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Material constrained portfolio determination

Quarter 4 - 2024

25 February 2025

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Executive summary

This is the ERA's determination of material constrained portfolios in the Wholesale Electricity Market (WEM), using constraint data from the three-month rolling test window from 8:00am 1 October 2024 to 7:59am 1 January 2025.[1] This set of material constrained portfolios replaces the ERA's previous determination made on 29 October 2024.[2] We have followed the WEM Procedure for portfolio determinations.[3]

This determination is part of the Electricity System and Market Rules' (market rules) market power mitigation framework, which aims to focus regulatory monitoring and surveillance effort on those entities with the greatest potential to exercise market power.[4] The ERA monitors market participants' price offers in the Real-Time Market to ensure that they are compliant with their general trading obligations, with particular focus on those facilities assigned to a material constrained portfolio.[5]

Material constrained portfolios contain those facilities that have the potential to exert localised market power due to network constraints.[6] Market participants whose facilities received energy uplift payments in more than 10 per cent of relevant intervals in a three-month rolling test window are part of a material constrained portfolio.[7] All facilities identified in the material constrained portfolios must comply with the requirements under the market rules, which includes record keeping obligations on their offer price construction.[8]

Importantly, market participants whose facilities that are not included in these material constrained portfolios are still monitored. The ERA monitors **all** market participant bidding in **all** intervals as required by the market rules. The ERA expects all market participants to comply with the offer construction guidelines as required by the market rules.[9]

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[1] The ERA must make its material constrained portfolios determination within 20 business days after the settlement date as required by the Wholesale Electricity Market Rules (WA), 1 February 2025, Rule 2.16C.2, (online).

[2] Economic Regulation Authority, 29 October 2024, *Material constrained portfolio determination*, (online), and Wholesale Electricity Market Rules (WA), 7 October 2024, Rule 2.16C.2A, (online).

[3] Economic Regulation Authority, 27 November 2024, *WEM Procedure: Portfolio Determination*, (online).

[4] Changes to the *Electricity Industries Act 2004* (WA) s123(1) on 6 February 2025 (online), changed the name of the Wholesale Electricity Market Rules (the WEM Rules) to the Electricity System and Market Rules (ESMR). This report refers to these as the market rules.

[5] Wholesale Electricity Market Rules (WA), 1 February 2025, Rule 2.16C.4(b), (online).

[6] Energy Policy Western Australia, *Market Power Mitigation Strategy: Information Paper*, 10 November 2022, p. 21, (online).

[7] Wholesale Electricity Market Rules (WA), 1 February 2025, Rule 2.16C.2, (online). A 'relevant interval' is an interval in which the network constraint equation, for which the constrained portfolio was assigned, bound.

[8] Further information is available in Economic Regulation Authority, 2025, *Offer Construction Guideline*, Chapter 10, (online). The record keeping requirement is in Wholesale Electricity Market Rules (WA), 1 February 2025, Rule 2.16C.3, (online).

[9] Wholesale Electricity Market Rules (WA), 1 February 2025, Section 2.16D, (online).

1. Introduction

The market power mitigation framework requires the ERA to complete two processes to identify those facilities with the greatest potential to exercise market power in the Real-Time Market. These processes are to:

1. Identify portfolios of facilities and those which are material portfolios.[10] The ERA published its latest portfolio and material portfolio determination on 10 October 2024.[11]

2. Identify those portfolios of facilities with the potential to exercise localised market power, due to network constraints that bound, which affected dispatch in the Real-Time Market. These portfolios are called material constrained portfolios.[12]

This determination is informed by the material portfolio determination published on 10 October 2024, as well as which network constraints bound and which facilities received uplift payments related to those binding network constraints. Those facilities that received constrained uplift payments in 10 per cent or more of relevant intervals over the three-month rolling test window (from 8:00am 1 October 2024 to 7:59am 1 January 2025) are considered material constrained portfolios. All market participants with facilities that are determined to be in a material constrained portfolio must keep adequate records as per the market rules to substantiate and justify their offers into the WEM.[13]

1.1 ERA's determination process

To make this determination, the ERA:

1. Identified the constrained portfolios.[14]

2. Identified each material constrained portfolio, published this determination and notified the affected market participants on 25 February 2025 of their registered facilities being classified under a material constrained portfolio.[15]

To identify the constrained portfolios, the ERA:

1. Identified each constraint equation that bound for at least one interval over the three-month rolling test window.

2. Identified each constrained portfolio of facilities for each identified constraint equation.

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[10] Wholesale Electricity Market Rules (WA), 1 February 2025, Rules 2.16B.1 and 2.16C.1, (online).

