

# Australian Energy Market Operator Allowable Revenue and Forecast Capital Expenditure 2019/20 to 2021/2022

Final Determination

14 June 2019

Economic Regulation Authority

WESTERN AUSTRALIA

DMS203147

Economic Regulation Authority  
4<sup>th</sup> Floor Albert Facey House  
469 Wellington Street, Perth

**Mail to:**

Perth BC, PO Box 8469  
PERTH WA 6849

**T:** 08 6557 7900

**F:** 08 6557 7999

**E:** [info@erawa.com.au](mailto:info@erawa.com.au)

**W:** [www.erawa.com.au](http://www.erawa.com.au)

National Relay Service TTY: 13 36 77  
(to assist people with hearing and voice impairment)

We can deliver this report in an alternative format for those with a vision impairment.

*© 2019 Economic Regulation Authority. All rights reserved. This material may be reproduced in whole or in part provided the source is acknowledged*

# Contents

<b>Overview .....</b>	<b>iii</b>
<b>1. Introduction .....</b>	<b>1</b>
1.1 Determination process and timeline .....	1
<b>2. AEMO's AR5 proposal.....</b>	<b>3</b>
2.1 Allowable revenue .....	3
2.2 Capital projects .....	5
2.2.1 WEM reform.....	6
2.2.2 Digital roadmap.....	7
<b>3. The ERA's obligations in the market rules .....</b>	<b>9</b>
3.1 Framework for the ERA's determination decisions .....	9
3.1.1 Approving AEMO's proposal.....	10
3.1.2 Scope and timing of WEM reform.....	12
3.1.3 The allowable revenue and forecast capital expenditure period .....	13
3.2 Benchmarking.....	14
<b>4. Public consultation.....</b>	<b>17</b>
4.1.1 On the issues paper.....	17
4.1.2 On the draft decision.....	19
<b>5. ERA's final determination .....</b>	<b>23</b>
5.1 WEM allowable revenue .....	23
5.1.1 Employee benefits .....	24
5.1.2 Accommodation costs.....	26
5.1.3 Supplies and services.....	27
5.1.4 Borrowing costs .....	28
5.1.5 Depreciation.....	28
5.1.6 Conclusion .....	29
5.2 WEM forecast capital expenditure.....	29
5.2.1 Seeking to achieve lowest practicably sustainable cost.....	29
5.2.2 Treatment of project contingencies .....	30
5.2.3 Digital roadmap project.....	32
5.2.4 Other capital projects.....	36
5.2.5 Summary of WEM forecast capital expenditure by project.....	41
5.3 GSI allowable revenue and forecast capital expenditure .....	42
5.4 Market Fees.....	45

**List of appendices**

**Appendix 1 Detailed capital project information ..... 48**

**Appendix 2 Legislative requirements ..... 70**

**Appendix 3 List of Tables..... 73**

**Appendix 4 List of Figures ..... 74**

## Overview

Every three years, the Australian Energy Market Operator (AEMO) estimates allowable revenue and forecast capital expenditure requirements for its Western Australian operations. In the electricity market, these include market operation and system management of the Wholesale Electricity Market (WEM), and preparing for and facilitating the implementation of market and constrained network access reform. In the gas market, AEMO's functions include operating the Western Australian Gas Bulletin Board and preparing the Western Australian Gas Statement of Opportunities.

AEMO then submits its allowable revenue and forecast capital expenditure proposal to the Economic Regulation Authority for review and approval.

The market rules state that:

The Allowable Revenue and Forecast Capital Expenditure must include only costs which would be incurred by a prudent provider of the services described in clause 2.22A.1, acting efficiently, seeking to achieve the lowest practicably sustainable cost of delivering the services described in clause 2.22A.1 in accordance with these Market Rules, while effectively promoting the Wholesale Market Objectives.<sup>1</sup>

and

When determining and approving the Allowable Revenue and Forecast Capital Expenditure or a reassessment of the Allowable Revenue or Forecast Capital Expenditure for AEMO for all or part of the Review Periods from 1 July 2016 to 1 July 2019 and 1 July 2019 to 1 July 2022, the Economic Regulation Authority must determine them on the basis that Wholesale Electricity Market and Constrained Network Access Reform will be implemented before 1 October 2022.<sup>2</sup>

AEMO can recover approved allowable revenue through market fees charged to market participants.

On 15 March 2019, the ERA received AEMO's proposal for the fifth allowable revenue period (AR5) that extends from 1 July 2019 to 30 June 2022.

The ERA undertook a three-stage process to review and approve AEMO's proposal. This included publishing an issues paper on 20 March 2019 and a draft decision on 8 May 2019, and receiving stakeholder comment in response to both documents. The ERA was required to make its final determination on AEMO's proposal by 14 June 2019.

### AEMO's AR5 proposal

For the three-year AR5 period, AEMO proposed allowable revenue of \$98.3 million and forecast capital expenditure of \$77.2 million for its functions in the WEM, and allowable revenue of \$5.9 million and forecast capital expenditure of \$1.3 million for its gas functions.

There are two large-scale projects driving most of AEMO's forecast capital expenditure in AR5: WEM reform and the digital roadmap. AEMO's initial proposal sought forecast capital expenditure of \$51.3 million for WEM reforms (later reduced to \$48.5 million) and \$13.8 million for digital roadmap. Both projects are at an early stage in their development.

The State Government is implementing reforms to the WEM to accommodate the growth of renewable and intermittent energy generation from wind and solar farms and rooftop solar

<sup>1</sup> Rule Change Panel, 2018, *Wholesale Electricity Market Rules (11 January 2019)*. Clause 2.22A.11, ([online](#))

<sup>2</sup> *Ibid*, Clause 1.20.3

systems. The revised market framework and draft rule changes needed to support a new WEM design are expected to be completed by mid-2020. From mid-2020 onwards, AEMO plans to design, procure and implement the IT and business systems required to deliver the re-designed WEM by 1 October 2022.

AEMO's digital roadmap project is a national project to be delivered over the next five years. A proportion of the total cost of this project has been allocated to Western Australia. The digital roadmap will gradually replace existing standalone systems and provide a common centralised and secure platform upon which AEMO can build all future IT infrastructure. AEMO anticipates that this will deliver efficiencies in systems development, support services and data sharing.

### **Changes between the draft decision and final determination**

There have been large changes between the level of approved forecast capital expenditure indicated in the draft decision and that approved in this final determination. The ERA has approved total capital expenditure for AR5 of \$66.3 million, \$45.4 million more than was approved in the draft decision. This results from a reconsideration by the ERA of the requirements of the market rules for approving AEMO's allowable revenue and forecast capital expenditure.

In the draft decision, the ERA interpreted market rules 2.22A.11 and 1.20 as requiring that the ERA approve only an amount of allowable revenue and forecast capital expenditure that comprised the lowest practically sustainable costs of providing services. As the WEM reforms are not currently well-defined and costs are not able to be forecast accurately, the ERA determined to approve only part of the proposed capital expenditure. This would require AEMO to submit further allowable revenue and forecast capital expenditure proposals as the reforms and the forecast costs became better defined.

After considering a submission by AEMO in response to the draft decision, the ERA has had greater regard to the requirement of the market rules that the ERA:

- Considers costs incurred by AEMO seeking to achieve the lowest practicably sustainable costs.
- Approves an amount of allowable revenue and forecast capital expenditure for the entire three-year period.

Accordingly, the ERA has approved capital expenditure equivalent to estimated costs for:

- WEM reform for the full AR5 period.
- Most of the new small capital projects.
- Business system changes planned for the first year of AR5 and delivered through the digital roadmap project.

There are only small changes in AR5 allowable revenue between the draft decision and final determination.

### **Forecast capital expenditure**

When assessing AEMO's AR5 forecast capital expenditure, the ERA considered whether AEMO:

- had acted prudently in proposing the forecast capital expenditure
- was seeking to achieve the lowest practically sustainable cost of delivering the services.

The ERA first determined whether a project was necessary (and therefore prudent). If the project supported one of AEMO's obligations under the market rules, then the ERA deemed it prudent. The exception was forecast capital expenditure AEMO proposed for its WEM reform and constrained network access functions. This is explained further below.

Once it determined that a proposed project was prudent, the ERA assessed whether the project as described and costed was efficient. This included looking for evidence that AEMO:

- used a consistent project cost estimation model
- had a defined project management and governance process
- compared estimated costs against the actual costs of similar projects
- had undertaken a competitive procurement process for products and services
- was actively optimising its resources.

If that evidence was available, then the ERA approved the proposed costs. Forecast capital expenditure was rejected only if there were material flaws in the processes used to forecast costs.

Where the ERA determined that forecast capital expenditure proposed was not prudent, then it did not need to apply the efficiency test.

The ERA determined that AEMO's proposed expenditure for the digital roadmap project for AR5 is not prudent. The reasons are summarised below and explained in more detail in chapter 5.

#### *Digital roadmap*

Although the reasoning for the digital roadmap project is sound, the project is at an early stage and high-level costs and benefits were determined for the National Electricity Market, not for the WEM. A proportion of the cost was allocated to the WEM and gas functions in Western Australia, and AEMO has assumed that similar benefits would be realised here.

The ERA has determined that a prudent service provider would have undertaken a robust cost benefit analysis for Western Australia before allocating and incurring actual costs. This has informed the ERA's determination not to approve full forecast capital expenditure of \$13.8 million for the digital roadmap project in AR5. Instead, the ERA has approved \$4.8 million. The reason and allocation between the WEM and gas activities is provided in section 5.2.3.

#### *WEM reform project*

The ERA has no discretion to determine whether the activities and timing of WEM reform and constrained network access are prudent. The changes to market rule 1.20 and the Minister for Energy's endorsement of AEMO's activities remove this test.

The only test the ERA can apply when reviewing AEMO's proposed WEM reform expenditure is whether AEMO is seeking the lowest practicably sustainable cost in estimating costs.

AEMO provided the ERA with the cost estimation model it used to forecast capital expenditure for the WEM reform project. The ERA reviewed the model and concluded that it is reasonable and that AEMO is seeking the lowest practicable sustainable cost of delivering the program. The ERA has approved forecast capital expenditure of \$48.5 million, equivalent to the costs of the WEM reform project for the entire AR5 period; noting that this forecast is likely to change.

*Other capital projects*

Following the draft decision, AEMO provided additional information on 13 new small projects in its capital program. There are also three projects that have commenced and have been partially funded in AR4. The ERA assessed most projects as prudent given that AEMO had provided justification that the projects were required for its business-as-usual functions and demonstrated that it had estimated capital expenditure using a reasonable approach. Forecast capital expenditure of \$0.8 million was not approved where AEMO had failed to demonstrate a clear need for the capital project, and so the project or part of a proposed project was not deemed prudent; or where AEMO had failed to demonstrate that it was seeking the lowest practicably sustainable cost by not exploring alternative ways to deliver the project.

The ERA has approved forecast capital expenditure of \$12.8 million, equivalent to the estimated costs of most of the new small projects proposed by AEMO.

*Capital project contingency*

In response to the draft decision, AEMO submitted recalculated contingency amounts based on identified project risks and the probability that costs would overrun given the risks. This addressed the ERA's concerns as expressed in the draft decision. Therefore, the ERA approves AEMO's revised project contingency amounts for those projects identified as meeting the approval criteria in the market rules. This is equivalent to forecast capital expenditure of \$11.4 million.

**Allowable revenue**

When determining allowable revenue, the market rules state:

The Allowable Revenue must be sufficient to cover the forward-looking costs of providing the services described in clause 2.22A.1 and performing AEMO's functions and obligations under these Market Rules in accordance with the following principles:

- i. recurring expenditure requirements and payments are recovered in the year of the expenditure;
- ii. capital expenditure is to be recovered through the depreciation and amortisation of the assets acquired by the capital expenditures in a manner that is consistent with generally accepted accounting principles; and
- iii. notwithstanding clauses 2.22A.11(a)(i) and 2.22A.11(a)(ii), expenditure incurred, and depreciation and amortisation charged, in relation to any Declared Market Project are to be recovered over the period determined for that Declared Market Project;

The Allowable Revenue and Forecast Capital Expenditure must include only costs which would be incurred by a prudent provider of the services described in clause 2.22A.1, acting efficiently, seeking to achieve the lowest practicably sustainable cost of delivering the services described in clause 2.22A.1 in accordance with these Market Rules, while effectively promoting the Wholesale Market Objectives;

Where possible, the Economic Regulation Authority should benchmark the Allowable Revenue and Forecast Capital Expenditure against the costs of providing similar services in other jurisdictions; and

Where costs incurred by AEMO relate to both the performance of functions in connection with the Market Rules, and the performance of AEMO's other functions, the costs must be allocated on a fair and reasonable basis between:

- i. costs recoverable as part of AEMO's Allowance Revenue and Forecast Capital Expenditure; and
- ii. other costs not to be recovered under the Market Rules.



Equivalent wording appears in the Gas Service Information rules.

The ERA approves AEMO's proposed allowable revenue for AR5, as AEMO has taken a reasonable approach to forecasting allowable revenue and is seeking the lowest practicably sustainable costs by offsetting increases in some expense categories with savings in others. AEMO has adequately explained and provided evidence to support all of the material year-on-year variances identified by the ERA.

Following its review, the ERA has approved AEMO's estimated allowable revenue forecast as being consistent with the requirements in the market rules. AEMO submitted minor adjustments prior to publication of the final determination to remove capital charges for capital expenditure not approved in the final determination and to correct some minor errors.

### **Final determination**

The ERA approves AEMO's forecast allowable revenue of \$99.8 million for the WEM and \$6.1 million for the gas sector.

The approved allowable revenue for the WEM is \$1.5 million higher than AEMO's proposal. There have been some movements between cost categories to account for the changes in the accounting treatment of leases and for capital expenditure proposed but not approved. The main reason for the increase is the adjustments made to the depreciation not initially included in the proposal.

The ERA approves \$65.8 million in forecast capital expenditure for the WEM projects.

The approved WEM forecast capital expenditure is 15 per cent lower than AEMO's proposal. Most of the \$11.4 million variance is due to the ERA not approving 65 per cent of the requested expenditure for the digital roadmap project (\$8.4 million) and not approving or only partially approving forecast capital expenditure requested for some of the smaller business-as-usual projects (\$3 million)

The ERA approves forecast allowable revenue for AEMO's gas functions of \$6.1 million and forecast capital expenditure of \$0.5 million. The allowable revenue is \$0.2 million higher than AEMO's proposal for the same reasons that affected the WEM allowable revenue. The increase in forecasted capital expenditure approved, compared to the draft decision, is mostly from including the digital roadmap costs for the first AR5 year (\$0.3 million) and capitalising accommodation costs.

Tables comparing the final determination against the ERA's draft decision and AEMO's proposal for AR5 and actual and approved allowable revenue and forecast capital expenditure in the previous period (known as the fourth allowable revenue period or AR4) are provided below.<sup>3</sup>

---

<sup>3</sup> Small variances in the tables are due to rounding.

**Table 1: AEMO's proposed allowable revenue and capital expenditure for AR5 and the ERA's draft decision and final determination (\$'000 nominal)**

Item	AR4 approved	AR4 actual	AR5 proposed	AR5 draft decision	AR5 final determination	Variance to proposed
WEM allowable revenue	93,649	89,906	98,348	96,645	99,828	1,480
WEM forecast capital expenditure	32,113	28,779	77,203	20,813	65,791	(11,412)
GSI allowable revenue	5,619	5,460	5,893	5,893	6,067	174
GSI forecast capital expenditure	1,118	984	1,273	116	533	(740)

**Table 2: Proposed, draft and approved allowable revenue and capital expenditure for WEM Market Operations (\$'000 nominal)**

Item	2019/20	2020/21	2021/22	AR5 total
<b>AEMO proposed</b>				
<b>Allowable revenue</b>	<b>13,695</b>	<b>14,109</b>	<b>14,959</b>	<b>42,764</b>
Forecast capital expenditure – business-as-usual	9,197	2,127	1,689	13,013
Forecast capital expenditure – market reform	4,516	10,463	10,646	25,624
<b>Forecast capital expenditure-total</b>	<b>13,713</b>	<b>12,590</b>	<b>12,335</b>	<b>38,637</b>
<b>ERA draft decision</b>				
<b>Allowable revenue<sup>4</sup></b>	<b>13,656</b>	<b>13,847</b>	<b>14,509</b>	<b>42,012</b>
Forecast capital expenditure – business-as-usual	4,038	267	129	4,434
Forecast capital expenditure – market reform	3,948	1,441	1,486	6,875
<b>Forecast capital expenditure-total</b>	<b>7,986</b>	<b>1,708</b>	<b>1,615</b>	<b>11,309</b>
<i>Allowable revenue variance</i>	<i>(39)</i>	<i>(262)</i>	<i>(450)</i>	<i>(752)</i>
<i>Capital expenditure variance</i>	<i>(5,727)</i>	<i>(10,882)</i>	<i>(10,720)</i>	<i>(27,328)</i>
<b>ERA final determination</b>				
<b>Allowable revenue</b>	<b>13,948</b>	<b>15,007</b>	<b>15,840</b>	<b>44,795</b>
Forecast capital expenditure – business-as-usual	9,045	681	514	10,240
Forecast capital expenditure – market reform	4,468	9,689	10,072	24,229
<b>Forecast capital expenditure-total</b>	<b>13,513</b>	<b>10,370</b>	<b>10,586</b>	<b>34,469</b>
<i>Allowable revenue variance</i>	<i>253</i>	<i>898</i>	<i>881</i>	<i>2,031</i>
<i>Capital expenditure variance</i>	<i>(200)</i>	<i>(2,220)</i>	<i>(1,749)</i>	<i>(4,168)</i>

<sup>4</sup> For this final determination, the ERA adjusted the allowable revenue to remove the depreciation for the capital projects that are not approved and to account for the accounting standard changes in the treatment of leases.

