Annual electricity consumption | All | MWh | Expected electricity consumption to provide required service. Please indicate if the cost of electricity has been factored in the operating costs. |  |
| External contributions | New projects | $,000 | Expected external funding (or is expected to receive external funding) for the project, such as from ARENA or government |  |
| Greenhouse gas emissions (scope 1)  | All | tCO2e/MWh or tCO2e/hour | Estimated scope 1 greenhouse gas emissions from providing system strength services |  |
| Greenhouse gas emissions (scope 2)  | All | tCO2e/MWh or tCO2e/hour | Estimated scope 2 greenhouse gas emissions from providing system strength services |  |
| Other market benefits | All |  | Beyond system strength services, describe other services that the assets/project will provide in energy and related markets (e.g. wholesale energy market, ancillary services markets, other network support services). |  |
| Expected system strength contract price  | All | . .$,000 | Proposed fees payable for the provision of system strength services. The fee structure should include the following components (in line with the draft OSM structure):* Establishment Fee: one-off setup cost, if applicable.
* Availability Fee: monthly payment for the service to be made available to AEMO. This is intended to cover fixed costs for providing the service.
* Enablement Fee: $ per event, intended to cover the cost of the service being enabled/activated.
* Variable Fee: $/MWh fee to operate at the minimum stable operating level for synchronous generators, or $/hour for other solutions.

Please specify whether fees are in real or nominal terms, and any indexation methodology that applies |  |

|  |  |  |
| --- | --- | --- |
| Parameter | Description of measure | Cost of measure |
| Emissions reduction measures to be taken |  |  |

Please also provide:

* Details of any material assumption used to prepare the Response.
1. Conflict declaration

Except as identified below, none of the personnel presently identified by [Name of Tenderer] to work on the provision of the Services to AVP:

1. is, or has a close relative[[2]](#footnote-3) who is, a member, director, employee or contractor of AEMO;
2. is, or has a close relative who is, a director, employee or contractor of a registered participant in a market that AEMO operates or of any business likely to be affected by the Services;
3. has, or has a close relative who has, a material financial interest in a registered participant in a market that AEMO operates or in any business likely to be affected by the Services;
4. has any other affiliation, position, engagement or interest that could reasonably be seen as a conflict of interest with that person’s involvement in the provision of the Services.

**Identified conflicts**

|  |  |
| --- | --- |
| **Person affected** | **Nature of conflict** |
|  |  |
|  |  |

* 1. How each conflict is to be addressed

[*The proponent must outline how any conflicts of interest identified are to be addressed*.]

1. As per RIT-T guidelines, capital costs are considered $0 for existing or committed assets, and for new assets the total capital cost of the underlying resource for the non-network solution (i.e. regardless of ownership). [↑](#footnote-ref-2)
2. Spouse, de facto partner, parent, sibling or child. [↑](#footnote-ref-3)