[11] Economic Regulation Authority, 10 October 2024, *Portfolio identification and material portfolio – Determination*, (online).

[12] Energy Policy Western Australia, *Market Power Mitigation Strategy: Information Paper*, 10 November 2022, p. 11, (online).

[13] Wholesale Electricity Market Rules (WA), 1 February 2025, Rule 2.16C.3, (online).

[14] Ibid, 2.16B.2, (online).

[15] Ibid, 2.16C.2, (online).

To identify each material constrained portfolio, the ERA:

1. Calculated the constrained uplift payment ratio for each constrained portfolio, for both the three-month rolling test window and any relevant fixed assessment period.[16]

2. Classified those constrained portfolios with energy uplift payments in more than 10 per cent of all relevant intervals for which the relevant network constraint bound within the three-month rolling test window as material constrained portfolios.

1.2 Record keeping obligations for facilities that are part of a material constrained portfolio

All market participants with facilities that are part of a material constrained portfolio must ensure that adequate records are kept that can be independently verified to support a market participant's price offers for those facilities made in the Real-Time Market, within three months of receiving the notice from the ERA.

An example of the types of records that are required include:

1. Internal governance arrangements.

2. Methods, assumptions, and cost inputs.

This includes those documents that market participants use to develop their prices, quantities, and ramp rates for each identified facility.

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[16]   This includes any Fixed Assessment Periods during the rolling test window which is a period of at least seven consecutive trading days in which a relevant constraint equation has bound continuously within a rolling test window. This is defined in Wholesale Electricity Market Rules (WA), 1 February 2025, Chapter 11, (online).

2. Assessment of constrained portfolios

The ERA has completed its assessment of constrained portfolios and identified each constraint equation for network constraints that bound within the rolling test window. Constraint equations are a mathematical representation of a constraint or limitation on how electricity can be transferred over parts of the network.[17] A constraint equation is considered binding when the Australian Energy market Operator (AEMO) applies a constraint to limit the risk to power system security or reliability. When a constraint equation is applied, those registered facilities that are located behind that constraint are assigned to a constrained portfolio. The constrained portfolio includes all registered facilities behind the constraint equation that are in the same portfolio.

The ERA identified 115 unique binding network constraint equations during the rolling test window. This resulted in identification of 374 unique constrained portfolios. A full list of constraint equations and constrained portfolios is included in Appendix 4.

The ERA used the portfolios identified in October 2024 for this constrained portfolio identification process.[18]

2.1 Constraint equation identification

The ERA used AEMO's constraint equation data to identify all network constraints that bound during the rolling test window. The data was filtered to include data for binding network constraints only from within the rolling test window. AEMO publishes this data on its public data site, which is embedded in the dispatch solution files.[19]

2.2 Constrained portfolio identification

The constrained portfolios consist of those registered facilities identified in the ERA's portfolio determination and where the facility is located behind a binding network constraint.[20] Registered facilities can be assigned to multiple constrained portfolios.[21]

We excluded five facilities from this stage of analysis, as they have not yet been considered in a portfolio determination process.[22,23] From 20 November 2024, any new facility or change to ownership or registration of a facility requires participants to provide a declaration to the ERA to facilitate updates of identified portfolios.[24] In this instance, the excluded facilities either joined the WEM after the last portfolio determination, but before changes to declaration requirements, or are completely new entrants and will need to provide a declaration to the ERA. The November 2024 rule changes decrease the likelihood that facilities will be excluded

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[17] Wholesale Electricity Market Rules (WA) 1 February 2025, Chapter 11, (online).

[18] Economic Regulation Authority, 10 October 2024, *Portfolio Identification and Material Portfolio Determination*, p. 3, (online).

[19] Australian Energy Market Operator, Market Data Western Australia, (online).

[20] Economic Regulation Authority, 10 October 2024, *Portfolio Identification and Material Portfolio Determination*, p. 3, (online).

[21] Wholesale Electricity Market Rules (WA) 1 February 2025, Rule 2.16B.3, (online).

[22] The five facilities are: ALINTA_WGP_ESR1, ERRRF_WTE_G1, KWINANA_ESR2, PHOENIX_KWINANA_WTE_G1, SBSOLAR1_CUNDERDIN_PV1.