**Table 3: Proposed, draft and approved allowable revenue and capital expenditure for WEM System Management (\$'000 nominal)**

Item	2019/20	2020/21	2021/22	AR5 total
<b>AEMO proposed</b>				
<b>Allowable revenue</b>	<b>17,866</b>	<b>18,594</b>	<b>19,123</b>	<b>55,584</b>
Forecast capital expenditure – business-as-usual	7,893	2,769	2,280	12,942
Forecast capital expenditure – market reform	4,516	10,463	10,646	25,624
<b>Forecast capital expenditure-total</b>	<b>12,408</b>	<b>13,232</b>	<b>12,926</b>	<b>38,566</b>
<b>ERA draft decision</b>				
<b>Allowable revenue</b>	<b>17,820</b>	<b>18,182</b>	<b>18,632</b>	<b>54,634</b>
Forecast capital expenditure – business-as-usual	2,351	125	153	2,629
Forecast capital expenditure – market reform	3,948	1,441	1,486	6,876
<b>Forecast capital expenditure-total</b>	<b>6,299</b>	<b>1,566</b>	<b>1,639</b>	<b>9,504</b>
<i>Allowable revenue variance</i>	<i>(46)</i>	<i>(412)</i>	<i>(492)</i>	<i>(950)</i>
<i>Capital expenditure variance</i>	<i>(6,109)</i>	<i>(11,666)</i>	<i>(11,287)</i>	<i>(29,062)</i>
<b>ERA final determination</b>				
<b>Allowable revenue</b>	<b>17,661</b>	<b>18,439</b>	<b>18,933</b>	<b>55,033</b>
Forecast capital expenditure – business-as-usual	5,779	755	560	7,094
Forecast capital expenditure – market reform	4,467	9,689	10,072	24,228
<b>Forecast capital expenditure-total</b>	<b>10,246</b>	<b>10,444</b>	<b>10,632</b>	<b>31,322</b>
<i>Allowable revenue variance</i>	<i>(205)</i>	<i>(155)</i>	<i>(190)</i>	<i>(551)</i>
<i>Capital expenditure variance</i>	<i>(2,162)</i>	<i>(2,788)</i>	<i>(2,294)</i>	<i>(7,244)</i>

**Table 4: Proposed, draft and approved allowable revenue and capital expenditure for GSI (\$'000 nominal)**

Item	2019/20	2020/21	2021/22	AR5 total
<b>AEMO proposed</b>				
Allowable revenue	2,045	1,925	1,923	5,893
Forecast capital expenditure	590	362	322	1,273
<b>ERA draft decision</b>				
Allowable revenue	2,045	1,925	1,923	5,893
Forecast capital expenditure	72	20	24	116
<i>Allowable revenue variance</i>	-	-	-	-
<i>Capital expenditure variance</i>	(518)	(342)	(298)	(1,157)
<b>ERA final determination</b>				
Allowable revenue	2,056	2,005	2,006	6,067
Forecast capital expenditure	402	62	69	533
<i>Allowable revenue variance</i>	11	80	83	174
<i>Capital expenditure variance</i>	(188)	(300)	(253)	(740)

# 1. Introduction

The Wholesale Electricity Market rules state that the ERA must take certain requirements into account when determining the Australian Energy Market Operator's (AEMO) allowable revenue and forecast capital expenditure. These are the costs AEMO can recover through fees charged to market participants.<sup>5</sup> The expenditure covers the services AEMO provides in the Western Australian electricity and gas markets.

The ERA must take the following into account when making its determination:

- The allowable revenue must be sufficient to cover the forward-looking cost of providing AEMO's market operator, system management and market reform functions.
- The allowable revenue and forecast capital expenditure must include only costs which would be incurred by a prudent provider of the services, acting efficiently and seeking to achieve the lowest practicably sustainable costs of delivering the services.
- The ERA should benchmark the allowable revenue and forecast capital expenditure against the costs of providing similar services in other jurisdictions.
- The costs incurred by AEMO should be allocated on a fair and reasonable basis between costs recoverable under the market rules and other costs not recovered under the market rules.

AEMO seeks approval of its allowable revenue and forecast capital expenditure every three years. The current period ends on 30 June 2019 and the next period extends from 1 July 2019 to 30 June 2022. AEMO can apply to the ERA to approve additional allowable revenue and forecast capital expenditure within a three-year period, if:

- Budgeted capital expenditure for a financial year is more than 10 per cent greater than the forecast capital expenditure approved by the ERA for the review period.<sup>6</sup>
- Revenue recovery for a financial year is likely to result in allowable revenue greater than 15 per cent of the allowable revenue approved by the ERA for the review period.<sup>7</sup>

## 1.1 Determination process and timeline

On 15 March 2019, the ERA received a proposal from AEMO seeking approval for its allowable revenue and forecast capital expenditure for the period 1 July 2019 to 30 June 2022 (referred to for convenience as the fifth allowable revenue period or AR5). This proposal covers AEMO's activities in the Wholesale Electricity Market (WEM) and its Gas Service Information (GSI) functions.

The ERA published AEMO's proposal and a short issues paper on 20 March 2019. Eight submissions were received that have informed the draft decision and final determination.

On 8 May 2019, the ERA published a draft decision, seeking further feedback from interested parties. There were seven submissions, including two from AEMO. A summary of these submissions is provided in chapter 4 and they informed the final determination that was required to be published by the legislative deadline of 14 June 2019.

<sup>5</sup> Rule Change Panel, 2019, *Wholesale Electricity Market Rules*, clause 2.22A.2 ([online](#))

<sup>6</sup> Ibid, Clause 2.22A.9

<sup>7</sup> Ibid, Clause 2.22A.8

The ERA commissioned reports from two consultants to inform its decision-making:

- A report providing advice on AEMO's forecast capital program from technical consultant Intelligent Energy Systems.
- A report on the comparable costs of operating electricity markets in different jurisdictions from The Lantau Group.

Both reports are available on the ERA's website.<sup>8</sup>

An amendment to WEM rule 1.20 in 2018, reduced the usual review timeline from four to three months. The ERA undertook a three-stage process for reviewing and approving AEMO's proposal for AR5. This included consultation on a draft decision, which increased the level of engagement for AEMO and market participants compared to previous reviews. The ERA undertook the additional consultation because the capital expenditure proposed for AR5 was more than double the actual capital expenditure in the previous period and included two large-scale but early-stage projects.

The ERA thanks all participants that contributed to the review process.

---

<sup>8</sup> IES, 2019, Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal, ([online](#)) and The Lantau Group, 2019, *Comparable Costs of Operating Electricity Markets in Different Jurisdictions*, ([online](#))

## 2. AEMO's AR5 proposal

AEMO's AR5 proposal covered:

- Business-as-usual functions in the Wholesale Electricity Market (WEM), including market operation and administration, system planning and system management.<sup>9</sup>
- WEM reform activities including preparing for and facilitating the implementation of WEM and constrained network access reform.<sup>10</sup>
- Functions under the Gas Service Information (GSI) rules, such as operating the Western Australian Gas Bulletin Board and preparing the Western Australian Gas Statement of Opportunities.<sup>11</sup>

AEMO's response to the ERA's draft decision provided additional information on projects not approved in the draft decision and other updated information, such as revised cost estimates and actual year-to-date operating expenditure. AEMO also updated its capital expenditure forecast to accommodate a recent change to Australian Accounting Standard 16. From 1 January 2019, operating leases, formerly treated as operating costs, must be capitalised and are subsequently expensed through depreciation and interest charges. AEMO will apply the revised treatment of operating leases from 1 July 2019.

Most WEM allowable revenue (\$98.3 million) was for AEMO's business-as-usual activities. The only allowable revenue allocated to WEM reform activities (\$0.6 million) was for staff training. This was evenly split between market operations and system management functions.

WEM forecast capital expenditure, \$77.2 million, was allocated 34 per cent to business-as-usual activities and 66 per cent to AEMO's large-scale WEM reform project. Just under half of the business-as-usual forecast capital expenditure (49 per cent) was allocated to AEMO's digital roadmap project. Following the draft decision, AEMO updated its forecast capital expenditure, which resulted in a total WEM forecast capital expenditure request of \$78.4 million, an increase of \$1.2 million.

GSI expenditure is small in comparison to the WEM: \$5.9 million in allowable revenue, and \$1.3 million in forecast capital expenditure. In response to the draft decision, AEMO made a minor reduction of \$0.1 million to its estimated forecast capital expenditure, down to \$1.2 million.

### 2.1 Allowable revenue

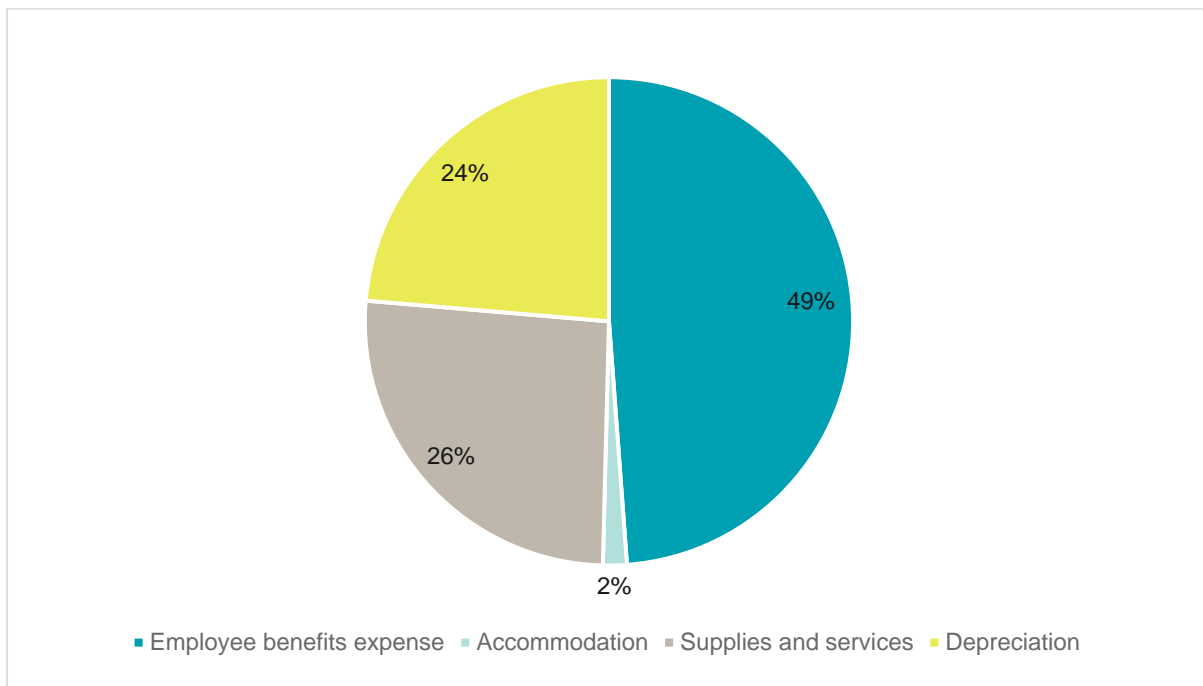
Forecast operating expenditure was grouped into four categories for AR5: employee benefits, supplies and services, depreciation and accommodation. AEMO did not include borrowing costs in its forecast allowable revenue for AR5. The reason for this is outlined in section 5.1.4. The allocation by expense categories for WEM allowable revenue is shown in Figure 1 below and reflects the approved allowable revenue.

<sup>9</sup> AEMO's business-as-usual functions are listed in clause 2.22A.1 of the market rules.

<sup>10</sup> AEMO's market reform activities are listed in WEM rule 1.20.

<sup>11</sup> Rule Change Panel. 2019, *Gas Service Information Rules*, clause 8, ([online](#))



**Figure 1 WEM AR5 approved allowable revenue by expense category**

Source: ERA analysis of AEMO data

AEMO proposed allowable revenue for AR5 (\$104.2 million) that is five per cent higher than the amount approved in AR4 (\$99.3 million). The proposed employee benefits expense is 24 per cent higher than that approved for AR4. This was driven by higher staff numbers and salary increases from AEMO's 2018 Enterprise Agreement. However, the increase is partially offset by an anticipated 19 per cent reduction in supplies and services expenditure from bringing IT support and system management IT functionality in-house.

AEMO applied different escalation factors on the different cost categories to reflect contractual obligations (for employee and accommodation costs) and applied an average Consumer Price Index (CPI) increase of 2.1 per cent across the AR5 period.

Resource expenditure for employees and contractors accounts for 50 per cent of the allowable revenue and 62 per cent of the forecast capital expenditure.

AEMO anticipated an increase in its permanent operational staff. This is predominantly in system management, where it intends to hire additional staff after all remaining system management systems had been brought in-house.<sup>12</sup> Temporary staff would also increase. There were two main reasons for this.

- Some operational staff, both from market operations and system management, seconded to capital projects during AR5, would be backfilled through fixed-term contractors.
- Temporary staff would be engaged to undertake capital projects. The increased numbers of contract staff, labour hire and consultants would reduce as capital projects were delivered in later allowable revenue periods.<sup>13</sup> Under the WEM reform timeline the new market is set to commence on 1 October 2022. This date falls in the first year of AR6.

<sup>12</sup> Through the System management systems transition and Power system operation projects

<sup>13</sup> The next allowable revenue period is AR6, which runs from 1 July 2022 to 30 June 2025.

Forecast expenditure on consultants is capitalised and not included in allowable revenue, other than as part of depreciation.<sup>14</sup>

During AR4, AEMO relocated to a single Perth office. The forecast cost of this accommodation in AR5 is lower than what was approved for AR4. This is because the AR4 approval was based on a higher per square meter cost.

Over half of the forecast expenditure on supplies and services is for payments to consultants (legal, IT and others). However, overall forecast expenditure on supplies and services in AR5 is lower than that approved for AR4. This is mostly because AEMO will have ended the service level agreement with Western Power for the provision of system management services. AEMO is undertaking a separate capital project to bring all system management systems in-house. Completing this and the power system operations project will conclude the transfer of system management functions from Western Power to AEMO.

The proposed forecast depreciation for AR5 (\$20.6 million) is 13 per cent higher than was approved for AR4 (\$18.3 million). This is because the depreciation charges from capital projects completed in AR4 and in the first two years of AR5 will be incurred during AR5. The depreciation for the largest capital projects (WEM reform) is not included in AR5 depreciation forecasts. The capital costs of this project will be depreciated over later allowable revenue periods.

The ERA's draft decision was to approve the allowable revenue. AEMO did not propose any changes to allowable revenue in its response to the draft decision. The ERA asked AEMO to update its allowable revenue forecast in advance of the final determination to correct for the following:

- A change to Australian Accounting Standard 16, as discussed in section 5.1.2.
- Some minor errors identified through the ERA's review process.
- A change to depreciation charges following the ERA' approval of forecast capital expenditure for AR5.

## 2.2 Capital projects

AEMO's proposal outlined the approach it took to estimate and internally approve capital costs for the three-year AR5 period. It used a standardised cost estimation model and an internal top-down challenge process to determine which proposed projects were to be included in the AR5 proposal.<sup>15</sup> AEMO has an established governance structure with clear roles and responsibilities that it used to develop the AR5 initial proposal. AEMO's board endorsed the AR5 proposal.<sup>16</sup>

Although AEMO used a consistent project cost estimation model and internal governance procedures to prepare its proposal, AEMO also acknowledged that its confidence in estimates varied:

The timing of the three-year AR5 forecast requirements result in many projects being developed and assessed at an earlier stage than would otherwise be expected in the AEMO governance lifecycle. As a result, the level of detail and/or confidence in estimates

<sup>14</sup> The treatment of consultants' expenditure is explained in section 5.1.1 Employee benefits.

<sup>15</sup> AEMO, 2019, *2019-2022 allowable revenue and forecast capital expenditure submission to the Economic Regulation Authority*, PP. 29 to 31, ([online](#))

<sup>16</sup> Ibid, P. 29

will vary across projects – especially those moving into or starting later in the AR5 period or those of significant scale and duration.<sup>17</sup>

In its initial proposal, AEMO managed the uncertainty of estimating capital project costs by applying project contingencies. It began with a project contingency of 30 per cent, which was then adjusted upwards or downwards after considering several factors, such as:<sup>18</sup>

Timing of the cost estimate (e.g. are there known business requirements and/or has rule drafting been provided?).

Nature of the project (e.g. is this lifecycle upgrade for a known application or is it a bespoke project based on specific regulatory requirements?).

Size and complexity of project (e.g. is it a small internal project or is it a multi-year project with multiple vendor and stakeholder interactions?).

Nature and status of risk, assumptions, issues and dependencies.

AEMO included project contingency expenditure of \$17.9 million in its AR5 proposal, or 30 per cent of the total forecast capital expenditure. Contingency percentages for individual projects ranged from 10 to 56 per cent. Most of the 22 capital projects identified in its proposal had contingencies of 29 per cent or higher.

Following recommendations in the ERA's draft decision, AEMO recalculated contingencies for all its projects using a project risk assessment method. This approach linked the contingency amount to identified project risks and the likelihood of them occurring. The exercise reduced total project contingency from \$17.9 million to \$14.8 million, and from an average contingency of 30 per cent per project to an average of 25 per cent per project.

Ongoing decisions also affected AEMO's cost estimates. AEMO made several adjustments to its expenditure estimates after its initial proposal. For example, AEMO cancelled one project it deemed no longer necessary, and the expenditure for some other projects was brought forward into AR4. The ERA has considered these adjustments to estimated project costs as part of its final determination in chapter 5.

The two largest capital projects, WEM reform (\$51.3 million, later adjusted to \$48.5 million) and the digital roadmap (\$13.8 million) are discussed separately below.

### 2.2.1 WEM reform

In June 2018, the Minister for Energy conferred additional functions on AEMO to “prepare for” and to “facilitate the implementation of” WEM and constrained network access reform.<sup>19</sup>

The WEM reform program plans to deliver a new market design, to be operational from 1 October 2022. The main elements of the new WEM design are known: security constrained economic dispatch, co-optimised energy and ancillary services markets, facility bidding, and some form of constrained network access.

On 6 March 2019, the Minister for Energy launched the Energy Transformation Strategy. In May 2019, the Minister for Energy incorporated the projects and deliverables of WEM and constrained network access reform into the foundation regulatory framework tranche of this transformation strategy. However, the Minister has not changed market rule 1.20, which outlines AEMO's functions in the WEM reform project. For the AR5 final determination, the

<sup>17</sup> Ibid, P. 48, footnote 19

<sup>18</sup> Ibid, P. 48

<sup>19</sup> Rule Change Panel, 2018, *Wholesale Electricity Market Rules (11 January 2019)*. Clause 1.20, ([online](#))

ERA has assumed that the foundation regulatory framework and WEM and constrained network access reform have remained the same.

Incorporating WEM and constrained network access reform into a wider energy transformation strategy introduces the possibility that AEMO's role and responsibilities may change during AR5. As the strategy develops and more clarity emerges during the first year of AR5 AEMO may have to reassess its allowable revenue and forecast capital expenditure requirements, which may require an in-period submission.

For its WEM reform activities, AEMO's initial proposal advised that it had provided its "best estimate based on the information available"<sup>20</sup> and would continue to "refine and review the expenditure program to ensure activities are developed for the lowest sustainable cost".<sup>21</sup> This suggests WEM reform costs will continue to change.

AEMO grouped<sup>22</sup> its market reform activities into three categories:

- Market design – designing, developing and consulting about changes to the legislation applying to the WEM, including the market rules.
- Implementation – procuring, developing and testing all systems, tools and procedures.
- Program management – project management, governance, planning, change management and stakeholder management activities.

AEMO's initial proposal provided a high-level WEM reform timeline. This showed that market design activities would continue to mid-2020, culminating in the approval of revised market rules to enable security constrained economic dispatch. Implementation activities, such as the design, building and testing of IT systems and business processes to deliver the new market design, are scheduled to increase from mid-2020 through the end of the AR5 period. This is in readiness for the planned start date of the new market design on 1 October 2022.

## 2.2.2 Digital roadmap

AEMO is developing a digital roadmap for all its Australian operations.<sup>23</sup>

The Digital Roadmap sets out a strategy whereby AEMO's systems, data repositories, computing platforms, cyber security and technical solutions will be consolidated and simplified for use by all parts of the organisation, with flow on benefits to participants and consumers.

AEMO initially estimated Western Australia's share of the digital roadmap expenditure at \$13.8 million, allocating \$12.7 million to the WEM and \$1.1 million to GSI. AEMO provided commercial-in-confidence information to the ERA on how it allocated costs to Western Australia.

