Government of Western Australia
Energy Policy WA

Scope of Works for the Review of the Reserve Capacity Mechanism

1. Introduction

1.1 Review Requirements

The Coordinator of Energy (**Coordinator**) plans to review the Reserve Capacity Mechanism (**RCM**) under clause 2.2D.1 of the WEM Rules in 2021/22 and to develop any WEM Rules resulting from the review in 2022/23. Clause 2.2D.1(h) confers the function on the Coordinator to consider and, in consultation with the Market Advisory Committee (**MAC**), progress the evolution and development of the Wholesale Electricity Market (**WEM**) and the WEM Rules.

In addition, clause 4.5.15 of the WEM Rules requires the Coordinator to review the Planning Criterion at least every 5 years. The RCM Review will incorporate the Coordinator's first review of the Planning Criterion.

The WEM Rules also require the Economic Regulation Authority (**ERA**) to undertake the following reviews, which may be affected by the Coordinator's RCM Review:

- review of the methodology for setting the Benchmark Reserve Capacity Price and the Energy Price Limits (clause 2.26.3);
- review of the Reserve Capacity Price Factors (clause 2.24.3A); and
- review of the Relevant Level Methodology (clause 4.11.3C).

The MAC maintains an Issues List to track and progress issues that have been identified by WEM stakeholders. Several open issues on the current MAC Issues List relate to the RCM. Appendix 1 to this paper lists the issues related to the RCM and provides comments from Energy Policy WA on how they will be addressed by the RCM Review.

1.2 Background

The RCM was implemented in 2004 and commenced in 2005. At that time:

- the high-level objective of the RCM was to ensure that:
    - there would be sufficient generation capacity to:
        - cover a 1 in 10 year peak demand with a given likelihood; and
        - ensure unserved energy does not exceed 0.002% of annual energy consumption (including transmission losses);
    - any demand lower than the 1 in 10 year peak demand would be covered with an even higher certainty; and
- the generation capacity in the SWIS was mainly thermal generation with very little penetration of intermittent generation and behind the meter PV.

1.2.1 The current RCM

The current RCM was implemented in the SWIS in 2005 to ensure sufficient capacity for system reliability. The RCM has subsequently been amended to address issues with the initial mechanism and to account for market and system changes. However, the overall concept of the RCM has remained unchanged, as follows:

- the purpose of the RCM is to ensure that there is sufficient capacity available in the SWIS to maintain acceptable reliability of supply;
- the minimum number of Capacity Credits procured is based on the greater of:
    - an expected 1 in 10 year peak demand plus a reserve margin, plus an allowance for Intermittent Loads, plus an allowance for Essential System Services (**ESS**); or
    - the capacity required to ensure unserved energy does not exceed 0.002% of annual energy consumption (including transmission losses).
- CRC is based on:
    - for thermal generators, the expected availability of the facility at 41°C; and
    - for Intermittent Generators and Demand Side Programmes, the expected availability of the facility during system peak demand periods.
- the monetary value of Capacity Credits is not affected by the technology of a facility, except for the period from the 2017 Capacity Year to the 2020 Capacity Year, inclusive, where a lower price was paid for Capacity Credits assigned to Demand Side Management Programmes (**DSP**s).[1]

Given the changes to the nature of the demand profile and generation in the SWIS since the RCM was implemented, and the transition to a low emissions energy system characterised by increasing levels of intermittent and distributed generation, the Coordinator and other stakeholders consider that the current RCM design may no longer be fit for purpose and requires a fundamental review.