[23] Economic Regulation Authority, 10 October 2024, *Portfolio Identification and Material Portfolio Determination*, p. 3, (online).

[24] Wholesale Electricity Market Rules (WA), 1 February 2025, Rules 2.16B.4 (online).

in future constrained portfolio determinations, as newly registered facilities are now required to provide a declaration to the ERA within 30 business days of their registration.[25]

The ERA conducted a sensitivity analysis that showed excluding these facilities had no effect on which market participants had material constrained portfolios (see chapter 3).

The ERA uses a combination of data provided by AEMO and information available in AEMO's public constraints library to identify the constrained portfolios.[26]

[25]   Wholesale Electricity Market Rules (WA) 1 February 2025, Rule 2.16B.4(b), (online).

[26]   Australian Energy Market Operator, 'Operational Constraints Library', (online).

3. Material constrained portfolio determination

After identifying the constrained portfolios over a rolling test window, the ERA must determine the material constrained portfolios by calculating and applying the materiality threshold specified in the market rule to the constrained uplift payment ratio (see section 3.1). The ratio is a percentage of the number of dispatch intervals where a network constraint bound and any registered facilities within the relevant constrained portfolio that received energy uplift payments.

A material constrained portfolio is a constrained portfolio that meets or exceeds the 10 per cent threshold in its constrained uplift payment ratio. The ERA has notified market participants that have registered facilities allocated to a material constrained portfolio. The ERA monitors any prices offered by the market participant in the Real-Time Market in line with the materiality test.[27,28]

Market participants have three months from the date of receipt of a material constrained portfolio determination notice to maintain additional records to support their compliance with their general trading obligations under the market rules.[29] Additional guidance regarding the record keeping obligations is available in the WEM procedure detailing portfolio determination and in the offer construction guideline.[30,31]

3.1 Constrained uplift payment ratio

The ERA identifies those constrained portfolios that have received energy uplift payments in 10 per cent or more relevant dispatch intervals within the rolling test window.[32] Where this occurs, the constrained portfolio is deemed to be a material constrained portfolio and the facilities within each material constrained portfolio are considered to have the potential to exercise market power when located behind a network constraint.

The calculation of the constrained uplift payment ratio is:[33]

$$Constrained\ Uplift\ Payment\ Ratio = \frac{CP\_UP}{NC} \times 100$$

where:

CP_UP is the number of dispatch intervals in the rolling test window or fixed assessment period (as applicable) in which:

1. the constraint equation relevant to the identification of the constrained portfolio identified under market rule 2.16B.2(a) bound; and

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27 Wholesale Electricity Market Rules (WA) 1 February 2025, Rule 2.16C.2(d), (online).

28 Ibid, Rule 2.16C.4, (online).

29 Ibid, Section 2.16A, (online).

30 Economic Regulation Authority, 27 November 2024, *WEM Procedure: Portfolio Determination*, p. 10, (online).

31 Economic Regulation Authority, 5 September 2024, *Offer Construction Guideline*, p. 52, (online).

32 This includes any Fixed Assessment Periods during the rolling test window which is a period of at least seven consecutive trading days in which a relevant constraint equation has bound continuously within a rolling test window. This is defined in Wholesale Electricity Market Rules (WA), 1 February 2025, Chapter 11, (online).

33 Wholesale Electricity Market Rules (WA), 1 February 2025, Rule 2.16C.2(a), (online).

2.   a registered facility in the constrained portfolio received an energy uplift payment; and

NC is the total number of dispatch intervals in the rolling test window or fixed assessment period (as applicable) in which the constraint equation relevant to the identification of the constrained portfolio bound.

3.2   Constrained uplift payment ratio calculation results

The constrained uplift payment ratio calculation is applied to the rolling test window and in any relevant fixed assessment periods.[34] The calculation returned 73 of 374 identified constrained portfolios with a non-zero result.

Full results of the calculation are provided in Appendix 4.

3.3   Material constrained portfolios

The constrained uplift payment ratio calculation resulted in 61 material constrained portfolios, capturing a total of 26 different facilities belonging to 13 different market participants.

Table 1 lists all material constrained portfolios. These are identified as all constrained portfolios that met or exceeded the 10 per cent threshold of the constrained uplift payment ratio calculation. In this rolling test window, no relevant fixed assessment periods were identified.[35] This list of material constrained portfolios replaces the previously published list of material constrained portfolios.[36]

Differences between this material constrained portfolio determination and the previous determination are detailed in Section 3.5.