In its initial AR5 proposal, AEMO identified some of the anticipated benefits based on analysis of National Electricity Market data and systems and stated, "it is reasonable to assume similar benefits will be realised in the WEM".<sup>24</sup> However, AEMO has not separately determined the

<sup>20</sup> AEMO, 2019, *2019-2022 allowable revenue and forecast capital expenditure submission to the Economic Regulation Authority*, P. 77, ([online](#))

<sup>21</sup> Ibid, P. 77

<sup>22</sup> Ibid, P. 107

<sup>23</sup> Ibid, P. 67

<sup>24</sup> Ibid, P. 72

benefits to Western Australia. However, some provisional, high-level Western Australian costs and benefits from the digital roadmap were provided to the ERA during the review process.

AEMO's response to the draft decision recommended that the ERA approve digital roadmap forecast capital expenditure for all three years of AR5 so the project could proceed, and Western Australia could benefit from the large-scale IT improvements. However, if this were not possible, AEMO requested that ERA approve a minimum of \$4.8 million for elements of the digital roadmap to be delivered in 2019/20.

These projects are to improve AEMO's corporate business systems and operations. AEMO provided information on the background, scope, options, benefits and costs for each of the 13 individual digital roadmap sub-projects included in the \$4.8 million minimum forecast capital expenditure request. AEMO would then make an in-period submission for the remainder of digital roadmap expenditure for AR5.

### 3. The ERA's obligations in the market rules

Under the Wholesale Electricity Market (WEM) rules, AEMO must seek approval for its allowable revenue and forecast capital expenditure from the ERA for its market operation, system management and WEM reform functions.

Clause 2.22A.11 of the market rules requires the ERA to take the following into account when determining AEMO's allowable revenue and forecast capital expenditure:

- The allowable revenue must be sufficient to cover the forward-looking costs of providing the services described in clause 2.22A.1 of the market rules.
- The allowable revenue and forecast capital expenditure should include only costs which would be incurred by a prudent service provider acting efficiently and seeking to achieve the lowest practicably sustainable costs of delivering the services described in clause 2.22A.1.
- Where possible, the ERA should benchmark AEMO's proposal against the costs of providing similar services in other jurisdictions.
- Costs must be allocated fairly and reasonably between AEMO's WEM and national activities, gas and electricity activities, and those functions for which it can recover costs and those for which it cannot under the market rules.

These requirements apply to both AEMO's WEM and Gas Services Information (GSI) functions and are discussed in greater detail in section 3.1. The applicable market rules are reproduced in Appendix 3.

The ERA initially assessed AEMO's forecast capital expenditure using the same determination framework used for previous determinations. This approach included the ERA's interpretation of the market rules and is described in section 3.1.

On 31 May 2019, AEMO made a second submission in response to the ERA's draft decision that provided new information regarding the ERA's interpretation of its obligations under the market rule<sup>25</sup>. The ERA considered this new information and has now applied a new determination framework.

This chapter has been included in the final determination to explain the change between the ERA's draft and final determinations, due to the application of the new framework.

The ERA's final determination in chapter 5 should be read in conjunction with the new framework summarised in section 3.1.

#### 3.1 Framework for the ERA's determination decisions

AEMO's second submission in response to the draft decision covered three aspects of the ERA's interpretation of its obligations:

- what the ERA must consider when approving AEMO's proposal
- the scope and timing of the WEM and constrained network access reform
- the period for which the determination must be made.

<sup>25</sup> AEMO, 2019, *Draft decision – AEMO's allowable revenue and forecast capital expenditure – review period from 1 July 2019 to 30 June 2022 – legal reasoning concerns*, ([online](#))

These are discussed separately below.

### 3.1.1 Approving AEMO's proposal

Clause 2.22A.11 of the market rules requires the ERA to take four matters into account when determining AEMO's allowable revenue and forecast capital expenditure. These four matters are replicated below.

- a. The Allowable Revenue must be sufficient to cover the forward-looking costs of providing the services described in clause 2.22A.1 and performing AEMO's functions and obligations under these Market Rules in accordance with the following principles:
  - i. Recurring expenditure requirements and payments are recovered in the year of the expenditure.
  - ii. Capital expenditure is to be recovered through the depreciation and amortisation of the assets acquired by the capital expenditures in a manner that is consistent with generally accepted accounting principles.
  - iii. Notwithstanding clauses 2.22A.11(a)(i) and 2.22A.11(a)(ii), expenditure incurred, and depreciation and amortisation charged, in relation to any Declared Market Project are to be recovered over the period determined for that Declared Market Project.
- b. The Allowable Revenue and Forecast Capital Expenditure must include only costs which would be incurred by a prudent provider of the services described in clause 2.22A.1, acting efficiently, seeking to achieve the lowest practicably sustainable cost of delivering the services described in clause 2.22A.1 in accordance with these Market Rules, while effectively promoting the Wholesale Market Objectives.
- c. Where possible, the Economic Regulation Authority should benchmark the Allowable Revenue and Forecast Capital Expenditure against the costs of providing similar services in other jurisdictions.
- d. Where costs incurred by AEMO relate to both the performance of functions in connection with the Market Rules, and the performance of AEMO's other functions, the costs must be allocated on a fair and reasonable basis between:
  - i. Costs recoverable as part of AEMO's Allowance Revenue and Forecast Capital Expenditure.
  - ii. Other costs not to be recovered under the Market Rules.

In previous allowable revenue determinations, the ERA has interpreted clause b above in the context of the market objective "to minimise the long-term cost of electricity supplied to customers from the South West interconnected system".

The ERA has previously tested the information provided by AEMO to see if it had proposed the lowest practicably sustainable costs for its activities. The ERA's methods of testing this included verifying whether AEMO:

- Included detailed information on the activities to be undertaken, including how those activities would contribute to the market objectives.



- Arrived at cost estimates by using robust models and governance mechanisms such that AEMO, market participants and the ERA could have confidence in the estimates underpinning the proposal.
- Considered different ways of delivering the projects/outcomes and demonstrated that the preferred option was the lowest practicable sustainable cost, such as through option analysis and/or cost benefit analysis.

### *AEMO's submission*

AEMO's second submission to the ERA's draft decision addressed the ERA's interpretation of clause 2.22A.11(b). AEMO's submission stated that while the ERA's draft decision characterised this clause (and AEMO's need to seek the lowest practicable cost) as a requirement to approve its proposal, under the rules, the ERA only had to take the clause into account.

AEMO also noted the ERA was only required to approve costs incurred by a service provider "seeking to achieve the lowest practicable sustainable costs", rather than actually achieving the lowest cost. Therefore, if AEMO could demonstrate that it had taken a reasonable approach to estimating its costs, the ERA was required to approve them.

### *New determination framework*

The ERA considered AEMO's second submission and agrees that, to reach its final determination, the ERA needed to satisfy itself that AEMO:

- Had acted prudently in proposing the allowable revenue and forecast capital expenditure.
- Was seeking to achieve the lowest practically sustainable cost of delivering the services.

Using this revised approach, the ERA first determined whether a project was necessary (and therefore prudent). If the project supported one of AEMO's obligations under the market rules, then the ERA deemed it prudent. The exception is allowable revenue and forecast capital expenditure that AEMO proposed for its WEM reform and constrained network access functions. The reason for this is covered in section 3.1.2 below.

Once it considered a proposed project prudent, the ERA then assessed if the project as described and costed was efficient. This included looking for evidence that AEMO:

- used a consistent project cost estimation model
- had a defined project management and governance process
- compared estimated costs against the actual costs of similar projects
- had undertaken a competitive procurement process for products and services
- was actively optimising its resources.

If that evidence is available, then the ERA must approve the proposed costs.

If the ERA determines that a capital project is not prudent, then it does not need to apply the efficiency test.



The ERA has determined that AEMO’s forecast capital expenditure for the digital roadmap projects was not prudent. The reasons for this are explained in chapter 5.

### 3.1.2 Scope and timing of WEM reform

Clause 1.20 in the market rules provides guidance on the additional functions for WEM and constrained network access reform, conferred on AEMO by the Minister for Energy in June 2018. Sub-clauses one and two (replicated below) of market rule 1.20 identify AEMO’s functions. This is expanded by the Minister’s letter to AEMO, submitted as part of AEMO’s proposal, that detailed the specific tasks expected of AEMO in the WEM reform program.<sup>26</sup>

The WEM Regulations provide for the Market Rules to confer additional functions on AEMO. Until 1 October 2022, the following additional functions are conferred on AEMO:

- To prepare for Wholesale Electricity Market and Constrained Network Access Reform.
- To facilitate the implementation of Wholesale Electricity Market and Constrained Network Access Reform (including through transitional measures).

Without limiting AEMO’s discretion in performing its functions, AEMO may undertake any of the following activities in carrying out the function conferred on it under clause 1.20.1:

- Procuring, developing, testing and otherwise preparing all systems, tools and procedures necessary or convenient for AEMO to continue to provide services and perform its functions and obligations on and from the commencement of Wholesale Electricity Market and Constrained Network Access Reform.
- Designing, developing, and consulting about, changes to the legislative regime applying to the Wholesale Electricity Market (including the Electricity Industry Act, the Regulations and these Market Rules) to accommodate Wholesale Electricity Market and Constrained Network Access Reform.
- Project management, governance, planning, change management and stakeholder management activities to facilitate implementation of Wholesale Electricity Market and Constrained Network Access Reform.

Sub-clause 1.20.3 states the timeline for delivery of the reforms and is replicated below.

When determining and approving the Allowable Revenue and Forecast Capital Expenditure or a reassessment of the Allowable Revenue or Forecast Capital Expenditure for AEMO for all or part of the Review Periods from 1 July 2016 to 1 July 2019 and 1 July 2019 to 1 July 2022, the Economic Regulation Authority must determine them on the basis that Wholesale Electricity Market and Constrained Network Access Reform will be implemented before 1 October 2022.

The ERA had previously interpreted this as saying that delivery of WEM and constrained network access reform is expected by 1 October 2022. The ERA understood the wording in sub-clause 1.20.3 above “for all or part of the Review Periods” to mean that it did not have to

<sup>26</sup> AEMO, 2019, *2019-2022 allowable revenue and forecast capital expenditure submission to the Economic Regulation Authority*, P. 93, ([online](#))

approve forecast capital expenditure for a whole three-year review period. Instead, the ERA could stage the approval of forecast capital expenditure of the WEM reform project. Market reforms are still at an early stage and there is uncertainty in the detail of the new market design and the IT systems and business processes necessary to deliver reform by the due date. Staging the approval of forecast capital expenditure for AEMO's WEM reform activities would ensure that, as the project progresses, there would be more information available for AEMO to provide more robust cost estimates.

### *AEMO's submission*

AEMO's second submission to the ERA's draft decision addressed the interpretation of this clause.

Clause 1.20.3 of the market rules requires the ERA to make its determination on the basis that reforms will be delivered by the target date. AEMO stated that the draft decision did not give effect to clause 1.20.3 for two reasons:<sup>27</sup>

- The draft decision suggested that the Minister for Energy's endorsement of the WEM reforms provided some certainty that they would proceed as planned. AEMO stated that this suggested a level of confidence that was less than absolute certainty, whereas the clause required the ERA to assume that the changes will be implemented.
- The draft decision suggested that it was too early in the WEM reform process for AEMO to estimate costs that met the determination requirement. AEMO's said that "it is not necessary for the WEM reform process to advance to a point where there is drafting to implement the necessary changes".

### *New determination framework*

The ERA considered AEMO's second submission and has revised its approach. The ERA has no discretion to determine whether the activities and timing of the WEM and constrained network access reform are prudent and efficient. The changes to market rule 1.20 and the Minister for Energy's endorsement of AEMO's activities remove this test.

The test for reviewing AEMO's proposed WEM reform expenditure is whether AEMO has sought to estimate the lowest practicably sustainable cost.

AEMO provided the ERA with the cost estimation model it used to forecast capital expenditure for the WEM reform project for AR5. The ERA concluded that this model was reasonable and therefore approved the costs. The ERA notes that cost forecasts for later years are top-down and high level and are likely to change.

## **3.1.3 The allowable revenue and forecast capital expenditure period**

Clause 2.22A.2(c) of the market rules provides guidance on the timing and duration of allowable revenue and forecast capital expenditure proposals and determinations.

<sup>27</sup> AEMO, 2019, *Draft decision- AEMO's allowable revenue and forecast capital expenditure – review period from 1 July 2019 to 30 June 2022 – legal reasoning concerns* ([online](#))

For the Review Period, AEMO must seek the approval of its Allowable Revenue and Forecast Capital Expenditure from the Economic Regulation Authority for each of the services described in clause 2.22A.1 in accordance with the following:

- a. By 30 November of the year prior to the start of the Review Period, AEMO must submit a proposal for its Allowable Revenue and Forecast Capital Expenditure over the Review Period.
- b. The Economic Regulation Authority must undertake a public consultation process in approving AEMO's Allowable Revenue and Forecast Capital Expenditure for a Review Period, which must include publishing an issues paper and issuing an invitation for public submissions.
- c. By 31 March of the year in which the Review Period commences, the Economic Regulation Authority must determine AEMO's Allowable Revenue and approve the Forecast Capital Expenditure of AEMO for the Review Period for each of the services described in clause 2.22A.1.

The timing of AEMO's AR5 initial proposal and the ERA's final determination were modified by clause 1.20.5(b) to 15 March 2019 and 14 June 2019 respectively.

Previously, the ERA has made determinations for three-year allowable revenue periods. However, the market rules also allow for in-period submissions.<sup>28</sup> AEMO made three in-period submissions during the current allowable revenue period (AR4).

### *AEMO's submission*

AEMO's second submission stated that, under the market rules the ERA must determine AEMO's allowable revenue and capital expenditure for a full, three-year review period. AEMO stated that the proposed staged or partial approach to approving forecast capital expenditure for WEM reform as suggested in the draft decision was not permitted under clause 2.22A.2(c.).

### *New determination framework*

As the ERA has determined that AEMO's proposed capital expenditure for WEM reform was reasonable (detailed above in section 3.1.2), it must approve this expenditure for the full three years of AR5.

## **3.2 Benchmarking**

The market rules require the ERA to, where possible, "benchmark the Allowable Revenue and Forecast Capital Expenditure against the costs of providing similar services in other jurisdictions".<sup>29</sup>

Direct cost comparison across jurisdictions is complicated by the different structure and operation of wholesale electricity markets in different jurisdictions. Institutional and legislative arrangements can differ, market designs can differ, the type and diversity of the different services or functions offered by the market and system operators can differ, as can the market

<sup>28</sup> Rule Change Panel, 2018, *Wholesale Electricity Market Rules (11 January 2019)*. Clause 2.22A.8 and 2.22A.9, ([online](#))

<sup>29</sup> Rule Change Panel, 2018, *Wholesale Electricity Market Rules (11 January 2019)*. Clause 2.22A.11(c), ([online](#))

size and the degree of complexity. There are also differences in the amount of information publicly available on market operation and system management costs.

The ERA wanted to know if benchmarking of the kind suggested in the market rules could inform its determination. The ERA was interested to understand whether AEMO's cost estimates diverged from the costs of other market and system operators when performing the same or similar functions and activities and if so why. The ERA asked The Lantau Group (TLG) to:

- Research the high-level range of costs of operating electricity markets in different jurisdictions.
- Consider why the costs differ between jurisdictions and identify the main drivers of costs in each jurisdiction.
- Compare the costs of common market operation activities in different jurisdictions.
- Investigate how the cost of operating electricity markets in each jurisdiction considered has changed over time, particularly where in a jurisdiction there has been a significant change in the market design or significant changes of market rules or functions and how the costs varied pre, during and post the market changes.
- Identify for each jurisdiction, what regulatory oversight or other mechanisms exist to ensure the costs of operating the wholesale market are efficient. Are there any material differences in the costs of electricity markets that are regulated compared to those that use other mechanisms, and what could be driving these differences?

TLG's final report is available on the ERA's website.<sup>30</sup> In preparing its report TLG considered the following markets:

- National Electricity Market (NEM)
- Singapore
- New Zealand
- Pennsylvania New Jersey Maryland (PJM), United States of America
- United Kingdom
- Ireland
- South Korea

As anticipated, there were problems in making direct like-for-like comparison of operating costs across jurisdictions because of differences in their wholesale markets. The size, in MW, of an electricity market is a driving factor when reviewing operating costs. TLG noted that the WEM was smaller by half, in terms of MWs sold, than the next wholesale market considered by size, New Zealand. Its report suggested that "larger markets appear to have a cost advantage often despite also having more complex markets".<sup>31</sup> Therefore, the benefits of scale in reducing costs may outweigh upward pressure on costs from increasing market complexity.

---

<sup>30</sup> The Lantau Group, 2019, *Comparable Costs of Operating Electricity Markets in Different Jurisdictions*, ([online](#))

<sup>31</sup> The Lantau Group, 2019, *Comparable Costs of Operating Electricity Markets in Different Jurisdictions*, P.3, ([online](#))

With fewer transactions over which to recover costs, TLG found that WEM unit costs were very high compared to other market and system operators, although TLG observed a downward trend from 2016/17 to 2018/19. TLG explored whether Western Australia would benefit in terms of economies of scale from AEMO also operating in the National Electricity Market and concluded that, in the short term:

WA may gain benefits of scale and cost synergies from joining AEMO, but almost certainly in the near term there will be adjustment costs as existing and new systems are enhanced or expanded. Evidence of these benefits will also be confounded by the fact that the WEM is expected to adopt and thus implement through new systems and process a number of significant wholesale market changes.<sup>32</sup>

TLG also reviewed the distribution of operating costs across individual expense classes, such as employee benefits, supplies and services, and accommodation in different jurisdictions. This was to understand whether the distribution of costs across expense categories in the WEM differed from Singapore, the next comparable market in size for which sufficiently detailed information was available. If there were differences in the distribution of costs this may identify expense categories for further investigation. However, this was not the case. Although the total costs in each category differ, the allocation of operating costs across expense categories in the WEM aligns with that in Singapore and is not significantly different from the cost allocation in the UK and in the PJM in the United States.<sup>33</sup>

Employee costs are the largest operating cost category in the jurisdictions considered. TLG compared the employee costs and benefits per employee across jurisdictions from 2016/17 to 2018/19. Overall, costs per Full Time Equivalent (FTE) have trended downwards in all jurisdictions. In 2018/19, the cost per FTE in the WEM of \$162,000 was similar to that in Singapore of \$159,000, although the Singapore Energy Market Company has double the number of FTEs.

The review of comparable costs of operating electricity markets in other jurisdictions has identified the limited extent to which the ERA is able to confidently benchmark allowable revenue and forecast capital expenditure for AEMO's WEM and GSI functions and draw meaningful comparisons. However, periodic reviews of comparable costs can determine how operating cost trends in the WEM move over time. While the WEM may not be able to benefit from economies of scale in the short term, AEMO may still be able to achieve operating efficiencies as it continues to operate in the WEM, particularly now that it has brought all system management functions in-house.

Direct cost comparisons with other jurisdictions are limited in how much they can demonstrate whether or not AEMO's costs in the WEM are efficient. TLG's report suggested "it makes sense to consider other ways to establish and maintain the credibility of cost levels being incurred".<sup>34</sup> Therefore, as part of its review, TLG also observed how other jurisdictions approached budgeting and governance, applied efficiency targets to market operators and system managers and how market fees are calculated and charged to market participants. These matters may be considered in more detail in future allowable revenue reviews and determinations.