1.2.2 Change to the RCM

The following significant changes have been made to the RCM since 2005:

- The regime for Capacity Cost Refunds has been amended several times and was last changed in 2016 (applicable from the 2017 Capacity Year) by the (then) Government's Electricity Market Review (**EMR**). The EMR changes included:
    - basing the amount of the refund payable on the system-wide generation reserve margin during the relevant Trading Interval instead of the time of day and year; and
    - redistributing the Capacity Cost Refunds to Market Generators based on the availability of their Facilities instead of to Market Customers.
- The method for assigning Certified Reserve Capacity (**CRC**) to Intermittent Generators has changed several times, with the most significant change applied from the 2014 Capacity Year (the 2012 Reserve Capacity Cycle). This change replaced the determination of CRC for Intermittent Generators based on average performance with the current Relevant Level Method that aims to account for performance during peak demand, variability, and saturation.
- The method for assigning CRC to Demand Side Programmes was last changed by the EMR in 2016 (applicable from the 2017 Capacity Year). The change amended the determination of the Relevant Demand to be based on a markedly larger set of high demand Trading Intervals (400

[1] DSPs are now paid the variable capacity price and are not protected by the price floor or ceiling that is afforded to facilities that were allocated Capacity Credits in the 2020 Capacity Year.

instead of 32) and a more stringent performance requirement (90th percentile instead of median).

- The Reserve Capacity Price regime has been amended several times, with the most recent changes including:
    - The EMR changed the Reserve Capacity Price regime in 2016 (applicable from the 2017 Capacity Year). The change steepened the slope of the price curve and introduced the DSP Reserve Capacity Price that was paid for Capacity Credits from DSPs and was based on the expected dispatch of these Facilities.
    - The Government changed the Reserve Capacity Price regime in 2020 (commencing for the 2021 Capacity Year). These changes included:
        - a modification of the formula for the Reserve Capacity Price to apply different slopes depending on the amount of excess capacity;
        - the removal of the DSP Reserve Capacity Price resulting in DSPs receiving the same Reserve Capacity Price as other Facilities; and
        - the introduction of a transitional price that applies a price floor and ceiling for incumbent Facilities that were assigned Capacity Credits for the 2020 Capacity Year (the 2018 Reserve Capacity Cycle).
- The Government's Energy Transformation Strategy (**ETS**) introduced provisions for storage and hybrid Facilities in 2020, which are to be applicable from the 2023 Capacity Year (the 2021 Reserve Capacity Cycle).
- The ETS introduced the Network Access Quantities regime in 2020, which is to be applicable from the 2024 Capacity Year (the 2022 Reserve Capacity Cycle) to account for network constraints in the RCM.

Since its introduction, the Planning Criterion has been reviewed twice (the last time in 2012) resulting only in minor changes as it was found to be appropriate overall.

1.2.3 Changes in the South West Interconnected System (SWIS)

The SWIS has changed substantially since 2012:

- the installed capacity of intermittent generation has increased from around 500 MW[2] to around 1,170 MW;[3]
- the estimated installed capacity of behind the meter PV has increased from around 170 MW to around 1,740 MW;[4]
- some of Synergy's thermal plant has exited (or will soon exit) the market:
    - 387 Capacity Credits exited the market from the 2018 Capacity Year in response to an order by the Government to retire capacity;[5]
    - the Government has announced the planned retirement of Muja 5 (195 Capacity Credits) for 1 October 2022 and Muja 6 (193 Capacity Credits) for 1 October 2024;

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2 Based on the list of Intermittent Generators taken into account for the 2021 review of the Planning Criterion, as published in the final report, and the associated nameplate capacity for the listed Facilities as published in the 2014 Electricity Statement of Opportunities (**ESOO**).

3 As published in the 2021 ESOO.

4 Installed capacity in April 2021, estimated by AEMO, as published on page 6 of the 2021 ESOO.

5 The 387 Capacity Credits was allocated to about 436 MW of nameplate capacity. About 120 MW of this capacity no longer receives Capacity Credits but is still operational under Network Control Service Contracts with Western Power.

- there has been a substantial reduction in capacity provided by DSPs:
    - around 460 Capacity Credits was allocated to DSPs for the 2012 Capacity Year and around 560 Capacity Credits for the 2016 Capacity Year;[6]
    - the subsequent change to capacity payments for DSPs caused about 450 Capacity Credits from DSPs to exit the market for the 2017 Capacity Year; and
    - 86 Capacity Credits are assigned to DSPs for the 2022 Capacity Year.