Table 1:   List of material constrained portfolios

Constrained portfolio	Constraint equation	Registered facility	Constrained uplift payment ratio (%)[37]
6	#E 1*COLLIE_G1 >= 94 id-826	COLLIE_G1	88
9	#E 1*NAMKKN_MERR_SG1 >= 6 id-806	NAMKKN_MERR_SG1	91
10	#E 1*NAMKKN_MERR_SG1 >= 6 id-838	NAMKKN_MERR_SG1	64
11	#E 1*NAMKKN_MERR_SG1 >= 6 id-842	NAMKKN_MERR_SG1	100
12	#E 1*NAMKKN_MERR_SG1 >= 6 id-844	NAMKKN_MERR_SG1	100

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[34]   Economic Regulation Authority, *WEM Procedure: Portfolio Determination*, 27 November 2024, 4.2.1, (online).

[35]   Fixed Assessment Period is a period of at least seven consecutive Trading Days in which the Constraint Equation relevant to the identification of a Constrained Portfolio has continuously bound within a Rolling Test Window. This is defined in Wholesale Electricity Market Rules (WA), 1 February 2025, Chapter 11, (online).

[36]   Wholesale Electricity Market Rules (WA), 1 February 2025, Rule 2.16C.2A, (online).

[37]   Value rounded to the nearest percentage point.

Constrained portfolio	Constraint equation	Registered facility	Constrained uplift payment ratio (%)[37]
13	#E 1*NAMKKN_MERR_SG1 >= 6 id-850	NAMKKN_MERR_SG1	65
14	#E 1*NAMKKN_MERR_SG1 >= 6 id-869	NAMKKN_MERR_SG1	83
16	#E 1*NAMKKN_MERR_SG1 >= 6 id-882	NAMKKN_MERR_SG1	100
31	AvoidDecommit(SWIS) * {NIL} [On(PINJAR_GT2)]	PINJAR_GT2	21
34	AvoidDecommit(SWIS) * {NIL} [On(PINJAR_GT7)]	PINJAR_GT7	20
35	AvoidDecommit(SWIS) * {NIL} [On(PRK_AG)]	PRK_AG	68
36	AvoidDecommit(SWIS) * {NIL} [On(TESLA_GERALDTON_G1)]	TESLA_GERALDTON_G1	100
37	AvoidDecommit(SWIS) * {NIL} [On(TESLA_KEMERTON_G1)]	TESLA_KEMERTON_G1	100
39	AvoidDecommit(SWIS) * {NIL} [On(TESLA_PICTON_G1)]	TESLA_PICTON_G1	33
55	EP-BTY 81 > {SF-AMT 81} [ST-EP 82 (ST~)]	NEWGEN_NEERABUP_GT1	26
70	MRT-NOR-CNS 81 > {MRS-MRT X1} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	93
74	MRT-NOR-CNS 81 > {WMK G501} [MU-NGS X1 (MU~)]	MERSOLAR_PV1	40
76	MRT-NOR-CNS 81 > {WMK G501} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	42
79	MRT-NOR-CNS 81 > {WMS G501} [MU-NGS X1 (MU~)]	MERSOLAR_PV1	38
81	MRT-NOR-CNS 81 > {WMS G501} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	32
85	MRT81-MNC > CVP0 {MRS-MRT X1} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	29
89	MRT81-MNC > CVP0 {WMK G501} [MU-NGS X1 (MU~)]	MERSOLAR_PV1	69
91	MRT81-MNC > CVP0 {WMK G501} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	38