<sup>32</sup> The Lantau Group, 2019, *Comparable Costs of Operating Electricity Markets in Different Jurisdictions*, P.21, ([online](#))

<sup>33</sup> The Lantau Group, 2019, *Comparable Costs of Operating Electricity Markets in Different Jurisdictions*, PP. 40-41, ([online](#))

<sup>34</sup> The Lantau Group, 2019, *Comparable Costs of Operating Electricity Markets in Different Jurisdictions*, PP.30, ([online](#))

## 4. Public consultation

On 20 March 2019, the ERA published an issues paper<sup>35</sup> to assist interested parties to make submissions on any aspect of AEMO's proposal. The ERA asked interested parties to review AEMO's proposal in detail. As two of AEMO's major capital projects were at an early stage of development, the ERA asked stakeholders whether they preferred the ERA to approve forecast capital expenditure:

- for the full three years of the AR5 period
- through a staged approach where AEMO proposes additional forecast capital expenditure as clarity and certainty develops through the market reform program.

Submissions to the issues paper closed on 15 April 2019. The ERA received eight submissions from: the Australian Energy Council, Bluewaters Power, the Chamber of Commerce and Industry of Western Australia, the Minister for Energy, NewGen Power Kwinana, Perth Energy, Synergy and Western Power. Submissions are available on the ERA's website.<sup>36</sup>

On 8 May, the ERA published its draft decision and asked stakeholders to provide feedback by 31 May 2019. The ERA received seven submissions, including two from AEMO, and these have informed the ERA's final determination.

### 4.1.1 On the issues paper

All submissions, excluding those from the Minister for Energy and Western Power, preferred a staged approach to approving forecast capital expenditure for AR5. Bluewaters Power and NewGen Kwinana suggested annual approvals:

Over AR4, there were several additional approvals for capex as the extent of reform became clearer, which is implicitly conducting annual approval processes. Therefore, given the extreme uncertainty over the AR5 period, an annual assessment of funding should be sought. Bluewaters also suggest that the whole funding process be performed annually, including the BAU Opex funding. An annual funding process would then mean no additional impost and should provide a better control on costs.<sup>37</sup>

The Chamber of Commerce and Industry also supported a staged, but not necessarily annual, approval approach:

CCIWA questions the need for AEMO to be approved funding to implement systems and processes that have not been designed yet. An incremental approach to approving capital expenditure would provide more certainty about the cost of reforms as the associated analysis and design work progresses.<sup>38</sup>

<sup>35</sup> Economic Regulation Authority, 2019, *Australian Energy Market Operator's allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*. ([online](#))

<sup>36</sup> Economic Regulation Authority website, 2019-2022 Allowable Revenue and Forecast Capital Expenditure ([online](#))

<sup>37</sup> Bluewaters Power, 2019, *Australian Energy Market Operator's allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 1, ([online](#))

<sup>38</sup> Chamber of Commerce and Industry, 2019, *Australian Energy Market Operator's allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 2, ([online](#))



Perth Energy said that WEM reform capital expenditure “must include alignment with the availability of cost benefit assessments of each block/phase/project of the WEM reform program”.<sup>39</sup>

Synergy suggested that the ERA maintain the AR4 approach whereby AEMO proposed and the ERA considered expenditure and allowable revenue in a staged manner as, and when, sufficient information and project certainty was provided. However, Synergy also recognised that it could be difficult for Market Participants to budget for in-period forecast capital expenditure adjustments.<sup>40</sup>

The Minister for Energy’s submission stated that “failure to provide funding certainty to AEMO over a multi-year period can only detract from its ability to plan for WEM and constrained network access reform as required under the market Rules and may ultimately increase the costs of AEMO’s work program”.<sup>41</sup> However, the Minister for Energy also acknowledged “that many aspects of future market and regulatory design are not yet finalised and will be determined over the next 12 months”.<sup>42</sup>

AEMO’s AR5 proposal suggested that a single allowable revenue and forecast capital expenditure determination would promote efficiency and eliminate the additional costs and resources required to develop in-period submissions.

Western Power preferred an “administratively simple determination process provided there is an appropriate adjustment mechanism such that revenue in future determinations can be reduced should the expenditure no longer be required”.<sup>43</sup> AEMO does adjust market fees for differences between actual and budgeted expenditure within an allowable revenue period. However, AEMO is also able to undertake other discretionary projects within its approved level of allowable revenue and forecast capital expenditure. Unless there is an in-period submission, there is no regulatory scrutiny of whether the cost of these discretionary projects meets the approval requirements in the market rules.

Comments in many of the submissions considered forecast capital expenditure proposed for the two largest capital projects, WEM reform and the digital roadmap. The Australian Energy Council said:

Considering the early stage of development of the market reform program, we are concerned with the ability to assess the AEMO revenue requirement, given the detail design of the wholesale market and the Information Technology systems required to operate such a market are yet to be identified. In other words, can the allowable revenue be efficiently determined in the absence of a detailed design?<sup>44</sup>

<sup>39</sup> Perth Energy, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 5, ([online](#))

<sup>40</sup> Synergy, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 3, ([online](#))

<sup>41</sup> Minister for Energy, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 2, ([online](#))

<sup>42</sup> Minister for Energy, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 2, ([online](#))

<sup>43</sup> Western Power, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 1, ([online](#))

<sup>44</sup> Australian Energy Council, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 1, ([online](#))

Perth Energy said that AEMO had not made a sufficiently strong case for funding the two largest capital projects:

The WEM reform initiatives are being driven by the PUO, and the digital roadmap is being driven by technical requirements in the NEM. AEMO is yet to demonstrate that the programs in their entirety can be considered prudent (in particular the timing) or that the costs included in the forecasts is reasonable and could be considered to reflect that of a service provider efficiently minimising costs for consumers.<sup>45</sup>

Six submissions commented on the proposed increases in future market fees. Bluewaters commented on the anticipated complexity of a new market design, “considering the makeup of the WEM, which is a net settled and heavily bilaterally contracted market, the benefit gained from creating and maintaining such a complex system at this cost is especially difficult to justify”.<sup>46</sup> Perth Energy’s submission stated “AEMO is proposing to undertake significantly higher levels of capital expenditure than in previous allowable revenue periods. This has a material impact on current and future market fees”.<sup>47</sup>

The Australian Energy Council and Chamber of Commerce and Industry were also concerned about the allocation of market reform costs to market participants. The Australian Energy Council said:

The AEC believes that participant fees should relate to costs of operating the market and accordingly market participants should not pay for government led market reform. In effect, consumers are being asked to pay upfront for reforms without any guaranteed benefits. The \$51M capex requirement for reform in the AR5 allowable revenue request is significant.<sup>48</sup>

The Chamber of Commerce and Industry’s submission noted that the approach of having the market pay for government-initiated reforms was “inconsistent with that of other jurisdictions and policy agencies in Australia”. The submission also recommended a review of fee allocations in the WEM.<sup>49</sup> Two submissions (from Bluewater and Synergy) recommended that the ERA undertake comparisons of AEMO’s proposed costs against those of market operators in other jurisdictions.

#### 4.1.2 On the draft decision

In response to the draft decision, both Bluewaters Power and NewGen Kwinana said that the “capital expenditure for WEM reform should be approved periodically over AR5 as certainty of expenditure is improved”.<sup>50</sup> Both Bluewaters Power and NewGen Kwinana’s submissions suggested “a prudent approach to approving uncertain expenditure is warranted”.<sup>51</sup>

<sup>45</sup> Perth Energy, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 5, ([online](#))

<sup>46</sup> Bluewaters Power, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 2, ([online](#))

<sup>47</sup> Perth Energy, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 1, ([online](#))

<sup>48</sup> Australian Energy Council, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 1, ([online](#))

<sup>49</sup> Chamber of Commerce and Industry, 2019, *Australian Energy Market Operator’s allowable revenue and forecast capital expenditure proposal for the period 2019/20 to 2021/22 Issues paper*, P. 1, ([online](#))

<sup>50</sup> Bluewaters Power, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 1, ([online](#))

<sup>51</sup> Bluewaters Power, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 1, ([online](#))



Perth Energy also supported a staged, but not necessarily annual, approval approach:

Perth Energy considers the ERA’s draft decision to approve expenditure in stages to be a pragmatic approach given the continued uncertainty regarding the scope and timing of the reform agenda. However, we recommend each project within the program is also independently estimated justified.<sup>52</sup>

The Australian Energy Council’s submission acknowledged AEMO’s “past performance in relation to prudent cost management, but also recognises that AEMO’s revenue requirement must be based on independently determined efficient costs”.<sup>53</sup> The Australian Energy Council also stated that “the ERA correctly points out that the current absence of drafted Wholesale Electricity Market (WEM) rules and the lack of detailed business requirements, mean the ERA is unable to determine an efficient revenue requirement for capital expenditure beyond year 1 of the AR5 period”.<sup>54</sup>

AEMO’s response to the ERA’s AR5 draft decision stated that “if the ERA maintains this position in its final decision, though the approved forecast capital expenditure would enable AEMO to deliver tranche 1 of the WEM reform program, AEMO would not have sufficient resources available to deliver tranche 2”.<sup>55</sup> AEMO maintains its view that approving funding for the full three years would be a more prudent and efficient course of action, and a staged approach would result in higher overall costs. AEMO’s proposal also acknowledges “the ERA’s and market participants’ concerns regarding approving implementation costs at this early stage. However, AEMO states a three-year determination on WEM reform is approvable and in AEMO’s view meets the intent of the WEM Rules. A three-year forecast capital expenditure determination has also been signaled by the Minister for Energy as the most appropriate course of action.

AEMO also made a second submission in response to the draft decision. The points made in this submission are addressed in chapter 3.

Perth Energy also commented on the forecast capital expenditure proposed for the Digital Roadmap:

Perth Energy consider the ERA’s draft decision not to approve forecast expenditure related to the Digital Roadmap is prudent given the lack of information on the costs and benefits provided by AEMO. Perth Energy welcomes any efficiencies offered by AEMO however AEMO has not quantified or included any operating efficiencies for the WEM or capital expenditure reductions that it expects to result from the implementation of the Digital Roadmap. Perth Energy recommends the Digital Roadmap is treated as a Declared Market Project and the necessary justification for the program is shared with the ERA and market participants prior to incurring expenditure.<sup>56</sup>

<sup>52</sup> Perth Energy, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 1, ([online](#))

<sup>53</sup> Australian Energy Council, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 1, ([online](#))

<sup>54</sup> Australian Energy Council, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 1, ([online](#))

<sup>55</sup> AEMO, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 5, ([online](#))

<sup>56</sup> Perth Energy, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 1, ([online](#))

Both Bluewaters Power and NewGen Kwinana agreed “with the caution applied to funding the IT digital roadmap project”.<sup>57</sup>

AEMO’s response to the ERA’s AR5 draft decision stated:

The digital roadmap is a foundational investment designed to uplift the entire organisation’s technology platforms, which are old and need replacing. It is AEMO’s view that without sufficient investment in its technology, AEMO’s ability to perform its functions and obligations under the WEM Rules will be compromised. It would also allow the WA components of this AEMO-wide uplift in IT capability to be delivered and avoid a scenario where AEMO WA must implement disparate IT systems at a likely greater cost. AEMO therefore maintains that the \$13.8 million forecast should be approved by the ERA in its final decision.<sup>58</sup>

Perth Energy supported the ERA’s request for further information on the method AEMO used to determine its proposed project contingencies. Perth Energy shared the ERA’s view that “any project contingency should be justified based on identified risks associated with each project”.<sup>59</sup> However, Perth Energy did not agree with the ERA’s suggested alternative that project contingencies need not be justified and AEMO may simply use the provisions in clause 2.22A.9 of the market rules instead. Perth Energy said that this clause was intended to be used for unforeseen capital requirements that arose during the period, and to use this mechanism was not prudent and may drive inefficient behavior. Perth Energy recommended:

The ERA reviews the additional risk-based justification provided to it by AEMO and then allows a contingency amount it considers appropriate given the scope, expected cost and risks associated with the projects it decides to approve. Perth Energy also requests the ERA monitors the actual project costs AEMO incurs during the period and to the extent possible, holds AEMO to account for delivering projects within the project baseline amounts during its next allowable revenue review.

Power Systems Consultants Australia (PSC) and Perth Energy also commented on the ERA’s determination to not approve AEMO’s approach to contingencies on capital projects. PSC’s submission said:

The mechanism for AEMO to spend 10% above its capital expenditure before applying to the ERA for additional funding, be mutually exclusive from the 30% per project contingency. PSC understands that this mechanism is for unforeseen issues with the overall capital program (e.g. addressing a major cyber security breach or a major data centre failure), or for projects that were not identified during the AR process. PSC supports the original submission of 30% contingency for the 22 capital projects identified for AR5.

AEMO’s response to the ERA’s AR5 draft decision also commented on the treatment of project contingencies. AEMO states that project contingencies will enable it “to deliver projects without the need to make additional in-period capital expenditure requests and incur the associated costs”.<sup>60</sup> AEMO has also reviewed the contingent amounts for each project and has provided further risk-based justification. AEMO adjusted the aggregated amount of project contingency and it now comprises \$14.8 million (19%) of the total forecast (down from \$17.9 million). AEMO

<sup>57</sup> Bluewaters Power, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 1, ([online](#))

<sup>58</sup> AEMO, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 6, ([online](#))

<sup>59</sup> Perth Energy, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 1, ([online](#))

<sup>60</sup> AEMO, 2019, *Response to Draft Decision – AEMO Allowable Revenue and Forecast Capital Expenditure Proposal for the 2019/20 to 2021/22 Period (AR5)*, P. 7, ([online](#))

considers the additional information provided is consistent with that approved by the ERA in past determinations and justifies the inclusion of project contingency expenditure in the AR5 capital expenditure forecast.

## 5. ERA's final determination

This chapter outlines the ERA's final determination on AEMO's proposal for AR5.

The ERA approves \$1.5 million allowable revenue and \$45.4 million forecast capital expenditure more than was recommended in its draft decision. This is in response to AEMO's 31 May 2019 submission to the draft decision, as discussed in chapter 3.

The final determination on AEMO's proposal allowable revenue and forecast capital expenditure for AR5 is shown in Table 5 below.

**Table 5 Approved allowable revenue and forecast capital expenditure for AR5 (\$'000 nominal)**

Item	2019/20	2020/21	2021/22	Total
WEM allowable revenue	31,609	33,446	34,773	99,828
WEM forecast capital expenditure	23,759	20,814	21,218	65,791
GSI allowable revenue	2,056	2,005	2006	6,067
GSI forecast capital expenditure	402	62	69	533

Consistent with the draft decision, the ERA has outlined its determination by the allowable revenue and forecast capital expenditure for AEMO's WEM and GSI functions separately. Section 5.2.5 provides a summary of the ERA's final determination for each capital project. Details on individual projects are provided in Appendix 1.

Where it is helpful, to understand the three-stage review and approval process, information is presented in the order of:

- draft decision
- response to the draft decision, including comments from AEMO and other stakeholders
- final determination that includes advice from the ERA's technical consultant.

### 5.1 WEM allowable revenue

AEMO provided detailed allowable revenue information to support its initial proposal, consistent with information provided for previous reviews. Therefore, the ERA applied the same approach to reviewing allowable revenue expenditure as it has in the past.

The ERA reviewed whether and how AEMO's functions have changed in AR5 compared to earlier review periods, and the proposed allowable revenue for any identified function changes. The ERA assessed allowable revenue variances at a high level, comparing the allowable revenue proposed for AR5 with the actual and approved allowable revenue in AR4. Variances were also compared at a more granular, account code level: in total between AR4

and AR5, and year-by-year from 2018/19 to 2021/22. The ERA queried any material variances with AEMO.

AEMO proposed a WEM allowable revenue for AR5 of \$98.3 million, which was five per cent higher than the allowable revenue the ERA approved for AR4.

In response to the draft decision, AEMO provided updated year-to-date actual data for the final AR4 financial year (2018/19), but did not adjust depreciation or other allowable revenue expense categories to reflect:

- projects not approved
- the change in accommodation cost treatment
- projects that were moved forward from AR5 into AR4.

Prior to the publication of the final determination, the ERA asked AEMO to update the allowable revenue to reflect capital projects that were not approved and to correct other small errors identified in the allowable revenue forecasts. The ERA has compared these updated figures against its own estimates. AEMO's revised allowable revenue figures are included and approved in the final determination.

AEMO applied different escalation factors to individual cost categories to reflect contractual obligations (for employee and accommodation costs) and has applied an average CPI of 2.1 per cent across the AR5 period. Following publication of the 2019/20 State Budget on 9 May 2019, the ERA recommended AEMO update its CPI assumptions to align with the State Budget forward estimates. AEMO responded that, as a national organisation, it applied the same CPI assumptions across the business

### **5.1.1 Employee benefits**

The proposed employee benefits expense was 23 per cent higher in AR5 compared to what was approved in AR4 and accounted for just under half of all allowable revenue costs. The forecast increases were driven by higher staffing levels and salary increases from AEMO's 2018 Enterprise Agreement.

AEMO's full-time equivalents (FTE) are internal staff, a combination of permanent employees and staff on fixed-term contracts. They are predominantly engaged on business-as-usual activities and most of them are already in position. AEMO forecast an increase to its FTE count from 119 in the first year of AR5 to 125 in the final AR5 year.

At the time of the AR5 initial proposal in March 2019, 15 of those 119 FTE positions were vacant. Those were a mixture of business-as-usual positions and capital project positions, and were included in the allowable revenue, as they would be filled during AR5.

Some of these FTEs would be filled on fixed-term contracts, while others would become permanent staff. The positions would provide operational support for systems to be implemented as part of the capital projects (for example the system management system transition project). Some of the individuals working on those projects would leave the business once the new systems become operational during AR5. Others would backfill permanent staff allocated to capital projects during the AR5 period, and some FTEs would be dedicated to capital projects only. Over the full AR5 period, AEMO was therefore expecting to hire a total of around 21 internal staff to fill all FTE positions.

AEMO also proposed to procure consultants to deliver some capital projects and their costs would be capitalised. Consultant expenditure is only included in allowable revenue through the depreciation charges for capital projects and does not affect employee benefits.

Employee benefits were escalated by 2.9 per cent in accordance with AEMO's 2018 Enterprise Agreement, which covered the period November 2018 to June 2021. This agreement will expire, and a new agreement will need to be negotiated, one year before the end of AR5. The escalation factor applied in the 2018 Enterprise Agreement was unchanged from the previous enterprise agreement.

AEMO has calculated employee benefits by using actual salaries for employees and fixed-term contractors working on business-as-usual activities, and using indicative day rates for permanent employees, fixed-term contractors and consultants working on capital projects.

The costs of internal employees and contractors working on capital projects are incurred in allowable revenue and then removed through a charge to capital projects, which is then depreciated over time. In contrast, consultant costs are not included in the allowable revenue as an ongoing expenditure, but only as part of the depreciation charge of each capital project.