The large increase in intermittent generation capacity and behind the meter PV have:

- shifted annual and daily system peak demand to later in the day because the high contribution of behind the meter PV reduces system demand markedly in the lead up to sunset;[7]
- reduced minimum system demand as the generation of behind the meter PV markedly decreases system demand during the middle of the day;
- steepened system demand increases ahead of the evening peak because the generation of behind meter PV has reduced minimum demand and moved it from before dawn to the middle of the day, causing a much greater and steeper climb in demand to the evening peak;[8]
- increased volatility of system demand because of the volatility of the output of behind the meter PV on days with broad-area moving cloud band cover; and
- increased uncertainty and volatility of supply because of the increased penetration of Intermittent Generators, whose output is dependent on weather conditions.

In addition, the SWIS is in the transition to a lower emissions energy system because of the decreasing generation cost of renewable generation facilities, the Federal Government's Renewable Energy Target, increased penetration of behind the meter PV, increasing pressure to reduce greenhouse gas emissions and consumers' demand for 'green' products.

Other generation technologies, such as battery storage, are becoming more viable. New sources of dispatchable capacity, such as Virtual Power Plants, are being trialled for future use. Some of these capacity sources could flatten the demand profile delaying the need for additional conventional capacity to address system stress events.

2. Project scope

The following conditions precedent are applicable to the RCM Review:

- the WEM will continue to have an RCM;
- the purpose of the RCM is to ensure acceptable reliability of electricity supply at the most efficient cost ("purpose of the RCM"); and
- any changes to the RCM should not erode the level of system reliability currently provided for by the WEM Rules.

The objective of this review is to develop an RCM that:

- achieves the system reliability that underpins the current RCM at the most efficient cost for consumers for the current and the anticipated future system demand profiles;

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6 As published on AEMO's website under clause 10.5.1(f) of the WEM Rules.

7 Peak demand was at 16:30 in the 2012 Capacity Year and at 18:00 in the 2020 Capacity Year, as published in the 2021 ESOO.

8 Minimum demand was 1,309 MW in the 2012 Capacity Year and 954 MW in the 2020 Capacity Year, as published in the 2021 ESOO Data Register.

- addresses the issues associated with the transformation of the energy sector, as indicated in section 1.2; and
- accounts for any transitional issues associated with any changes to the RCM.

The following aspects related to the RCM are out of scope for this RCM review:

- the Network Access Quantities regime;
- the Reserve Capacity Price regime; and
- Energy Price Limits.[9]

2.1 Guiding principles

The guiding principles for the RCM Review are that the RCM should:

(1) Meet the Wholesale Market Objectives:

  (a) to promote the economically efficient, safe and reliable production and supply of electricity and electricity related services in the South West interconnected system;

  (b) to encourage competition among generators and retailers in the South West interconnected system, including by facilitating efficient entry of new competitors;

  (c) to avoid discrimination in that market against particular energy options and technologies, including sustainable energy options and technologies such as those that make use of renewable resources or that reduce overall greenhouse gas emissions;

  (d) to minimise the long-term cost of electricity supplied to customers from the South West interconnected system; and

  (e) to encourage the taking of measures to manage the amount of electricity used and when it is used.

(2) Enable the orderly transition to a low greenhouse gas emissions economy.

(3) Be cost-effective, simple, flexible, and able to be maintained on an ongoing basis.

(4) Provide investment signals, including locational and technical capability signals, that deliver resource adequacy by ensuring that diverse and sufficiently reliable capacity is available to meet the capacity requirements.

2.2 Project stages

The RCM Review is planned to be undertaken in the following three stages. Where possible, the steps will be undertaken in parallel, rather than sequentially.