Constrained portfolio	Constraint equation	Registered facility	Constrained uplift payment ratio (%)[37]
94	MRT81-MNC > CVP0 {WMS G501} [MU-NGS X1 (MU~)]	MERSOLAR_PV1	86
96	MRT81-MNC > CVP0 {WMS G501} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	71
117	MRT81-MNC > {MRS-MRT X1} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	80
121	MRT81-MNC > {WMK G501} [MU-NGS X1 (MU~)]	MERSOLAR_PV1	46
122	MRT81-MNC > {WMK G501} [MU-NGS X1 (MU~)]	NAMKKN_MERR_SG1	22
123	MRT81-MNC > {WMK G501} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	21
126	MRT81-MNC > {WMS G501} [MU-NGS X1 (MU~)]	MERSOLAR_PV1	51
128	MRT81-MNC > {WMS G501} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	16
131	MSR-KMK 81 * {NIL} [Manual(TIWEST_COG1)]	TIWEST_COG1	22
132	MSR-KMK 81 * {NIL} [RegLower(TIWEST_COG1)]	TIWEST_COG1	22
133	MSR-KMK 81 * {NIL} [RegRaise(TIWEST_COG1)]	TIWEST_COG1	22
152	NIL > CVP0 {MRT-NOR-CNS 81} [MU-NGS X1 (MU~)]	MERSOLAR_PV1	68
154	NIL > CVP0 {MRT-NOR-CNS 81} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	18
239	NIL > {MRT-NOR-CNS 81} [MU-NGS X1 (MU~)]	MERSOLAR_PV1	68
241	NIL > {MRT-NOR-CNS 81} [MU-NGS X1 (MU~)]	INVESTEC_COLLGAR_WF1	18
252	NIL > {NBT T2} [TST-TS 81 (TS-)]	PINJAR_GT1 PINJAR_GT10 PINJAR_GT11 PINJAR_GT2 PINJAR_GT3 PINJAR_GT4 PINJAR_GT5	50

Constrained portfolio	Constraint equation	Registered facility	Constrained uplift payment ratio (%)[37]
		PINJAR_GT7 PINJAR_GT9 MUNGARRA_GT1 MUNGARRA_GT3	
253	NIL > {NBT T2} [TST-TS 81 (TS-)]	TESLA_NORTHAM_G1 TESLA_GERALDTON_G1	25
287	NIL > {PJR-CTB 81} [PJR-RGN 81 (RGN~)]	MUNGARRA_GT1 MUNGARRA_GT3 PINJAR_GT1 PINJAR_GT10 PINJAR_GT11 PINJAR_GT2 PINJAR_GT3 PINJAR_GT4 PINJAR_GT5 PINJAR_GT7 PINJAR_GT9	21
313	NT T1, SPS_NTBUS > {NT T2, SPS_NTBUS} [NBT-WNO 81 (NBT~)]	NAMKKN_MERR_SG1	100
317	NT T1, SPS_NTBUS > {NT T2, SPS_NTBUS} [NBT-WNO 81 (NBT~)]	PRK_AG	60
350	NetworkCommit(ALINTA_WGP_GT) * {NIL} [On(ALINTA_WGP_GT)]	ALINTA_WGP_GT	99
351	NetworkCommit(ALINTA_WGP_U2) * {NIL} [On(ALINTA_WGP_U2)]	ALINTA_WGP_U2	97
353	NetworkCommit(KWINANA_GT3) * {NIL} [On(KWINANA_GT3)]	KWINANA_GT3	100
354	NetworkCommit(NEWGEN_KWINANA_CCG1) * {NIL} [On(NEWGEN_KWINANA_CCG1)]	NEWGEN_KWINANA_CCG1	100
355	NetworkCommit(NEWGEN_NEERABUP_GT1) * {NIL} [On(NEWGEN_NEERABUP_GT1)]	NEWGEN_NEERABUP_GT1	93
356	NetworkCommit(PINJAR_GT1) * {NIL} [On(PINJAR_GT1)]	PINJAR_GT1	98
357	NetworkCommit(PINJAR_GT11) * {NIL} [On(PINJAR_GT11)]	PINJAR_GT11	95
359	NetworkCommit(PINJAR_GT4) * {NIL} [On(PINJAR_GT4)]	PINJAR_GT4	84
360	NetworkCommit(PINJAR_GT5) * {NIL} [On(PINJAR_GT5)]	PINJAR_GT5	84