Ongoing consultant payments are made through AEMO's consolidated cash flow facility. As part of the broader AEMO organisation, the Western Australian unit has access to the whole-of-business cash flows to make ongoing payments. Cost are then recovered at a slower rate through the depreciation on a causer-pays basis. This allows AEMO to achieve efficiencies of scale by using available cash for ongoing payments where required<sup>61</sup> from a whole-of-business facility. By applying this approach, AEMO has demonstrated that it takes advantage of available business-wide facilities to keep operating costs down.

The calculation of proposed employee benefits expenditure for AR5 is consistent with the escalation factors and other assumptions provided, such as FTE growth rates. The ERA tested the escalation factors and other assumptions and found them to be reasonable. Average FTE costs were calculated to confirm that the growth in FTE numbers is driving the increase in overall employee expenses observed in AEMO's proposal over and above the increase from escalation.

The ERA reviewed FTE numbers for the proposed capital project schedules and was satisfied that the year-on-year movements were reasonable. There is an increase in permanent system management staff from the transfer of the final system management systems and functions from Western Power to AEMO. Resource numbers increase during AR5 to reflect the ramp-up of effort to deliver the WEM reform project. A corresponding decrease in resources will not be observed until after the new WEM design goes live in the next allowable revenue period (2022/23 to 2024/25).

For the final determination, AEMO recalculated allowable revenue to ensure employee benefits expense only reflected the FTEs and fixed-term contractor numbers required for the capital projects where forecast capital expenditure was approved. In the final determination, employee benefits expense represents 49 per cent of the total allowable revenue.

---

<sup>61</sup> AEMO's access to and treatment of borrowing costs are discussed in section 5.1.4 Borrowing costs.



### 5.1.2 Accommodation costs

At the beginning of AR4, AEMO selected the location for its current Perth office and provided the ERA with a comparison of different accommodation alternatives.<sup>62</sup> The ERA's AR4 final determination considered that the "process and criteria used by AEMO to select the new office to be robust and thorough. The Authority considers AEMO's proposed accommodation cost to be reasonable".<sup>63</sup>

In the final year of AR4, AEMO rented an additional half-floor in the same building for the extra staff, contractors and consultants required for its additional WEM reform functions conferred by the change to market rule 1.20. AEMO requested additional forecast capital expenditure to set up and equip this additional half floor. In its December 2018 determination, the ERA acknowledged that AEMO required additional space, but was not satisfied that AEMO had considered all available options prior to renting the new floor<sup>64</sup> and did not approve additional capital expenditure. AEMO used available approved funds from the previous AR4 determination to fit-out and equip the additional half-floor.

Forecast accommodation costs in AR5 were 22 per cent above the actual expenditure incurred in AR4. This was primarily due to actual costs in AR4 being lower than anticipated rather than forecast costs in AR5 being higher. At the time of the AR4 determination on new office accommodation, the location of the new office was known, but the contract was not finalised. Therefore, the approved accommodation cost for AR4 was calculated based on AEMO's old office which had a higher lease cost per square meter.

Due to changes in international and Australian accounting standards, a mandatory change in the treatment of leases came into effect on 1 January 2019. The new standards require all leases, except for low value leases,<sup>65</sup> to be capitalised on the balance sheet and expensed through depreciation and interest charges. Over the full term of the lease, the change in accounting treatment will have a neutral effect.

In its response to the ERA's draft decision, AEMO provided an update on the revised accounting treatment of rental costs. From 1 July 2019, AEMO will capitalise rental expenditure only, while the other operational expenditure on accommodation, including utilities and outgoings, will remain in its allowable revenue. AEMO's response to the draft decision proposed to capitalise \$3.9 million of rental expenditure for the WEM. The ERA notes that the accounting standard changes are to be applied on rental expenditure net of any lease incentives.

Rental costs are escalated by the fixed annual review rate included in the rental agreement. The remaining accommodation costs are escalated by the CPI. Overall, the ERA is satisfied that the proposed accommodation costs are reasonable for the current location.

AEMO has advised that the two and a half floors it rents will be enough to accommodate all staff during AR5. AEMO's accommodation strategy now includes options such as requiring consultants to work from their own premises and hot desking to minimise the need for

<sup>62</sup> As part of the AR4 final decision, AEMO has provided the ERA with costings for several different office spaces (all within the Perth CBD), and at that time the ERA was satisfied that the selected location represents best value for money.

<sup>63</sup> Economic Regulation Authority, 2016, *Allowable Revenue and Forecast Capital Expenditure for the Australian Energy Market Operator 2016/17 - 2018/19 Final Determination*, P. 15, ([online](#))

<sup>64</sup> Economic Regulation Authority, 2018, *Australian Energy Market Operator - Allowable Revenue and Forecast Capital Expenditure for 2016/17 to 2018/19 - Forecast Capital Expenditure Adjustment Final Determination*, P. 28, ([online](#))

<sup>65</sup> Asset value of up to \$5,000.

additional office space. This demonstrates that AEMO has sought to restrict its accommodation costs.

In the draft decision, the ERA noted that AEMO only considered options within the Perth Central Business District when it selected its new office at the start of AR4. In its response to the draft decision, AEMO committed to consider options outside the central city when its current contract expired and was due for renewal in AR7.

For the final decision, AEMO adjusted its allowable revenue to reflect the new accounting treatment of rental costs, including lease incentives. The ERA approves AEMO's adjustment to remove \$2.05 million from its WEM accommodation costs, to make a corresponding increase in the depreciation (which includes interest) and to add the same amount as a capital liability. In the final determination, accommodation costs account for 2 per cent (compared to 4 per cent in AEMO's proposal), due to the changes in the accounting treatment of leases.

### 5.1.3 *Supplies and services*

AEMO's proposed supplies and services expenditure for AR5 was 29 per cent lower than its forecast actual expenditure for AR4. This was mostly driven by the end of AEMO's service level agreement with Western Power in the first year of AR5.

Following completion of the system management system transition project,<sup>66</sup> which will bring all remaining system management systems and functions in-house in the first year of AR5, the service level agreement with Western Power will cease. While there will still be some cost incurred from the service level agreement in 2019/20, over the full AR5 period the contribution of the service level agreement to overall supplies and services costs will reduce substantially.

Software and hardware upgrades and support contracts are another main cost component of the supplies and services expense category. AEMO forecast that these IT upgrade and support costs would grow from an average of 18 per cent of the total supplies and services expenses during AR4 to 30 per cent in AR5. This is because, through AR5, AEMO will become responsible for more IT systems. From January 2020, AEMO will also take full operational control and responsibility to manage, upgrade and support all system management systems and functions. In addition, following completion of the power system operations project (when AEMO's new e-terra energy management system goes live), AEMO will begin to incur upgrade and support costs for e-terra.

The supplies and services expenditure is escalated by the CPI of 2.1 per cent per year. Given that AEMO will fully own these additional IT systems from AR5 onwards, the ERA considers that the proposed supplies and services expenditure is reasonable. Bringing systems in-house has resulted in an overall reduction in supplies and services expenditure.

Following the draft decision, AEMO advised that it had overstated forecasting data costs by \$179,963 in its initial proposal. AEMO adjusted supplies and services expense to correct for this overspend when it recalculated allowable revenue for the final determination. The final determination has adjusted the supplies and services expenditure for this minor error.

---

<sup>66</sup> This project was approved by the ERA in its December 2018 determination, P.16, ([online](#))



### 5.1.4 Borrowing costs

AEMO advised that, in AR5, it would not recover borrowing costs through its allowable revenue, but include those directly in the costs of each capital project. This was a different treatment of borrowing costs than in AR4. AEMO advised that the borrowing costs approved and incurred in AR4 were for a loan it inherited from the Independent Market Operator. The loan has been repaid, which provided an opportunity to change its treatment of borrowing costs for AR5.

AEMO has a consolidated borrowing facility which, because of its size, allows it to access funds at favourable terms and conditions. AEMO also provides a consolidated working capital and a cash facility that all business units can access to make ongoing payments.

Only capital projects that are greater than \$1 million incur a borrowing cost, which is capitalised. This is expensed via depreciation, when the project is completed and then recovered over the useful life of the project. In AR4, borrowing costs and depreciation were separate items. However, because of the different treatment of borrowing costs, for AR5 these are included as a part of the overall depreciation line item. AEMO does not need to borrow to fund its day-to-day operations.

The ERA is of the view that by using the consolidated borrowing facility, AEMO has proposed a prudent approach to estimating costs for its capital projects and has sought to minimise its operating costs.

### 5.1.5 Depreciation

The total proposed depreciation for the WEM in AR5 was 68 per cent higher than the actual depreciation for AR4. The two main factors contributing to this were the low level of actual depreciation in AR4 and the forecast depreciation for AR5.

Actual depreciation charges in AR4 were low, because many of the systems AEMO inherited from the Independent Market Operator were old and fully depreciated. Also, most of the capital expenditure in AR4 was for IT systems that would either be installed towards the end of the AR4 period or completed in AR5. Therefore, the depreciation charges for these assets did not fall in AR4.

Depreciation charges for the assets installed at the end of AR4 and in the first and second years of AR5 will be incurred in AR5. These systems have useful lives of between three and five years, which is consistent with commonly accepted useful lives of software and hardware. In specific cases, AEMO proposed to accelerate system depreciation where systems will be replaced as part of the WEM reform implementation. This is also a reasonable approach.

The expenditure proposed for the WEM reform project will not be depreciated before AR6, as the projects will not be completed in AR5.

For the final determination, AEMO recalculated the depreciation expense included in the WEM allowable revenue to account for adjustments that reflect:

- Approved forecast capital expenditure that differed from the amount proposed in AEMO's initial proposal.
- The inclusion of depreciation for some projects (the digital roadmap, the hardware and software lifecycle and the identity and access management projects) that was not included in the initial proposal.

- Approved additional forecast capital expenditure to reflect the required new treatment of operating leases – an increase of \$2.05 million in depreciation.

### 5.1.6 Conclusion

The ERA's final determination is to approve \$99.8 million for AEMO's WEM allowable revenue for AR5. This is \$1.5 million or 1.5 per cent more than AEMO's initial proposal.

## 5.2 WEM forecast capital expenditure

This section summarises the ERA's final determination on WEM forecast capital expenditure for AR5. The draft decision information has been retained to help explain how the ERA arrived at its final determination following additional information provided by AEMO, including its second submission on 31 May 2019, stakeholder feedback in response to the draft decision and the provision of advice from the ERA's technical consultant.

Table 6 compares AEMO's proposed WEM forecast capital expenditure, the ERA draft decision and the final determination by project. Commentary on individual projects is provided in Appendix 1.

### 5.2.1 Seeking to achieve lowest practicably sustainable cost

AEMO's initial proposal provided information on its approach to estimating forecast capital expenditure for AR5. AEMO used an established project lifecycle process to create, cost and manage capital projects. This included a "standardised cost estimation model to forecast various cost elements (for example internal and external resources, platform, expenses) followed by review and validation by the Project Management Office".<sup>67</sup>

AEMO also undertook a "top-down challenge" with its AR5 Steering Committee.<sup>68</sup> This reviewed project scope, cost estimates, justification and overall deliverability before finalising AR5 capital projects that were endorsed by AEMO's Board prior to submitting to the ERA.

The ERA reviewed AEMO's standard approach to cost estimation for AR5 and acknowledges that the approach is reasonable and AEMO has demonstrated clear project governance and accountability for internal approvals. In the information provided on individual projects, the ERA looked for evidence that AEMO had sought to achieve the lowest practicable sustainable cost of delivering its functions. This included:

- comparing different options to deliver projects
- obtaining multiple quotes for services and products procured
- aligning and sequencing projects to benefit later projects
- justifying the need for projects through benefits delivered or operating risk mitigated.

ERA analysis against its market rule obligations is outlined in chapter 3 has informed the final determination. This is summarised in section 5.2.2 and details at the individual project level are provided in Appendix 1.

<sup>67</sup> AEMO, 2019, *2019-2022 allowable revenue and forecast capital expenditure submission to the Economic Regulation Authority*, P. 48, ([online](#))

<sup>68</sup> *Ibid*, P.48

There are some instances where the ERA found AEMO's approach did not meet the approval requirements in the market rules. These are in AEMO's estimation of costs for:

- PASA process improvement project
- Enhanced control room tools
- System Management application remediation
- Administrative improvements to the outage process proposed rule change
- the digital roadmap project.

These are discussed below.

### 5.2.2 *Treatment of project contingencies*

In previous determinations, the ERA has accepted the inclusion of contingencies for capital projects, where the reason for the contingencies was clearly defined and based on identified risks and proposed risk mitigation measures.

AEMO's proposal outlined its approach to calculating project contingencies. However, the information provided did not clearly demonstrate that contingencies have been applied to individual projects based on identified tangible risks, but rather they have been applied as a standard additional cost component (30 per cent) and, for a small number of projects, varied up or down in response to factors such as the timing of the estimate and the size and complexity of the project.

In many cases this appeared to be because projects included in the proposal are in an early stage of development and not yet fully defined. The project contingency had been added to acknowledge uncertainty. The draft decision proposed an alternative mechanism available to AEMO.

#### *Draft decision*

Market rules 2.22A.8 and 2.22A.9<sup>69</sup> enable AEMO to incur higher allowable revenue and forecast capital expenditure, up to 15 per cent and 10 per cent respectively, over a full allowable revenue period, before it needs to come to the ERA for an in-period adjustment. This mechanism could be used as a means of recognising uncertainty in AEMO's total capital program. The allowances could provide project contingency without requiring explicit identification of project risks.

The draft decision was to approve forecast capital expenditure where it met the approval requirements in the market rules, but excluded any specific project contingency expenditure. It suggested that AEMO could use the overspend mechanism in the market rules to accommodate cases where the actual costs incurred were above the approved amount for each project. This was unless it could provide clear, risk-based justifications why individual project contingencies were required and why they should be separately funded.

AEMO has previously advised that it preferred to reserve the overspend mechanisms in the market rules to accommodate in-period market rule changes. Therefore, in the draft decision the ERA requested AEMO to estimate and propose an amount to be included in its AR5

<sup>69</sup> Rule Change Panel, 2018, *Wholesale Electricity Market Rules (11 January 2019)*. Clauses 2.22A.8 and 2.22A.9, ([online](#))

proposal for expected or known rule changes (outside the WEM reform program) that may occur in AR5.

### *Response to the draft decision*

AEMO did not agree that using the overspend mechanisms in the market rules was a “prudent alternative”<sup>70</sup> to accommodate project overspends, as it did not promote transparency.

AEMO advised that it preferred to reserve the allowances provided by market rules 2.22A.8 and 2.22A.9 for unbudgeted rule changes approved during an allowable revenue period, or for other unforeseen expenses. At public forums,<sup>71</sup> stakeholders have expressed the view that AEMO should have a minimum provision in its allowable revenue and/or forecast capital expenditure for the development and implementation of business-as-usual rule changes.

AEMO’s response to the draft decision was that its original contingency amounts were well-reasoned and based on consideration of the likely risk identified for each project. However, it did review its contingencies and “used additional information on project scope and risk (that was not available at the time of drafting the initial AR5 proposal)”.<sup>72</sup> This included estimating the probability that an identified project risk would occur. This exercise reduced total project contingency from \$17.9 million in the initial proposal to \$14.8 million.

AEMO’s response also estimated “forecast capital expenditure of \$1.42 million to accommodate known business-as-usual rule changes that may need to be delivered during the AR5 period but are as yet undefined”.<sup>73</sup>

The ERA’s technical consultant, drawing on its experience of working with market and system operators in south-east Asia, suggested that “a 30% contingency is not unreasonable particularly in the context of the WEM reform and Digital Roadmap projects.”<sup>74</sup> However, it felt there was inconsistency in how AEMO had estimated project contingencies in its initial proposal.

### *Final determination*

The final determination has approved AEMO’s revised project contingency amounts for those projects identified as meeting the approval criteria in the market rules. The ERA is satisfied with the probabilistic approach to project risks that AEMO has adopted in response to concerns expressed in the draft decision. The ERA has approved forecast capital expenditure of \$11.4 million.

AEMO has previously advised the overspend mechanisms were reserved for in-period rule changes and “minor operating or capital cost requirements”.<sup>75</sup> When asked to estimate forecast capital expenditure for in-period rule changes, AEMO estimated it would need \$1.4 million for the first two AR5 years. This represents 21 per cent of the overspend allowances based on the final determination of \$65.8 million for WEM forecast capital expenditure. The ERA determines that the overspend mechanisms can accommodate

<sup>70</sup> AEMO, 2019, *Response to the ERA’s AR5 draft decision*, P. 18, ([online](#))

<sup>71</sup> AEMO, 2019, *WA Electricity Forum – meeting notes January 2019*, ([online](#))

<sup>72</sup> AEMO, 2019, *Response to the ERA’s AR5 draft decision*, P. 18, ([online](#))

<sup>73</sup> *Ibid*, P. 19

<sup>74</sup> IES, 2019, *Review of AEMO’s 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.11, ([online](#))

<sup>75</sup> AEMO, 2019, *Response to the ERA’s AR5 draft decision*, P. 7, ([online](#))

AEMO's estimated costs of identified in-period rule changes, and minor unexpected operating or capital costs.

Although AEMO improved its approach to calculating project contingency and the ERA has approved its estimates of project contingency, there are further improvements AEMO could make.

In reviewing AEMO's proposal, the ERA made the following observations:

- Historically, AEMO's actual expenditure has been below the approved levels of allowable revenue and forecast capital expenditure. There may be several reasons for this such as poor cost estimation, good cost management, projects being cancelled, or projects being deferred.
  - Overall in AR4, AEMO underspent approved capital expenditure by 23 per cent in market operations, 46 per cent in system management and 59 per cent for GSI functions.
  - AEMO regularly does not use its estimated project contingency amount. Projects completed in AR4 and under budget, were underspent in the range of 20 to 25 per cent.
- Some of the project risks identified, such as exchange rate risk, could work in AEMO's favour.
- There is no demonstrated feedback loop between AEMO's actual experience of managing project risk, utilising project contingency and its estimation of contingency for new projects.

The ERA recommends AEMO uses its experience of managing project risk to inform the calculation of project contingency. This will be an area of focus for future AEMO allowable revenue and forecast capital expenditure proposals.

### **5.2.3 Digital roadmap project**

AEMO currently has multiple standalone systems in the WEM, some of which are end-of-life, or inflexible and not easily scaled or adapted to meet the changes under way in the electricity market. AEMO identified several risks or problems with current arrangements:

- There was growing complexity in the underlying systems due to systems and processes being developed on a standalone basis. This complexity was an issue when major changes to systems and sub-systems were needed, as every change involved more time, effort and resources.
- Multiple systems on different platforms were costlier to maintain than if the same systems were on a single consolidated platform. Also, different platforms may depend on specialist external support if knowledge was not available in-house.
- Data may be collected separately by multiple standalone systems, which can lead to data duplication and governance issues. Standalone systems may not easily communicate with each other and required the creation of bespoke 'workarounds' or.
- Multiple standalone systems can expose AEMO to multiple points at risk from cyber security attacks. This required multiple security protections for each standalone system.

The risks would be lower and easier to manage, if all WEM systems operated on one secure platform. AEMO recognised that, with these known challenges and an increasing complexity of power systems, it needed to rationalise how it developed technical capability to deliver its functions and services in the National Electricity Market and the WEM.