Stage 1

- Step 1: Assess the requirements for the capacity needed to achieve the purpose of the RCM, in the context of the recent and anticipated transformation of the SWIS and WEM, by defining:
  - the types of system stress in the WEM (currently and for 2030);
  - the capacity requirements needed to achieve the desired system reliability (the “reliability target”), including to meet:
    - peak demand;

[9] The Energy Price Limits will be considered as part of Energy Policy WA’s work on market power mitigation measures.

        - minimum demand;
        - reliable transition between minimum demand and peak demand (e.g. through flexibility, adequate ramping capability; and
    - which system stress situations can/should be addressed through the RCM or outside of the RCM (such as via ESS).
- Step 2: Review the Planning Criterion to ensure that it reflects the purpose of the RCM and achieves the reliability target determined in Step 1, including:
    - assessing whether the installed capacity (**ICAP**) or unforced capacity (**UCAP**) concept[10] is best suited to determining the capacity value of a facility in the SWIS (includes assessment of MAC Issue 4).
- Step 3: Develop one or more methods for assigning CRC that can meet the Planning Criterion determined in Step 2. This includes:
    - how to determine the ability of different types of capacity (e.g. different technology types) to contribute to meeting the reliability target;
    - what obligations should be placed on different technology types (includes assessment of MAC Issue 4 and part of MAC Issue 30); and
    - enable the achievement of net zero emissions by 2050.
- Step 4: Review the method for setting of the Benchmark Reserve Capacity Price (**BRCP**), considering the revised Planning Criterion (includes assessment of MAC Issue 4).
- Step 5: assess the method(s) for assigning CRC under different scenarios (2030, 2050) (includes assessment of parts of MAC Issue 30).

Stage 2

- Assess how the outcomes of Stage 1 affect the following aspects of the RCM:
    - outage scheduling;
    - the refund mechanism (includes assessment of MAC Issues 3 and 14/36);
    - Reserve Capacity Testing; and
    - determination of Individual Reserve Capacity Requirement (**IRCR**) (currently and for 2030) (includes assessment of MAC Issue 1 and part of MAC Issue 30).

Stage 3

- Develop a detailed design of the RCM to implement the high-level design developed under Stages 1 and 2 (includes assessment of parts of MAC Issue 56).
- Assess whether any transitional measures are needed, and if so, develop the transitional measures.

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[10] **ICAP** refers to the maximum amount of energy a resource can provide under given conditions, such as a certain ambient temperature. ICAP may overstate a resource's ability to provide capacity when needed since it does not account for the probability of forced outages.

UCAP refers to the average amount of ICAP that is available at a given time after discounting the time that the facility is unavailable due to outages or deratings. There are different approaches how to determine the outage expectation for different types of capacity (i.e. different technologies).

The current RCM uses ICAP (at 41°C) to determine the CRC of all thermal generators and bases the determination of CRC for all other capacity providers on the ICAP concept by estimating their capacity value during peak demand.

2.3 Approach to analysis

The following analysis will be undertaken for Steps 1 and 2 of Stage 1 of the RCM Review. The approach to analysis in the remaining steps and stages of the review will be defined based on the outcomes of this analysis.

2.3.1 System stress

Literature review: Review of RCM arrangements in other markets and what they aim to address, which problems their electricity systems are facing or are expected to face in the future, and whether/how these arrangements and issues relate to the WEM. Jurisdictions to be investigated include:

- UK;
- PJM; and
- any other jurisdictions identified by the MAC or Energy Policy WA.

Modelling to identify system stress (current and expected future): Modelling of the current SWIS demand and the demand and demand profile expected in 2030 under different credible scenarios. The analysis will assess daily, seasonal and annual demand profiles and load duration curves as well as demand profiles for 1 in 10 year weather conditions. The modelling will account for the current generation fleet, other existing identified capacity sources and expected developments, and will reflect the DER Roadmap and the findings of, and information from, the Whole of System Plan and expected demand-response capacity and storage uptake. The objective is to identify causes of system stress such as:

- maximum demand (including extreme peaks);
- minimum demand (including extreme lows);
- fluctuation of demand (including rate and speed of change);
- generation volatility, including rapid changes of availability from intermittent generation (including DER);
- forced outages and maintenance planning; and
- any other aspects identified in the course of the modelling work.