Constrained portfolio	Constraint equation	Registered facility	Constrained uplift payment ratio (%)[37]
361	NetworkCommit(PINJAR_GT7) * {NIL} [On(PINJAR_GT7)]	PINJAR_GT7	74
365	RCS(ALINTA_WGP_GT) * {NIL} [On(ALINTA_WGP_GT)]	ALINTA_WGP_GT	93
366	RCS(ALINTA_WGP_U2) * {NIL} [On(ALINTA_WGP_U2)]	ALINTA_WGP_U2	98
367	RCS(NEWGEN_KWINANA_CCG1) * {NIL} [On(NEWGEN_KWINANA_CCG1)]	NEWGEN_KWINANA_CCG1	99
368	RCS(NEWGEN_KWINANA_CCG1, SteamBypass) * {NIL} [On(NEWGEN_KWINANA_CCG1)]	NEWGEN_KWINANA_CCG1	100
369	RCS(PINJAR_GT2) * {NIL} [On(PINJAR_GT2)]	PINJAR_GT2	97
370	RCS(PINJAR_GT4) * {NIL} [On(PINJAR_GT4)]	PINJAR_GT4	96
373	SHO-PMB 91 ^ {LWT-SHO-KEM 91} [On(COLLIE_G1)]	COLLIE_G1	99
374	SHO-PMB 91 ^ {LWT-SHO-KEM 91} [VoltCollapse(BOD)]	COLLIE_G1	100

Source: ERA analysis of WEM data.

3.4 Market participants and facilities in a material constrained portfolio

Table 2 is a list of market participants with facilities that are part of a material constrained portfolio.

Table 2: Market participants and those facilities that are part of a material constrained portfolio

Market participant	Facility
ALINTA	ALINTA_WGP_GT ALINTA_WGP_U2
COLLGAR	INVESTEC_COLLGAR_WF1
GLDFLDPW	PRK_AG
MERREDIN	NAMKKN_MERR_SG1
NEWGEN	NEWGEN_KWINANA_CCG1

Market participant	Facility
NGENEERP	NEWGEN_NEERABUP_GT1
SUNAUST22	MERSOLAR_PV1
TIWEST	TIWEST_COG1
TSLA_GER	TESLA_GERALDTON_G1
TSLA_KEM	TESLA_KEMERTON_G1
TSLA_MGT	TESLA_PICTON_G1
TSLA_NOR	TESLA_NORTHAM_G1
WPGENER	COLLIE_G1 PINJAR_GT2 PINJAR_GT7 PINJAR_GT1 PINJAR_GT10 PINJAR_GT11 PINJAR_GT3 PINJAR_GT4 PINJAR_GT5 PINJAR_GT9 MUNGARRA_GT1 MUNGARRA_GT3 KWINANA_GT3

Source: ERA assessment of WEM data.

3.5   Comparison to previous determination

The differences between the most recent and previous rolling test windows are detailed below:

- Table 3 is the number of constraint equations identified to have bound.
- Table 4 is the number of unique constrained portfolios identified.
- Table 5 is the number of unique facilities that were part of a material constrained portfolio.
- Table 6 is the number of unique market participants that have facilities that are part of a material constrained portfolio.

Table 3:   Number of constraint equations identified

Rolling test window	Number of constraint equations identified
Q4 2024	115
Q3 2024	71

Source: ERA analysis of WEM data.

Table 4:   Number of unique constrained portfolios identified

Rolling test window	Number of unique constrained portfolios
Q4 2024	374
Q3 2024	161

Source: ERA analysis of WEM data.

Table 5:   Number of unique facilities within a material constrained portfolio

Rolling test window	Number of unique facilities
Q4 2024	26
Q3 2024	5

Source: ERA analysis of WEM data.

Table 6:   Number of unique market participants that have facilities in a material constrained portfolio

Rolling test window	Number of unique market participants
Q4 2024	13
Q3 2024	5

Source: ERA analysis of WEM data.

Appendix 1 List of Tables

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Appendix 3 Constrained portfolio method

The ERA developed and applied the process and method, outlined in this appendix, to identify constrained portfolios and calculate the constrained uplift payment ratio for determining material constrained portfolios. The method is outlined in Figure 1, with additional detail provided in the following sections.
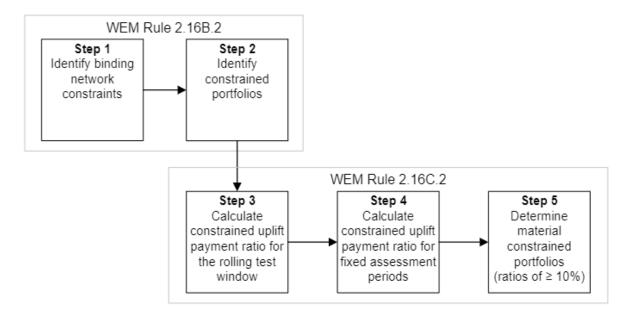
Figure 1:   High level steps in the constrained portfolio method

The assignment of constrained portfolios and the calculation of the constrained uplift payment ratio is completed using R within RStudio.[38]

Data sets

The following data sets were used as inputs to this process:

1.   WEMDE dispatch solution constraints.[39]

2.   'Left Hand Side' terms of network constraints, which lists all facilities located behind each network constraint.