AEMO's plan is to have a common centralised platform upon which to build all future IT infrastructure. Moving from standalone systems to a common infrastructure platform would mean that AEMO could use the same tools and processes and in-house knowledge for developing systems. There would be more efficient resource-sharing for data centres and the network. One secure environment would house all AEMO's systems to increase cyber security and there would be a single co-ordinated strategy for collection, manipulation, authentication and then multiple use of data.

AEMO subdivided its digital roadmap into four work streams:

- Cyber security - is to create more secure environment for AEMO's people, processes, technologies and IT infrastructure.
- Compute - is the central component of AEMO's digital future and will deliver a centralised technology infrastructure platform. All existing and future IT systems will be transferred to or built upon this platform.
- Data - is AEMO's strategy for collecting, authenticating, storing and using data.
- Solutions - deals with the other systems that are not directly required for market operation and system management, but are needed to service the organisation, such as corporate systems and project delivery.

AEMO has committed to delivering its digital roadmap over the next five years. Most of the cost is allocated to the National Electricity Market. AEMO's initial proposal allocated \$13.8 million of costs to Western Australia: \$12.7 million to the WEM, and \$1.1 million to the GSI function.

Stakeholders expressed concerns that the digital roadmap was driven by requirements in the National Electricity Market. AEMO estimated the benefits of the digital roadmap for the National Electricity Market but has not specifically identified the benefits to the WEM. In its initial proposal, AEMO did not provide information on the cost of the digital roadmap against continuing with a separate collection of WEM systems. Also, it costed the \$51.3 million WEM reform program based on separate WEM IT systems and infrastructure. AEMO had anticipated, but at the time not calculated, cost savings in the WEM reform program from using digital roadmap initiatives.

AEMO stated it would prefer Western Australia's IT requirements to be considered as part of the design and scoping process of the digital roadmap, because WEM systems would migrate onto the new platform at some point in the future. This is reasonable.

### **Draft decision**

In previous allowable revenue determinations, the ERA has approved forecast capital expenditure for digital roadmaps proposed by the Independent Market Operator. However, applying the criteria in the market rules for the proposed digital roadmap project was challenging because the project:

- Was introduced late in AEMO's public AR5 preparation and stakeholder communication process.



- Was described at a high level, with costs and benefits focussed on the National Electricity Market.

In responding to the ERA's issues paper, stakeholders expressed concern about the ERA approving forecast capital expenditure for the project. When reviewing AEMO's proposal, the ERA requested additional information on the digital roadmap project. At such an early stage in the project, AEMO was unable to identify what resources would be used on the project. It was also unclear how and when some of the relatively new IT systems in the WEM<sup>76</sup> would be rolled into the new centralised infrastructure platform to be delivered by the roadmap project, nor how this aligned with the proposed capital expenditure profile. AEMO did not provide costs for alternative options, such as developing Western Australian systems in isolation from the National Electricity Market, to understand the scale of the benefits for the WEM.

The ERA's draft decision was to not approve any digital roadmap forecast capital expenditure. AEMO was invited to determine and cost the resources it required to establish a project that could fully scope the cost and benefits that would accrue to the WEM and GSI from the design and implementation of the digital roadmap.

### **Response to the draft decision**

AEMO restated its position that the ERA should fund the digital roadmap for the whole of AR5, as it considered "approving a full three-year capital forecast will result in the lowest practicably sustainable cost of delivering the work".<sup>77</sup> However, since AEMO's initial proposal in March 2019, more detailed information was available on the scope, cost and likely benefits of some of the AEMO-wide business system projects planned to be delivered in the first year of AR5.

AEMO therefore requests that as a minimum, the ERA approves \$4.5 million (WEM component only) of forecast capital expenditure for elements of the digital roadmap to be delivered in 2019/20. A capital expenditure forecast for the remainder of the AR5 period can then be submitted in-period.<sup>78</sup>

The revised amount proposed for 2019/20 for the WEM was \$4.5 million,<sup>79</sup> which was 18 per cent lower than the initially proposed requirement of \$5.6 million. The respective GSI amount was \$0.3 million and was 40 per cent lower than the initially proposed requirement of \$0.5 million for 2019/20.

AEMO also provided a preliminary and high-level cost benefit analysis for the Western Australian markets, prepared by AEMO's consultant, as was recommended in the draft decision. AEMO stated that:

By aligning to AEMO's digital roadmap, WA would have access to this new computing platform to host its current and future systems, and could lower its capital and operating costs by 15% to 35%. Using AR4 and AR5 costs as a guide and assuming no change in AEMO's functions or data requirements, a 15% operating cost saving would have been \$450,000 per year during AR4 and \$500,000 per year during AR5. A 15% capital saving from the implementation of the digital roadmap would have resulted in \$1.4 million per year in AR4 and \$3.9 million per year in AR5.<sup>80</sup>

<sup>76</sup> These new Western Australian systems include the Reserve Capacity Mechanism system, the three new systems delivered through the power system operations project, and the new settlements system.

<sup>77</sup> AEMO, 2019, *Response to the ERA's AR5 draft decision*, P. 6, ([online](#))

<sup>78</sup> *Ibid*, P. 33

<sup>79</sup> This was provided without project contingency.

<sup>80</sup> *Ibid*, P. 33

AEMO's response to the draft decision also stated that if it invested in IT platform infrastructure now through the digital roadmap:

The hardware costs of the WEM systems (and any other systems what (sic) use the platform) will be marginal at around 8-12% of what they would be if a new platform had to be built for each of those systems.<sup>81</sup>

AEMO also reviewed the allocation of the costs between both the WEM and the GSI functions and increased the WEM allocation from 92 per cent to 94 per cent, reducing the GSI share proportionately. In addition, while AEMO made some adjustments to the contingency calculations in the GSI cost component, the WEM contingency remained unchanged at an average of 30 per cent.

*Consultant's view:*<sup>82</sup>

The ERA's technical consultant Intelligent Energy Services (IES) agreed that system consolidation and transition towards a common platform made sense and could deliver benefits to the WEM. However, it was also concerned at the lack of information on how and when current systems would transition to a common platform, and how this corresponded to when benefits would be realised in the WEM. IES recommended the ERA to not approve any digital roadmap forecast capital expenditure as the information provided did not satisfy the approval requirement "given that the projects is only in early stages, the nature of the project itself and the difficulties in providing alternative cost estimates."

Labour costs accounted for over 50 per cent of digital roadmap costs and IES was unable to confirm whether the proposed labour costs were reasonable as, given the early stage of the project, no labour cost breakdowns were provided. IES made the following points on two of the digital roadmap workstreams:

- Cyber security: AEMO's proposal did not "mention how much it would cost to upgrade the existing cyber security platform" or whether the AR5 projects to upgrade or replace systems "would experience a sufficient uplift to security" immediately.
- Solutions: Projects in this workstream were to service AEMO's broader operations and not directly related to market operations or system management:
  - Improving project delivery and rationalising applications in use across AEMO would lead to cost savings at both the capex and opex level, although the likely savings for WA were not calculated.
  - Corporate Systems and digital delivery were projects to improve corporate support systems and design a digital hub to service customer interactions with AEMO. IES noted the corporate systems and digital delivery project constituted over 70 per cent of the cost of this workstream but the information supplied suggested "these requirements do not come across as critically need and aren't supported by cost breakdowns".

### **Final determination**

Applying the revised determination framework outlined in chapter 3, the ERA has assessed whether the digital roadmap proposal is prudent.

<sup>81</sup> Ibid, P. 41

<sup>82</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.16, ([online](#))



The ERA agrees that the reasoning behind the digital roadmap is sound, and that Western Australia should be included in the digital roadmap project. AEMO can use systems delivered by the roadmap to fulfil its obligations to seek the lowest practicably sustainable cost of delivering other capital projects.

AEMO provided indicative and high-level cost benefit outcomes for Western Australia's inclusion in the digital roadmap. AEMO also says that the WEM reform IT platform costs (including allocated borrowing costs) for the second and third year of AR5 could fall from \$2.9 million to \$291,000 if the project is able to benefit from systems delivered by the digital roadmap project.

Although positive, the cost benefit estimates for estimates digital roadmap project for Western Australia are preliminary and high-level and have not been substantiated. A prudent service provider would have conducted a separate exercise to determine and then provided evidence to support the benefits Western Australia could expect from the digital roadmap project before assigning costs. For this reason, the ERA does not approve full forecast capital expenditure for the digital roadmap project.

AEMO's revised cost estimates for improvements to its cyber security and corporate business systems in the first year of AR5 are prudent. The maintenance and replacement of business technology systems supports AEMO's ongoing business-as-usual functions.

The ERA confirms that AEMO's revised cost estimates for the WEM proportion of digital roadmap costs in the first year of AR5 have been estimated based on more robust information on project scope and costs that was not available when AEMO made its initial proposal.

The final determination is to approve forecast capital expenditure of \$4.5 million for the WEM.

If AEMO chooses to make an in-period proposal for additional capital expenditure for the digital roadmap project, it should ensure that it has:

- Undertaken a thorough cost-benefit analysis for its Western Australian functions and can demonstrate the benefits expected to be realised in Western Australia, and when these benefits will be realised.
- Demonstrated clearly the dependencies and anticipated cost savings between the digital roadmap project and any other capital projects.
- Provided clear and detailed information on the projects proposed.
- Explained clearly how the costs have been allocated to Western Australia and then to AEMO's WEM and GSI functions.

#### **5.2.4 Other capital projects**

##### *Existing projects initiated and partially funded in AR4*

There are three projects identified as initiated and partially funded in AR4:

- the power system operations projects (PSO), including the implementation of e-terra
- the system management system transition (SMST) project
- the reduction in prudential exposure (RoPE) project Phase 2.

In AR4, the ERA reviewed the justification and the cost estimates for all three projects and approved additional forecast capital expenditure where necessary. These are summarised below.

In its December 2018 determination, the ERA approved forecast capital expenditure for AEMO to continue the implementation of its energy management system, e-terra (version 2.5). AEMO's proposal for AR5 was to complete implementation of e-terra (\$0.5 million) and then upgrade to version 3.2 (\$0.7 million). Since its initial proposal, AEMO decided to install version 3.2 of e-terra directly within the original project estimate of (\$0.5 million).

The requirement for the e-terra system was established in previous ERA determinations. By comparing different install and upgrade options, AEMO demonstrated prudent cost management and so the ERA's draft decision was to approve forecast capital expenditure of \$0.418 million for AR5.

In its December 2018 determination, the ERA acknowledged that the SMST project was the lowest cost option in the circumstances. However, there was enough forecast capital expenditure approved but unspent for AEMO to progress the project in AR4.<sup>83</sup> The ERA did not need to approve additional forecast capital expenditure at the time. In its AR5 proposal, AEMO advised that the total project cost had reduced to \$5.0 million, of which \$2.2 million, including project contingency, would be incurred in AR5. The ERA had already confirmed that the SMST project was the least cost option and AEMO had managed costs prudently during the project. Therefore, the draft decision was to approve forecast capital expenditure of \$1.703 million for AR5.

In its December 2018 determination, the ERA approved \$2.7 million of additional forecast capital expenditure in AR4, to deliver Phase 1 of the RoPE project. Due to an underspend on internal costs and no requirement to call on the 30 per cent project contingency, AEMO advised the ERA that the RoPE Phase 1 project would be completed at a forecast capital cost of \$1.6 million. AEMO estimated that capital expenditure of \$2.3 million would be required to complete Phase 2 of the RoPE project in AR5.

The rule change proposal demonstrated that an anticipated \$69 million reduction in credit support payments by market participants would be delivered by the RoPE rule and procedure changes. The sizeable benefits anticipated by delivering the project, and AEMO's demonstrated cost control informed the ERA's draft decision to approve \$1.872 million in forecast capital expenditure for AR5.

### **Response to draft decision**

AEMO advised that the e-terra installation was well underway and that costs for the project had not changed from those identified in its initial proposal. However, after reviewing the project contingency in response to the ERA draft decision, AEMO increased the project's contingency from 13 per cent to 23 per cent, an increase of \$42,000. AEMO cited the possibility of additional specialist resourcing being needed over and above what was initially proposed. The cost of the SMST project also remained unchanged in AEMO's response to the draft decision. AEMO recommended the ERA include contingency because the project was "underway and unanticipated costs and issues have already emerged"<sup>84</sup> and also it was concerned that "integrating the many bespoke components of the SM may prove more

<sup>83</sup> Economic Regulation Authority, 2018, *Australian Energy Market Operator - Allowable Revenue and Forecast Capital Expenditure for 2016/17 to 2018/19 - Forecast Capital Expenditure Adjustment Final Determination*, PP. 16-19, ([online](#))

<sup>84</sup> AEMO, 2019, *Response to the ERA's AR5 draft decision*, P. 21, ([online](#))

complex than anticipated. Additional external resources may be required to help solve any integration problems that emerge”.<sup>85</sup> The revised contingency increased by \$6,000.

AEMO also increased the contingency requirement for the RoPE Phase 2 project from 24 per cent to 32 per cent, an increase of \$154,000. The settlement engine developed as part of the project interfaces with multiple other AEMO systems, which introduces complexity which in turn represents an addition risk to the project scope, cost and schedule.

### **Final determination**

Costs for these three projects have remained unchanged from those proposed in AEMO’s initial position. The ERA finds that AEMO has sought to achieve the lowest practicably sustainable cost estimates in the projects’ costs and so the final determination is to approve capital expenditure of \$5.209 million for AR5 equivalent to the proposed costs for these three projects.

### **WEM reform**

This section summarises the ERA’s draft decision and final determination on forecast capital expenditure for WEM reform in AR5. The draft decision information has been included in this report to explain how the ERA arrived at its final determination following additional information provided by AEMO, stakeholder feedback in response to the draft decision and the provision of advice from the ERA’s technical consultant.

In AEMO’s proposal, over 60 per cent of total WEM reform capital expenditure was for resources or staffing. From the staffing information provided, AEMO expected to enter AR5 having already recruited most of its WEM reform internal project team. At the start of AR5, there would be 23 internal FTEs (including permanent employees and fixed-term contractors) working on the WEM reform project. Five-and-a-half additional FTEs were expected to be recruited in the second half of 2019/20 and around two more in 2020/21. Most of these FTEs would remain until the end of AR5 and around two thirds were expected to remain in the first year of AR6, the year that WEM reforms are scheduled to be complete. Of these FTEs, AEMO identified a core WEM reform team of around 14 FTEs, who were responsible for delivering WEM reform by 1 October 2022. These staff were already in place.

Most of the resource costs in the second and third years of AR5 were for labour-hire contractors (internal) or consultants (external). There were around five full-time consultants at the start of AR5 that sharply increased in the second AR5 year (by an additional 18) for the implementation phase, and then gradually reduced over the final year.

The number of internal and external staff working on WEM reform at the beginning of AR6 was expected to be higher than at the beginning of AR5. This was reasonable given WEM reforms were not expected to be completed until the first year of AR6. Peak staffing levels were expected to occur in the second and third years of AR5.

### **Draft decision**

The ERA understood that the core WEM reform team would be involved in the WEM reform project until its completion in AR6. These individuals would manage market reform activities through the different project stages. In the first AR5 year, the core WEM reform team would be engaged with developing and designing the new market characteristics, culminating in new market rules. These rules would then inform the system requirement design and implementation phases of the project in years two and three of AR5.

---

<sup>85</sup> Ibid, P.21

AEMO identified the core WEM reform team members, the skills and knowledge they brought to the project and the allocation of their time to project activities. The ERA was satisfied that this team represented the minimum FTEs required. AEMO demonstrated that the core team was actively working on the individual activity areas identified in tranche 1 (and undertaking some early tranche 2 work), as evidenced by information shared through the two Market Advisory Committee Working Groups.

There was also a clear deliverable mid-2020 for the team to produce draft rule changes and framework documents to enable implementation of the new market design by 1 October 2022. Given that delivery of the WEM reforms continued beyond the end of the AR5 period, there was a requirement to have a minimum core WEM reform team in place for the duration of AR5. Therefore, the draft decision was to approve forecast capital expenditure for the WEM reform core team for the three years of AR5.

The Minister for Energy endorsed the WEM reform program, and the date for the new market design remained unchanged at 1 October 2022. This provided some certainty that the WEM reform project would continue as planned through AR5. AEMO also provided additional detail on tranches 1 and 2 WEM reform activities in the first year of AR5, and how these activities were costed. The ERA was comfortable that the activities were well scoped, cost estimates were prudent and contributed to a clear deliverable by mid-2020. The draft decision was to approve all of the forecast capital expenditure for the first year of the WEM reform project, excluding contingency.

In total, the ERA approved \$13.8 million for AR5 in its draft decision.

### *Response to draft decision*

In its response to the ERA's draft decision, AEMO provided an updated cost estimate for the WEM reform project: \$48.5 million compared to \$51.3 million in its initial proposal. The reduction of \$2.8 million or 5.5 per cent was mostly driven by a lower project contingency.

There were few changes to resource estimates compared to the initial proposal:

- At the start of AR5, there would be 24 internal FTEs (including permanent employees and fixed-term contractors) working on the WEM reform, up from 23 FTEs.
- Five-and-a-half additional FTEs were expected to be added in the second half of 2019/20 unchanged from the initial proposal.
- In 2020/21, AEMO expected to add 1.6 FTE, down from its earlier estimate of two FTEs.
- Most of the WEM reform FTEs would remain until the end of AR5 and around 70 per cent were expected to remain in the first year of AR6, the year of completion of the WEM reform.

AEMO will enter AR5 having already recruited most of its WEM reform internal project team.

In its response to the draft decision, AEMO expanded its core team to 21.2 FTEs, an increase of seven, from the 13.8 identified in its initial proposal. AEMO advised that the 13.8 FTEs were its core team at the time and that this would need to expand as it moved through AR5. The overall resource numbers did not change, just that more of them would transition into the core team. This change was based on improved information on the projects and the work the core team would undertake. For example, the expanded core team included subject matter experts to start drafting market rule changes and engineers to begin writing the constraint equations for constrained network access.

AEMO also updated the overall contingency of the WEM reform project to 25 per cent, down from 30 per cent. This has reduced the total requested forecast capital expenditure for the project by \$2.8 million.

### *Final determination*

The ERA has very limited discretion in approving proposed costs for WEM reform, and can review only the method AEMO used to calculate WEM reform costs.

AEMO used a standard cost estimation method to determine the number of FTEs, contractors and consultants it would require for its WEM reform activities as determined by market rule 1.20 and supplemented by information in the Minister for Energy's letter to AEMO included as part of AEMO's proposal. The standard cost estimation model is consistent with how AEMO estimates costs for other capital projects and is reasonable. The ERA's review of staffing levels and the work of the core WEM reform team is described in the draft decision section.

AEMO's proposal stated that "top-down estimation" had been used to forecast capital costs for the second and third years of AR5. The ERA has reviewed this model and it is reasonable. The model assumptions include developing Western Australian systems to deliver WEM reforms. The WEM reform capital expenditure forecasts do not assume the project can benefit from any systems delivered by the digital roadmap project.

Given its conclusion that AEMO's approach to cost estimation for WEM reform costs are reasonable, the ERA must approve WEM reform expenditure for the full AR5 period.

The ERA's final determination is to approve the full proposed forecast capital expenditure of \$48.457 million.