2.3.2 Required capacity services

This will include:

- first modelling how the current generation mix and other capacity sources accommodate the identified system stress types (current and future) and identifying any deficiencies; and
- then identifying the capacity requirements and types for the SWIS that are needed to efficiently meet the reliability target for different scenarios. This will include:
    - determining the ideal generation and other capacity mix(es) that could manage the identified system stress types (current and future); and
    - assessing the need for other types of ESS in the SWIS.

2.3.3 Review the Planning Criterion

This will include:

- undertaking a cost benefit analysis of using ICAP or UCAP to meet the capacity requirements for the SWIS; and

- assessing whether the current Planning Criterion is adequate for meeting the capacity requirements of the SWIS, and if not, developing a planning criterion that will meet them. This will be based on modelling of the different load scenarios.

3. Stakeholder engagement

The RCM Review will be undertaken in close consultation with the MAC, either directly through MAC meetings or, more likely, through the establishment of a Working Group. Participation in the Working Group will not be limited to MAC members. Energy Policy WA will develop straw man solutions to provide starting points for the discussions at each stage of the review process, as appropriate.

Energy Policy WA will develop consultation papers based on the outcomes from the Working Group or MAC meetings and invite feedback from all stakeholders.

Under clause 2.5.1C of the WEM Rules, the Coordinator must consult with the MAC before commencing the development of a Rule Change Proposal.

4. Project Schedule

The following is a preliminary high-level project schedule for the RCM Review.

Tasks/Milestones	Timing
Consult with the MAC on the scope of works for the RCM review.	21 September 2021
Engage a consultant(s) to assist with the review.	October 2021
Establish MAC Working Group.	2 November 2021
Stage 1	
Literature review of RCM arrangements in other jurisdictions.	January 2022
Determine the requirements for capacity needed to achieve the purpose of the RCM, by defining: • what system stress situations appear in the WEM (currently and forecast for 2030); • the capacity requirements needed to achieve the reliability target; and • which system stress situations can/should be addressed through the RCM.	January 2022
Review the Planning Criterion to ensure it reflects the purpose of the RCM and the reliability target, including assessing whether to use ICAP or UCAP is best suited to determine the capacity value in the SWIS.	February 2022
Consultation with the MAC Working Group and stakeholder workshops.	December 2021 to February 2022
Develop high-level approaches for: • assigning CRC; and • setting of the BRCP considering the revised Planning Criterion. This will include: • testing of the approaches through modelling; and • consultation on the approaches with the MAC Working Group.	May 2022

Tasks/Milestones	Timing
Consultation on Stage 1 with the MAC Working Group and stakeholder workshops.	May 2022 to June 2022
Stage 2	
Develop a high-level approach to reflect the design developed under Stage 1, including: • outage scheduling; • the refund mechanism; • Reserve Capacity Testing; and • determination of IRCR. This will include consultation on the approaches with the MAC Working Group.	June 2022
Publish a consultation on the outcomes of Stages 1 and 2 via the release of a Consultation Paper and a request for stakeholder submissions.	July 2022
Stage 3	
Develop the detailed design for the concepts developed under Stages 1 and 2, in consultation with the MAC Working Group.	September 2022
Assess whether any transitional measures are needed, and if so, develop the transitional measures, in consultation with the MAC Working Group.	September 2022
Consultation paper(s) on the detailed RCM design and proposed transitional measures (if any) and a request for stakeholder consultation.	October 2022
Publish a final Information Paper on the proposed detailed revised RCM design.	December 2022
Develop a Rule Change Proposal for consideration and approval by the Coordinator and Minister.	February 2023

Appendix 1: MAC Issues related to the RCM

Several issues on the MAC Issues List relate to the RCM. The following table lists the RCM-related issues and provides Energy Policy WA's assessment of how they relate to the RCM Review.