3.   Energy uplift payment data.

4.   Portfolios identified under market rule 2.16B.1.[40]

Data set 1 is available publicly via AEMO's public data site.[41] Data set 2 is partially available publicly via the Operational Constraints Library, however discretionary constraints are not included.[42] Data set 3 is not publicly available. Data set 4 is published by the ERA.[43]

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38   Libraries used were "tidyverse", "readxl" and "here".
39   WEMDE stands for the Wholesale Electricity Market Dispatch Engine.
40   Wholesale Electricity Market Rules (WA) 1 February 2025, Rule 2.16B.1, (online).
41   Australian Energy Market Operator, Market Data Wester Australia: Dispatch Solution Files, (online).
42   Australian Energy Market Operator, Operational Constraints Library, (online).
43   Economic Regulation Authority, 27 November 2024, WEM Procedure: Portfolio Determination, (online).

Data cleansing

All data underwent cleansing processes. This included filtering the data to include only dispatch intervals falling within the rolling test window, ensuring consistent variable naming and formatting across data frames, and extracting facility names from string variable values.

Step 1 - Binding network constraint identification

The first step in the process of identifying constrained portfolios is to identify all binding network constraints within a rolling test window is. [44]

A network constraint is a limitation or requirement in a part of a network that may impact one or more registered facilities in the central dispatch process, such that it would be unacceptable to transfer electricity across that part of the network at a level or in a manner outside the limit or requirement.[45]

This step in the process requires the list of WEMDE dispatch solution constraints. This data was checked against the publicly available data. The three filters applied are date range, constraintType = "Network" and isBindingConstraint = "TRUE".

The list of unique constraint IDs are the network constraints that bound within the rolling test window.

Step 2 - Constrained portfolio identification

Following identification of all network constraints that bound during the rolling test window, the ERA then identified all constrained portfolios for each constraint equation.[46] A constrained portfolio is, for each constraint equation, a set comprising all the registered facilities within a single portfolio that are located behind the relevant network constraint.[47]

This step requires three data sets:

5. The list of unique binding network constraint resulting from part A of this process.

6. 'Left Hand Side' terms of those network constraints, which lists all the facilities located behind each network constraint.

7. Portfolios identified under market rule 2.16B.1.[48]

Some network constraints have versions which applied through the rolling test window. Whilst most version changes only affect facility coefficients in the constraint equation, if a facility is commissioned or decommissioned, the terms of the equation would change. A strict interpretation of the market rules' definition of constrained portfolio is used, and the set comprising all the registered facilities that are located behind any version of the network constraint are considered.

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44 Wholesale Electricity Market Rules (WA) 1 February 2025, Rule 2.16B.2(a), (online).

45 Ibid, Chapter 11, p. 742, (online).

46 Ibid, Rule 2.16B.2(b), (online).

47 Ibid, Chapter 11, p. 715, (online).

48 Economic Regulation Authority, 27 November 2024, WEM Procedure: Portfolio Determination, (online).

The three data sets are merged, the first two by network constraint ID and the last two by facility. Only those facilities which sit behind a network constraint that bound during the period are included in this process.

The data frame is arranged alphabetically by constraint ID, then numerically by portfolio and then alphabetically by facility. An exception to this ordering is where a constraint ID uses a numerical suffix, in which case those constraints are arranged numerically by their suffix.

A constrained portfolio number is assigned to each facility, row by row, according to the constraint ID and portfolio number. If either the constraint ID or the portfolio changes, then a new constrained portfolio number is assigned, see Table 7.

Table 7: Example of constrained portfolio identification

Constraint ID	Facilities	Portfolio	Constrained portfolio number
Constraint-equation-1	Facility A	1	1
Constraint-equation-1	Facility B	1	1
Constraint-equation-1	Facility C	2	2
Constraint-equation-2	Facility A	1	3
Constraint-equation-3	Facility A	1	4

Source: ERA created example based on WEM data.

Step 3 - Constrained uplift payment ratio calculation (rolling test window)

Steps 1 and 2 of the process meet the market rule 2.16B.2 requirements.[49] From this point on, the steps are designed to apply the calculation required under the materiality test set in market rule 2.16C.2 to determine which of the constrained portfolios meet or exceed the materiality threshold in the market rules.[50] This step calculates the constrained uplift payment ratio for each constrained portfolio within the rolling test window.