### *New small-scale projects*

There are 13 new small-scale projects with a total forecast capital expenditure of \$7.7 million. Some of these projects are driven by the need to update systems or from software reaching end-of-life, others are externally driven such as to implement an accepted rule change. Other projects are driven by recommendations from AEMO's annual audit.

The ERA draft decision approved total forecast capital expenditure of \$3.069 million for the projects where AEMO provided a clear project scope, considered alternative options where appropriate and demonstrated that forecast costs meet the approval requirements in the market rules. This was equivalent to forecast capital expenditure for approximately 50 per cent of the identified projects.

The ERA's draft decision did not approve forecast capital expenditure equivalent to the estimated capital required for new small-scale projects, if there was insufficient detail to:

- justify the need for the project
- explain how the project costs have been determined
- demonstrate that the forecast satisfies the approval requirement in the market rules.<sup>86</sup>

AEMO was invited to provide additional or enhanced information in support of those projects that did not attract forecast capital expenditure approval in the draft decision.

---

<sup>86</sup> Rule Change Panel, 2018, *Wholesale Electricity Market Rules (11 January 2019)*. Clause 2.22A.11(b), ([online](#))



### Response to draft decision

AEMO provided additional information for most of its new, small-scale projects. The ERA's technical consultant also provided its views on each project. This is provided in summary for each project in Appendix 1.

This information enabled the ERA to approve additional forecast capital expenditure of \$4.509 million, equivalent to the costs of progressing another six of the 13 small-scale projects.

The capitalised accommodation costs of \$2.05 million for the WEM have been added to this group of projects. This links to the change in accounting standard discussed in section 5.1.2.

### Final determination

In its assessment of this group of projects, the ERA has applied the framework described in chapter 3.

The ERA has approved \$7.578 million forecast capital expenditure for AR5. This is equivalent to fully funding or partially funding 12 out of 13 new, small-scale projects and the capitalisation of the accommodation costs.

Information on individual projects is provided in Appendix 1.

## 5.2.5 Summary of WEM forecast capital expenditure by project

Table 6 provides a comparison, at the capital project level, of AEMO's proposed capital expenditure, the ERA's draft decision and the final determination. The ERA has approved forecast capital expenditure of \$65.791 million, or 85 per cent of the WEM forecast capital expenditure proposed by AEMO for AR5. Detail on individual projects is provided in Appendix 1.

**Table 6: Proposed and final decision forecast capital expenditure by WEM capital project (\$'000 nominal)**

WEM capital project	AEMO initial proposal	ERA draft decision	AEMO revised proposal	ERA final determination	Variance FD to initial proposal
<b>Existing projects</b>					
Power System Operation	473	418	516	516	43
E-terra upgrade	687	-	-	-	(687)
System Management System Transition	2,209	1,703	2,215	2,215	6
Reduction of Prudential Exposure Phase 2	2,324	1,872	2,478	2,478	154
<b>Sub-total existing projects</b>	<b>5,693</b>	<b>3,993</b>	<b>5,209</b>	<b>5,209</b>	<b>(484)</b>
<b>New, small-scale projects</b>					
POMAX Database and Metering	1,036	946	997	968	(68)
POMAX Settlements Replacement	1,597	1,132	1,521	1,521	(76)
Business continuity capability	498	-	229	229	(269)
STEM Fortran replacement	469	-	448	448	(21)
Hardware and software lifecycle support	904	696	864	864	(40)

WEM capital project	AEMO initial proposal	ERA draft decision	AEMO revised proposal	ERA final determination	Variance FD to initial proposal
Enhanced control room tools	304	-	314	69	(235)
Demand and renewable energy forecasting	90	69	89	89	(1)
Market operator interface	420	-	363	363	(57)
PASA process improvement	216	-	209	-	(216)
System Management application remediation	406	-	402	179	(227)
Spinning reserve cost allocation rule change	176	114	129	129	(47)
Administrative improvements to outage process rule change	408	-	759	553	145
Identity and access management	1,045	112	112	112	(933)
Business-as-usual rule changes	-	-	1,420	-	-
Accommodation		-	3,870	2,054	2,054
<b>Sub-total new small-scale projects</b>	<b>7,569</b>	<b>3,069</b>	<b>11,726</b>	<b>7,578</b>	<b>9</b>
<b>Large-scale, early stage projects</b>					
Digital roadmap	12,692	-	12,968	4,546	(8,146)
WEM reform	51,249	13,751	48,457	48,457	(2,792)
<b>Sub-total large-scale early stage projects</b>	<b>63,941</b>	<b>13,751</b>	<b>61,425</b>	<b>53,003</b>	<b>(10,938)</b>
<b>Total WEM forecast capital expenditure</b>	<b>77,203</b>	<b>20,813</b>	<b>78,360</b>	<b>65,791</b>	<b>(11,413)</b>

### 5.3 GSI allowable revenue and forecast capital expenditure

In its initial proposal, AEMO proposed allowable revenue for AR5 that was five per cent higher than what was approved in AR4. AEMO estimated an allowable revenue requirement of \$5.9 million for its GSI functions, allocated over the same expense categories as the WEM allowable revenue.

The proposed employee benefits expense was 54 per cent above that approved for the AR4 period. This was because, during AR4, AEMO increased the number of FTEs allocated to GSI functions from three to six to accommodate in-house production of the annual Gas Statement of Opportunities report. It expected to retain the six FTEs during AR5.

The ERA has undertaken an FTE and year-on-year analysis of the employee benefits expenditure and is satisfied that the forecast growth is in line with FTE numbers and annual salary increases, as outlined in AEMO's 2018 Enterprise Agreement.

Following the move to the new AEMO office, AEMO reviewed the way it allocated costs between business units, specifically between the two units that were transitioned from the Independent Market Operator: market operations and GSI. Subsequently, the actual accommodation costs allocated to the GSI function dropped by around a third in the final AR4 year and were forecast to be 18 per cent lower over the full AR5 period.

AEMO's actual forecast expenditure for supplies and services in AR4 was 13 per cent below the approved level for AR4. However, the proposed AR5 allowable revenue was 32 per cent



above actual AR4 expenditure. One of the reasons for this was that AEMO proposed retaining consultancy support while brought forecasting and production of the Gas Statement of Opportunities report in-house. The consultants were expected to be retained and work in parallel with the internal staff. This would allow time for the internal staff to understand the models and develop forecasting capabilities before they could confidently undertake these activities.

The total depreciation cost for AR5 was expected to be over 50 per cent less than both the actual and the approved depreciation in AR4. In its initial proposal, AEMO expected the actual AR4 capital expenditure to be 38 per cent lower than what was approved for this period. In response to the draft decision, AEMO's revised its estimated actual expenditure and its current expectation is that it would underspend AR4 capital expenditure by 12 per cent. This will contribute to lower depreciation in AR5 compared to AR4.

Most forecast capital expenditure that will be incurred in AR5 for GSI functions, namely for the digital roadmap project, will not be depreciated until AR6.

In its initial proposal, AEMO allocated eight per cent of the forecast capital expenditure for three capital projects in AR5 to the GSI business unit. These were:

- Lifecycle support investment for hardware and software to cover system growth and application upgrades: GSI allocation was \$79,000 of the total expenditure of \$983,000.
- Identity and access management: GSI allocation was \$91,000 out of the total project cost of \$1.1 million
- Digital roadmap: GSI allocation was \$1.1 million of the full expenditure of \$13.8 million.

### **Draft decision**

The ERA found that AEMO's proposed allowable revenue for its GSI functions was reasonable. The draft decision approved \$5.9 million allowable revenue for GSI functions for AR5 in principle, subject to adjustments for any capital projects not approved.

The draft decision also adjusted the proposed forecast capital expenditure for GSI functions as follows:

- Lifecycle support investment for hardware and software to cover system growth and application upgrades:
  - The proposed expenditure for this project included 30 per cent contingency, applied in the final year of AR5. As stated in AEMO's proposal, this project involved "occasional, and relatively minor, uplift to accommodate capacity demand for disk space, CPU or network bandwidth".<sup>87</sup>
  - The ERA recognised that AEMO must procure hardware and software to update and upgrade its existing systems, and so the draft decision approved forecast capital expenditure of \$60,000 in AR5.
- Identity and access management:

<sup>87</sup> AEMO, 2019, *2019-22 allowable revenue and forecast capital expenditure submission to the Economic Regulation Authority*, PP. 66. ([online](#))

- During the determination process, AEMO advised that this project commenced early (in AR4) and most of the capital expenditure would be incurred in AR4. AEMO provided an updated total cost for this project in AR5 that excluded contingencies.
  - The draft decision was to approve forecast capital expenditure of \$56,000 for AR5. While the full amount reduced materially compared to AEMO’s proposal, the updated expenditure information also allocated a higher portion of expenditure to the GSI function. This was because AEMO had undertaken more planning and scoping work and gained a better understanding of how to allocate the costs between the WEM and GSI functions.

The ERA’s draft decision did not to approve forecast capital expenditure for the digital roadmap. This is explained in section 5.2.3 and in Appendix 1.

### **Response to draft decision and final determination**

In response to the draft decision, AEMO provided further justification for the digital roadmap project, which accounted for 70 per cent of the proposed forecast capital expenditure in the GSI function. The final determination approves a total allowable revenue of \$6.1 million for the GSI function for the AR5 period. Similar to the amendments made to the WEM allowable revenue, AEMO adjusted its allowable revenue forecast for the final determination.

Between the draft decision and the final determination, AEMO also provided updated information on the capital projects for the GSI function. The ERA’s final determination on forecast capital expenditure for the individual capital projects is as follows:

- Accounting treatment of leases:
  - AEMO changed the way it presents its lease expenditure and proposed to capitalise \$247,000 of rental costs.
    - The ERA recognises that this is an accounting requirement, however, the accounting standards require the capitalisation of leases less lease incentives. For this reason, the ERA approves the capitalisation of rental costs less lease incentives, which results in an approved amount of \$131,000. AEMO made an adjustment to its allowable revenue.
- Lifecycle support investment for hardware and software to cover system growth and application upgrades:
  - AEMO reduced the contingency of the project from 30 per cent to 22 per cent. In addition, AEMO moved some of the cost between WEM and GSI functions and reduced the GSI’s allocation by \$15,000.
    - The ERA approves forecast capital expenditure of \$55,000 for AR5.
- Identity and access management:
  - AEMO commenced this project in AR4 and used existing underspent funds to fund a major portion of it in 2018/19. The AR5 estimate was updated prior to the draft decision and remains unchanged.
    - The ERA’s final determination approves the same amount of \$56,000 for AR5.
- Digital roadmap:
  - In response to the draft decision, AEMO provided more information on the digital roadmap project. AEMO provided more justification of the value of the project and was able to formulate some benefits for the Western Australian functions, as

described in section 5.2.3 above. In addition, AEMO proposed that if the ERA was not able to approve the full amount of the digital roadmap project forecast capital expenditure over the AR5 period, the ERA should fund a minimum amount for the first AR5 year, which would allow AEMO to commence work.

- The ERA understands the reasons for the digital roadmap program and agrees that if AEMO was to undertake a stand-alone program for Western Australia, the costs are likely to be higher. In its draft decision, the ERA discussed an alternative option, should AEMO be unable to provide enough justification that would allow the ERA to approve the full three-year program. In such case, the ERA recommended that AEMO should propose an amount that would allow it to commence work in the first AR5 year and would also allow it to analyse and scope the working program for the WEM and the GSI functions.
- In AEMO's response to the draft decision, AEMO reduced the GSI allocation by 25 per cent, from \$1,104 million to \$0.828 million. This has been achieved through lower allocation to the GSI function (six per cent instead of eight per cent) and through updated, lower contingencies.
- AEMO also provided an alternative forecast capital expenditure proposal, that it would require as a minimum to commence work in the first AR5 year. For the GSI function this amount is \$0.291 million.
  - The ERA's final determination is to approve the amount AEMO requests for the first AR5, which is \$291,000, for the GSI function.

In total, the ERA's final determination is to approve \$533,000 of forecast capital expenditure for the GSI function to be able to undertake the above capital projects during AR5.

## 5.4 Market Fees

### *WEM fees*

The approved allowable revenue forms the basis for AEMO's annual budgets and the annual WEM fees. WEM fees are made of a market fee, a system management fee and a regulator fee. Market generators and market customers are charged with WEM fees based on their share of the volume of energy generated or consumed. AEMO uses loss factor adjusted energy forecasts, published in its WEM Electricity Statement of Opportunities to calculate the WEM fees.

The annual budgets are adjusted to account for over and/or under recovery and for any differences between actual and forecast cost and energy. AEMO collects the regulator fee on behalf of the ERA. WEM fees are paid monthly.

AEMO's proposed allowable revenue results in an increase of the average AR5 WEM fees of \$0.105/MWh or 11.1 per cent compared to the average AR4 WEM fees. During AR5, WEM fees are expected to increase by an average of 4.2 per cent year-on-year.

The WEM reform project, which drives most of the capital expenditure in AR5, will not affect the allowable revenue and WEM fees in AR5. This project will be added to the depreciation, and therefore allowable revenue, after it is completed. This is expected to occur during AR6.

AEMO expects that WEM fees will experience more material increases from AR6 onwards. Based on current estimates, the average year-on-year increase in AR6 is expected to be around 4.4 per cent. The average AR6 WEM fees are expected to be 14 per cent higher than the average AR5 WEM fees, but this is an early estimate based on currently known information.

The proposed WEM fees are shown in Table 7 below.

**Table 7: AEMO estimated WEM fees for AR5 (\$/MWh nominal)**

WEM fees	AR4 average	2019/20	2020/21	2021/22	AR5 average	Variance on average
Market fees	0.404	0.357	0.364	0.375	0.365	(9.5%)
System management fees	0.430	0.499	0.519	0.540	0.519	20.8%
Regulator fees*	0.111	0.140	0.143	0.146	0.143	28.3%
<b>WEM fees</b>	<b>0.945</b>	<b>0.996</b>	<b>1.026</b>	<b>1.061</b>	<b>1.028</b>	<b>8.7%</b>

\* The Regulator fee is estimated by escalating the 2018/19 ERA fee of \$0.137 by CPI. This estimate is subject to change.

Table 8 below shows the WEM fees based on the ERA's approved AR5 allowable revenue. These fees are however only preliminary, as the allowable revenue is only the basis for the calculation and does not include all adjustments.

**Table 8: WEM fees for AR5 based on approved allowable revenue (\$/MWh nominal)**

WEM fees	AR4 average	2019/20	2020/21	2021/22	AR5 average	Variance on average
Market fees	0.404	0.362	0.387	0.414	0.388	(4.0%)
System management fees	0.430	0.499	0.519	0.540	0.519	20.8%
Regulator fees*	0.111	0.140	0.143	0.146	0.143	28.3%
<b>WEM fees</b>	<b>0.945</b>	<b>1.001</b>	<b>1.049</b>	<b>1.100</b>	<b>1.050</b>	<b>11.1%</b>

\* The Regulator fee is estimated by escalating the 2018/19 ERA fee of \$0.137 by CPI. This estimate is subject to change.

### GSI fees

Western Australian gas market participants pay GSI fees that include AEMO's allowable revenue requirement for the services it provides under the GSI rules and the ERA revenue requirement to provide regulatory oversight in the gas market. AEMO collects the ERA revenue requirement on ERA's behalf. GSI fees are paid quarterly and are charged to gas shippers and gas producers based on their share of the gas delivered and provided to shippers respectively.

Like the WEM fees, the GSI allowable revenue is only the basis for the annual budget and annual fee calculations. These are subject to adjustments for over- and under-recoveries.

AEMO's proposed GSI fees for AR5 are shown in Table 9 below.

**Table 9: AEMO estimated GSI requirement for AR5 (\$'000 nominal) excl. ERA requirement**

GSI requirement	AR4 average	2019/20	2020/21	2021/22	AR5 average	Variance on average
GSI allowable revenue	1,823	2,045	1,925	1,923	1,964	7.7%

GSI requirement	AR4 average	2019/20	2020/21	2021/22	AR5 average	Variance on average
Over / under recovery	(229)	(510)	(126)	289	(116)	(49.3%)
GSI fees base	1,594	1,535	1,799	2,212	1,849	16.0%

Table 10 below shows the GSI requirements, excluding the ERA requirement, based on the ERA's approved AR5 allowable revenue. These fees are however only preliminary, as the allowable revenue is only the basis for the calculation and does not include all adjustments.

**Table 10: GSI fees base for AR5 based on approved allowable revenue (\$'000 nominal)**

GSI requirement	AR4 average	2019/20	2020/21	2021/22	AR5 average	variance
GSI fees base	1,594	1,521	1,828	2,368	1,905	19.5%

## Appendix 1 Detailed capital project information

The ERA's final decision on forecast capital expenditure for AR5 is provided by individual project below.

### *Power System Operations (PSO) project*

In the final AR4 year, AEMO sought and received approval for forecast capital expenditure to commence a project to implement a new energy management system (e-terra v. 2.5) in the WEM. AEMO expected that the project would cost \$4.2 million<sup>88</sup> and would be completed in the 2018/19 financial year. Following completion, AEMO intended to upgrade the energy management system from version 2.5 to 3.2 almost immediately.

Due to delays, AEMO now expects to spend \$3.5 million on this project in AR4 and seeks to transfer \$0.473 million capital expenditure from AR4 into AR5 to complete the project in the first half of 2019/20. AEMO also advised the ERA that it will implement e-terra version 3.2 directly. Therefore, the cost for the e-terra 3.2 upgrade project, \$0.687 million in the AR5 proposal, is no longer required.

#### *Draft decision*

The ERA agrees that forecast capital expenditure requested to finalise the implementation of e-terra version 3.2 represents the least cost option for the WEM. By implementing version 3.2 and taking advantage of internal resources and lessons learned<sup>89</sup> from the upgrade in the National Electricity Market, AEMO has demonstrated that it has taken a prudent approach to minimising costs for this project.

For these reasons, the ERA's draft decision approved \$0.419 million in forecast capital expenditure for AR5.

#### *Response to draft decision*

In AEMO's AR5 response to the ERA's draft decision, the scope and costs for the PSO project remained unchanged from AEMO's AR5 initial proposal. AEMO has reviewed the project contingency and submitted an updated 23 per cent (\$0.1 million) contingency for this project.

AEMO's justification for the increased project contingency is due to the primary risks associated with the PSO project. AEMO's response states that the project contingency needs to be incorporated due to the potential complexity of the e-terra implementation and the need for specialist resources to support any resolution of issues. Even though the e-terra version 3.2 will be installed in the National Electricity Market prior to its application in the WEM, AEMO is of the view that the inherent differences between the WEM and National Electricity Market may give rise to possible integration issues. As a result, AEMO considers it is feasible that the project contingency includes forecast capital expenditure for additional resources that may be required to implement the new energy management system including external specialist consultants or resources that will come at a premium cost.

<sup>88</sup> The \$4.2 million is only for the implementation of e-terra (\$0.5 million approved in 2017 and \$3.74 million approved in 2018). The PSO project included two other systems, a short-term demand forecasting system and a SWIS power model. These were completed on time and within the funding originally approved in 2017.

<sup>89</sup> AEMO expects to complete the upgrade of e-terra to version 3.2 in the National Electricity Market by May 2019. This will free internal resources for the WEM.