MAC Issue	Treatment
Issue 1: There is a need to look at how IRCR and the annual capacity requirement are calculated (i.e. not just the peak intervals in summer) along with recognising behind the meter solar plus storage. The incentive should be for retailers (or third-party providers) to reduce their dependence on grid supply during peak intervals, which will also better reflect the requirement for conventional 'reserve capacity' and reduce the cost per kWh to consumers of that conventional 'reserve capacity'.	Stage 2
Issue 4: Incentives for maintaining an appropriate generation mix.	Stage 1
Issue 30: Review of reserve capacity requirement and reserve capacity capability criteria to ensure alignment and consistency in determination of certain criteria. For instance:	
• assessment of RCR criteria, reserve capacity capability and reserve capacity obligations;	• Stage 1
• IRCR assessment;	• Stage 2
• Relevant Demand determination;	• Stage 1
• determination of Non-Temperature Dependant Load status;	• Out of scope
• Relevant Level determination; and	• Stage 1
• assessment of thermal generation capacity.	• Stage 1
Issue 3: Penalties for outages.	Stage 2
Issue 14/36: Capacity Refund Arrangements: The current capacity refund arrangement is overly punitive as Market Participants face excessive capacity refund exposure. This refund exposure is well more than what is necessary to incentivise the Market Participants to meet their obligations for making capacity available. Practical impacts of such excessive refund exposure include: • compromising the business viability of some capacity providers – the resulting business interruption can compromise reliability and security of the power system in the SWIS; and • excessive insurance premiums and cost for meeting prudential support requirements. Bluewaters recommended imposing seasonal, monthly and/or daily caps on the capacity refund. Bluewaters considered that reviewing capacity refund	Stage 2

MAC Issue	Treatment
arrangements and reducing the excessive refund exposure is likely to promote the Wholesale Market Objectives by minimising: • unnecessary business interruption to capacity providers and in turn minimising disruption to supply availability; which is expected to promote power system reliability and security; and • unnecessary excessive insurance premium and prudential support costs, the saving of which can be passed on to consumers.	
Issue 58: Outage scheduling for dual-fuel Scheduled Generators: '0 MW' outages are currently used to notify System Management when a dual-fuel Scheduled Generator is unable to operate on one of its nominated fuels. There is no explicit obligation in the WEM Rules or the Power System Operation Procedure: Facility Outages to request/report outages that limit the ability of a Scheduled Generator to operate using one of its fuels. In terms of the provision of sent out energy (the service used to determine Capacity Cost Refunds), it is questionable whether this situation qualifies as an outage at all. More generally, the WEM Rules lack clarity on the nature and extent of a Market Generator's obligations to ensure that its Facility can operate on the fuel used for its certification, what (if anything) should occur if these obligations are not met, and the implications for outage scheduling and Reserve Capacity Testing. (See section 7.2.2.5 of the Final Rule Change Report for RC_2013_15.)	Out of scope/ stage 2
Issue 47: Market Procedure for conducting the Long Term PASA (clause 4.5.14): The scope of this procedure currently includes describing the process that the ERA must follow in conducting the five-yearly review of the Planning Criterion and demand forecasting process. AEMO considers that its Market Procedure should not cover the ERA's review, and the ERA should be able to independently scope the review. As such, AEMO recommends removing this requirement from the head of power in clause 4.5.14 of the WEM Rules.	Out of scope
Issue 56: Issues with Reserve Capacity Testing:	
• Market Generators that fail a Reserve Capacity Test may prefer to accept a small shortfall in a test (and a corresponding reduction in their Capacity Credits) than to run a second test.	• Out of scope
• There is a discrepancy between the number of Trading Intervals for self-testing vs. AEMO testing.	• Stage 2
• There is ambiguity in the timing requirements for a second test when the relevant generator is on an outage.	• Stage 2
• There is ambiguity on the number of Capacity Credits that AEMO is to assign when certain test results occur.	• Stage 2