This calculation is applied to each constrained portfolio.

$$Constrained\ Uplift\ Payment\ Ratio = \frac{CP\_UP}{NC} \times 100$$

Where:

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49   Wholesale Electricity Market Rules (WA) 1 February 2025, Rule 2.16B.2, (online).

50   Ibid, Rule 2.16C.2, (online).

CP_UP is the count of dispatch intervals within the rolling test window for a bound network constraint where uplift payments were made.

NC is the count of dispatch intervals within the rolling test window where a network constraint equation bound.

This process requires the following data sets:

1. WEMDE dispatch solution constraints.

2. 'Left Hand Side' (LHS) terms of those network constraints, which lists all the facilities located behind each network constraint.

3. Energy uplift payment data.

4. Constrained portfolios assigned in part B of this process.

The denominator (NC) is extracted for each constrained portfolio by filtering the WEMDE dispatch solution constraints by the network constraint for which the constrained portfolio was assigned. The row count is the number of dispatch intervals in the rolling test window for which the network constraint bound.

The numerator (CP_UP) is found by merging the solution constraints with the facilities from the LHS terms, and then with the facilities receiving energy uplift. The same filter for the relevant constraint is then applied as before. The data is then filtered to include intervals for which there is an energy uplift payment received by a facility within that constrained portfolio only. The number of unique dispatch intervals is counted, which forms the numerator.

For example, Table 8 below shows a hypothetical example where all the dispatch intervals in which constraint equation 1 bound. This constraint equation resulted in identification of example constrained portfolios 1 and 2. Constrained portfolio 1 includes facilities A and B, while constrained portfolio 2 includes facility C. From this example, NC is determined to be 4 for both constrained portfolios, and CP_UP is the count of gold and blue shaded intervals for constrained portfolios 1 and 2 respectively.

Table 8:   Example of determining constrained facilities that received energy uplift payments by dispatch interval

Dispatch interval	Constrained facilities	Energy uplift recipients
2023-10-01 11:00	A, B, C	A, B
2023-10-01 11:05	A, B, C	A
2023-10-02 17:30	A, B, C	-
2023-10-02 17:35	A, B, C	C

Source: ERA example based on WEM data.

These numbers are then input to a second table, in which the ratio is calculated according to the formula set out in the market rules. Table 9 below shows the calculation of constrained uplift payment ratios for example constrained portfolios 1 and 2.

Table 9: **Example of how the constrained uplift payment ratio is calculated**

Constrained portfolio	CP_UP	NC	Constrained uplift payment ratio (%)
1	2	4	50
2	1	4	25

Source: ERA example based on WEM data.

Step 4 - Constrained uplift payment ratio calculation (fixed assessment periods)

The process for calculating the fixed assessment period is the same used for the whole of the rolling test window period. However, instead of using the rolling test window, the calculation is applied where the constraint equation relevant to the constrained portfolio has continuously bound for a period of a least seven consecutive trading days within the rolling test window. A rolling test window may contain multiple fixed assessment periods.[51]

This process is the same as outlined in step 3 and uses the same data set, however the key difference is first filtering the network constraint data to consider only fixed assessment periods. This is done by creating a duration variable, by ordering the data by constraint ID, then by chronological order. Rows are then checked to see if they are five minutes apart, if they are then this is added to a cumulative duration, if they are not, a new count is started.

The duration variable is then filtered to only include those which exceed seven days. The numerator and denominator are then extracted as before, and the constrained uplift payment ratio is calculated. If there are multiple fixed assessment periods for the same network constraint, the highest constrained uplift payment ratio is provided.

Step 5 – Material constrained portfolios

A filter is applied to the calculation tables generated in steps 3 and 4 to only include those portfolios with a constrained uplift payment ratio greater than 10 per cent from either of steps 3 or 4.

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51   Wholesale Electricity Market Rules (WA) 1 February 2025, Chapter 11, (online).

Appendix 4 Constrained uplift payment ratio results

The ERA must publish the results of the calculations carried out for the market rule clause 2.16C.2(a). This includes both the results of the constrained uplift payment ratio for all constrained portfolios for both the rolling test window and any fixed assessment periods.

This table has been published as a .csv file, available on the ERA's Portfolio Assessment page.