*Consultant's view:*

IES recommended that “as it is not a new capex project, and the cost and requirements have remained the same”, the project should be approved ‘based on the original proposal of \$473,000.”

IES recommended approving the costs of this project based on AEMO’s original AR5 proposal. However, IES questioned “why the contingency has been revised upwards given AEMO’s experience with e-terra in the National Electricity Market with no change in circumstances since the original AEMO AR5 proposal”.<sup>90</sup>

*Final determination*

Based on its assessment of the information provided by AEMO, and advice from its technical consultant, the ERA’s final determination is to approve forecast capital expenditure of \$0.516 million for AR5.

## System Management Systems Transition

During AR4, AEMO requested, and the ERA approved, forecast capital expenditure for the transfer of system management from Western Power to AEMO. Part of this transfer is the SMST project, which aimed at replicating several Western Power systems over to AEMO’s IT platforms. As part of the approval process in 2018, AEMO provided justification and information on the options considered and selected. AEMO expected to incur \$4.9 million in 2018/19 and flagged that it will require around \$0.5 million to complete the project in late 2019, taking the total project cost to \$5.4 million. The ERA had already approved forecast capital expenditure for the system management transfer, recognising that this was the least cost option in the circumstances. There was a \$4.8 million underspend available to AEMO to complete the SMST project as so no additional forecast capital expenditure was approved in AR4.

Following delays to the project in 2018/19, AEMO expects an actual spend of \$2.8 million by the end of AR4. AEMO’s proposal sought approval for \$2.209 million in forecast capital expenditure in 2019/20 to complete the project. Based on AEMO’s current estimates the total estimated cost of the project has reduced to \$5.0 million.

*Draft decision*

The ERA acknowledged the justification for and estimated cost of the SMST project in its December 2018 determination paper. By demonstrating a reduction in the total project estimate AEMO has demonstrated that it is actively seeking to reduce costs in line with a lowest practicably sustainable cost approach. For these reasons, the ERA’s draft decision approved forecast capital expenditure of \$1.703 million for AR5.

*Response to draft decision*

AEMO has since submitted an updated response to the ERA’s draft decision emphasising a 30 per cent project contingency is required for the SMST project.

AEMO considers it is prudent to include a contingency for the SMST project due to the high risk of integrating many bespoke components of the system management systems. This integration may prove more complex than anticipated and additional external resources could

<sup>90</sup> IES, 2019, Review of AEMO’s 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal, P. 41, [\(online\)](#)



be required to help solve any integration problems that emerge. Additional issues will also likely emerge as the project enters the test and remediation phase. The nature, volume and cost of these issues will not be clearly defined until the test and remediation phase has progressed further which justifies the need for a 30 per cent contingency for the SMST project.

During the review period, the overall scope and cost of the SMST project have remained the same as AEMO's AR5 proposal.

#### *Consultant's view:*

IES concluded that, although the project was short-lived and would be replaced by systems implemented under WEM reforms, AEMO had "taken the necessary steps to show the copy-and-paste option is the most prudent course of action" and that it would be a "hedge against delays as AEMO will have the option to enhance and extend the system as required."<sup>91</sup>

IES recommended the ERA approve full forecast capital expenditure for the SMST project "minus the contingency components associated with remediation activities and the additional hardware and licensing requirements."<sup>92</sup>

#### *Final determination*

The ERA's final determination is to approve forecast capital expenditure of \$2.215 million equivalent to the proposed costs of the SMST project.

## **Reduction of Prudential Exposure (ROPE) Phase 2 project**

In May 2018, the Rule Change Panel approved rule change RC\_2017\_06 – Reduction of the prudential exposure (RoPE) in the Reserve Capacity Mechanism. This rule change was to mitigate a prudential risk in the WEM arising from a market customer's Individual Reserve Capacity Requirement obligations. Implementation of the rule change was expected to reduce the credit support provided by market participants by \$69 million, a clear market benefit.<sup>93</sup>

In July 2018, AEMO proposed that the RoPE project would be delivered in two phases:

- Phase 1 (Rule Change) – make the software changes required to implement the reduction of prudential exposure rule change in the AR4 period by May 2019.
- Phase 2 (Procedure Change) - develop a procedure change and new WEMS<sup>94</sup> sub-system to improve the responsiveness of the outstanding amount calculation and the efficiency and effectiveness of the prudential framework to be completed in the AR5 period.

In July 2018, AEMO requested and the ERA later approved \$2.7 million of additional forecast capital expenditure in AR4, equivalent to the cost estimate for delivering Phase 1 of the RoPE project. Due to an underspend on internal costs and no requirement to call on the 30 per cent

<sup>91</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P. 42 ([online](#))

<sup>92</sup> *Ibid*, P. 42

<sup>93</sup> Rule Change Panel, 2018, *RC\_17\_06: Final Rule Change report*, P. 101 ([online](#))

<sup>94</sup> The Wholesale Electricity Market System (WEMS) is a collection of sub systems run by AEMO to operate the Wholesale Electricity Market operations and system management functions. The WEMS Market Participant Interface (MPI) is a medium between the market participant and AEMO to exchange and submit registration information, trading submissions, settlement information and facilitate the extraction of market reports.

project contingency, AEMO has advised that RoPE Phase 1 will be completed at a forecast capital cost of \$1.6 million.

The RoPE Phase 2 project will address inefficiencies in the WEM prudential framework and deliver a dynamic daily outstanding amount calculation. For the AR5 period, AEMO has estimated that \$2.324 million forecast capital expenditure, including a 24 per cent project contingency, is required to complete Phase 2 of the RoPE project.

#### *Draft decision*

AEMO has engaged with market participants throughout the delivery of the RoPE project. The ERA's December 2018 determination report recommended that AEMO communicates the likely costs of Phase 2 of the project with stakeholders as well as its benefits and delivery.<sup>95</sup> AEMO has discussed Phase 2 of the RoPE project in detail at the WA Rule Change Projects Working Group meetings. The notes of these meetings have not recorded any stakeholder concerns about AEMO proceeding with the changes proposed in Phase 2 of the project.

AEMO undertook a competitive tendering process for consultants to support the project and has used the same consultants for both phases. It has also communicated costs to stakeholders.

For these reasons the ERA's draft decision approved \$1.872 million in forecast capital expenditure for AR5.

#### *Response to the draft decision*

In AEMO's AR5 response to the ERA's draft decision, AEMO has revised the project contingency and submitted an updated 32 per cent contingency for the RoPE Phase 2 project.

AEMO considers it is prudent to include a project contingency due to key project risks which have a high probability of occurring. There is a high probability risks due to the complexity of the settlement equations that developing, testing and certifying the new settlement calculation engine will require more effort than estimated. This indicates an increased risk to the project cost and schedule. AEMO also believe that the complex architecture and data flows in the existing WEM Systems also represent an additional risk to the project scope, cost and schedule. For these reasons AEMO considers it reasonable to include a contingency amount of 32 per cent for this project.

#### *Consultant's view*

IES concluded that there are "clear benefits associated with the project" and that the project will serve the full, intended five-year project life and will not be replaced by WEM reforms. IES concluded that the RoPE rule change "does meet the requirement that it is the lowest practicably sustainable cost given it went out to a competitive tender process" and will provide "the groundwork for the critical POMAX settlement replacement project". IES recommended the ERA approve the full forecast capital expenditure for the RoPE project.<sup>96</sup>

---

<sup>95</sup> Economic Regulation Authority, 2018, *The Australian Energy Market Operator Allowable Revenue and Forecast Capital Expenditure for 2016/17 to 2018/19 – Forecast capital expenditure adjustment – Final determination*, P. 15 ([online](#))

<sup>96</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, PP. 30-31, ([online](#))

### *Final determination*

The ERA's final determination is to approve forecast capital expenditure of \$2.478 million equivalent to the proposed costs for the RoPE Phase 2 project.

## ***POMAX Oracle Database and Metering Upgrade project***

AEMO currently uses POMAX Energy Data Management (EDM) software that is provided and supported by Brady PLC. This software monitors, maintains and collates the information on interval meters that is provided by Western Power metering for settlement purposes.

The POMAX EDM system relies on Oracle version 11c to provide database services, with the database currently using a Windows Server 2008 R2 operating system. In January 2015 and October 2015 both Microsoft and Oracle announced that the Windows Microsoft Server 2008 R2 will reach end of life in January 2020 and Oracle version 11c will no longer be supported after December 2020.

AEMO advised that, as part of software asset lifecycle management, it must ensure the currency of software used to support WEM market systems. Maintaining an unsupported operating system and database for one of the WEM's most critical systems carries significant risk. AEMO's proposal provided information on alternative metering system options considered and provided appropriate justification for upgrading to a newer, version 12c of the Oracle database, which will be supported by Oracle until 2025, and the latest supported operating system.

### *Draft decision*

The ERA agrees that the forecast capital expenditure requested to upgrade the POMAX EDM application and database to supported versions represents the most secure and efficient cost option for the WEM. For these reasons, the ERA's draft decision approved \$946,000 in forecast capital expenditure for AR5.

### *Response to the draft decision*

In AEMO's AR5 response to the ERA's draft decision, AEMO has revised the project contingency and submitted an updated 8 per cent contingency for the POMAX Oracle database and metering upgrade project.

AEMO's updated contingency assessment is based on project risks. AEMO states that one risk is some of the predicted internal roles for this project may need to be filled by external resources, or that the internal resources assigned need to be backfilled by external resources. AEMO have stated that this project is well advanced, and the risks associated with project delivery are clearly defined. For these reasons AEMO considers it reasonable to include a contingency amount of eight per cent for this project.

### *Consultant's view:<sup>97</sup>*

IES acknowledged the "clear requirement to upgrade the systems relating to its POMAX EDM to remove any key support risks associated with the existing Oracle and Windows platforms."

<sup>97</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.33, ([online](#))

Based on its assessment of the costs, and alternative options considered by AEMO, IES recommended the ERA approve the full capex amount.

#### *Final determination*

The ERA's final determination is to approve \$968,000 in forecast capital expenditure equivalent to the forecast costs of the POMAX Oracle Database and Metering Upgrade project. The ERA's final determination does not approve estimated borrowing costs (\$29,000) due to the total project cost being below the \$1.0 million threshold set by AEMO's internal processes. Only projects with a total cost above \$1 million attract separate capital costs.

### **POMAX Settlements Replacement**

AEMO is currently the sole user of the POMAX settlements system owned by Brady PLC and relies on Brady vendor support to address any problems with the POMAX application. Brady's support team consists of two specialist subject matter experts based in Scotland. This can lead to issues taking longer to resolve, given the support team is based in a different time zone. AEMO has proposed to extend the systems delivered in the RoPE Phase 2 project and the existing WEMS systems and bring all WEM settlement services in-house. This will ultimately cease reliance on the Brady PLC POMAX settlement system.

AEMO has outlined the additional benefits of the proposed POMAX replacement, including

- the elimination of ongoing Brady vendor support payments
- access to and timeliness of in-house technical support
- full control over any changes or improvements that may be required to the settlement system.

AEMO forecasts it will require \$1.597 million in capital expenditure to plan and implement the POMAX settlements replacement project. This forecast included a \$465,000 (41 per cent) project contingency.

#### *Draft decision*

The ERA's draft decision was to approve forecast capital expenditure of \$1.132 million for AR5, as this represents the lowest practicably sustainable cost. AEMO considered three alternative options<sup>98</sup> and provided clear justification for its recommended approach. Bringing the settlement system in-house reduces system development and support risks and reduces ongoing system support costs. The operational life of the proposed POMAX settlement system will not be shortened by implementation of WEM reform and AEMO has advised it intends to utilise the system for as long as practicable until it is prudent to transition to a new platform provided by the digital roadmap project.

#### *Response to the draft decision*

In AEMO's AR5 response to the ERA's draft decision, AEMO has submitted a revised budget request of \$1.521 million for the POMAX settlements replacement project. AEMO has also requested an updated 37 per cent contingency for this project.

The updated contingency required for this project is due to the interdependency between this and two other projects (RoPE Phase 2 and POMAX Oracle database and metering upgrade)

<sup>98</sup> AEMO, 2019, *2019-22 allowable revenue and forecast capital expenditure submission to the Economic Regulation Authority*, P. 55. ([online](#))

which means there are considerably more variables and delivery risks than in a less complex standalone project. Another risk identified is that most of the budget for this project is based on external resources. The cost estimates currently provided from external vendors are based on a rough order of magnitude (ROM) which has a +/- 50 per cent degree of confidence attached to it. AEMO therefore considers it prudent to include a contingency amount to accommodate the upper bound of the vendor's estimate.

*Consultant's view:*<sup>99</sup>

IES agreed the "in-house solution leverages work already underway in RoPE and will remove one of the core risks associated with external solutions and reliance on vendors to make changes." The consultant determined that the detailed cost breakdowns provided were "not unreasonable or inconsistent with the specified requirements". The consultant also considered that the 37 per cent contingency reflected the "complex nature of a critical system replacement." IES recommended the ERA approve the full capital expenditure forecast for this project.

*Final determination*

The ERA's final determination is to approve forecast capital expenditure of \$1.521 million equivalent to the revised cost of the POMAX settlements replacement project.

## **Business continuity capability project**

Currently, AEMO relies on Western Power's East Perth control room as a backup facility to provide real-time operation of the WEM should AEMO need to evacuate its Perth CBD office.

System Management's IT and operational technology systems are being brought in-house through AEMO's SMST and PSO projects. The current service level agreement with Western Power ceases in January 2020, after which Western Power's backup facility will no longer be available to AEMO. Therefore, AEMO must provide its own business continuity capability and backup facility from January 2020 onwards.

AEMO has considered several alternative arrangements for business continuity capability in the event the current control room facility is unavailable. AEMO's preference is to lease a small secure section of an existing commercial facility in Western Australia. This facility will be equipped with the necessary workstations, systems, IT equipment and facilities to continue operation of the WEM power systems and market operational support systems.

AEMO forecasted a capital expenditure of \$498,000 for the business continuity capability project with a 30 per cent project contingency. AEMO's proposal advised that a final decision on the location of the backup facility had yet to be made, and therefore, detailed project costs were not available.

*Draft decision*

The ERA's draft decision was to not approve forecast capital expenditure of \$498,000 for the business continuity capability project as the ERA could not determine that this was the lowest practicably sustainable cost option while commercial negotiations are ongoing.

<sup>99</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.32, [\(online\)](#)



*Response to the draft decision*

In AEMO's AR5 response to the ERA's draft decision, AEMO has now identified its preferred backup facility location and has submitted the updated project costs and scope to the ERA. The revised capital cost estimate is \$229,000 for the business continuity capability project with a 15 per cent project contingency.

The updated 15 per cent project contingency is based on the risk that the assumption of internal resources required to deliver these works is too low. AEMO also considers that this contingency is required to accommodate any potential variance in hardware/technical requirement for the backup facility. Detailed technical discussions with the property owners and fitters has not yet commenced which means there is a risk the technical solution may be more complex than anticipated. For these reasons, AEMO considers it prudent to include a 15 per cent contingency for the Business continuity capability project.

*Consultant's view:*<sup>100</sup>

IES notes the "absolute requirement" for this project "in the timeframe proposed by AEMO to ensure there is an adequate business continuity plan post-2020 expiry of the existing arrangement with Western Power". IES also acknowledges that "AEMO has provided high-level options analysis to support a leasing solution to be the lowest cost and sustainable" and recommends approving the full amount of capital expenditure requested.

*Final determination*

AEMO's preferred option to lease a commercial facility in Western Australia, poses the lowest risk to maintaining system security when a business continuity event happens. AEMO provided commercial-in-confidence estimated cost information to the ERA on several alternate existing commercial facilities in Western Australia and has selected the least practicable sustainable cost option as its preferred backup facility location.

The ERA's final determination is to approve forecast capital expenditure of \$229,000.

**STEM Fortran replacement project**

The Short-Term Energy Market (STEM) is currently supported by applications that have been developed using the Fortran programming language. Support for these STEM applications requires knowledge of Fortran, which is old and AEMO's staff have limited knowledge of the language.

In AR5, AEMO proposes to re-write the STEM applications. This will update the applications such that they will be able to interface with proposed WEM reform systems. AEMO will have in-house capability to support the STEM and will be able to modify these systems efficiently in the future. However, the Public Utilities Office has indicated that the design of the STEM will remain unchanged through the WEM reform program.<sup>101</sup>

The STEM Fortran replacement project is costed at \$469,000 and is scheduled to be completed in the first year of AR5 and includes a 30 per cent contingency.

<sup>100</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.44, ([online](#))

<sup>101</sup> AEMO, 2019, *2019-22 allowable revenue and forecast capital expenditure submission to the Economic Regulation Authority*, P. 65. ([online](#))

*Draft decision*

The draft decision was to not approve forecast expenditure of \$469,000 for AR5, although the ERA recognises AEMO's proposal to update STEM applications and to mitigate the risks that may exist from running outdated systems for real-time market operations. However, AEMO has not provided information on why the STEM Fortran programming language needs to be updated in the AR5 period, as it was also 'old' in AR4, but no replacement project was identified. AEMO's annual market audits have not identified any risks linked to the Fortran language and not made any recommendations to replace the STEM Fortran code.

*Response to the draft decision*

In AEMO's AR5 response to the ERA's draft decision, AEMO argued the STEM Fortran replacement project should be funded because:

- Despite being funded to undertake the project twice before in both AR3 and AR4, other elements had acted to impede the delivery of the projects.
- IT failures had delayed and suspended the STEM on occasion and present a continuing risk.
- Maintaining systems written in superseded languages would increase costs to other projects.

The ERA acknowledges that AEMO has been consistent regarding the requirement to deliver the STEM Fortran replacement over recent allowable revenue periods. The AR3 and AR4 STEM Fortran project deferrals have been the result of circumstances outside of AEMO's control and therefore the risks associated with Fortran remain. The ERA had approved forecast capital expenditure for the STEM Fortran code replacement in both the AR3 and AR4 periods. The STEM application also interfaces with several other AEMO systems. These systems will be modified as part of the WEM reform program and as such the interfaces with the STEM application will need to be maintained. The Public Utilities Office has also indicated that the core design of the STEM will remain unchanged through the WEM reform program. AEMO states that replacing the STEM Fortran code base in the AR5 period remains the most prudent approach to mitigate the risks associated with running outdated systems for real-time market operations.

In AEMO's AR5 response to the ERA's draft decision, AEMO has reviewed the contingency and reduced this to 24 per cent for the STEM Fortran replacement project. This is due to some of the predicted internal roles may need to be filled by external resources, or that the internal resources assigned need to be backfilled by external resources. AEMO's previous experience also shows that internal resource costs may vary if there are significant issues during the testing. The capital cost of resources and platform for this project remains the same at \$361,000.

*Consultant's view:*<sup>102</sup>

IES noted that STEM applications will require change to ensure they are capable of interfacing with new WEM systems, but these costs had not been provided by AEMO. IES concluded that there was "not evidence what has been proposed is the lowest practicably sustainable cost." The recommendation was to not approve forecast capital expenditure.

<sup>102</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.38, ([online](#))



### *Final determination*

The ERA acknowledges IES concerns regarding greater justification of the least cost option by AEMO. However, the ERA has previously approved forecast capital expenditure in both the AR3 and AR4 periods for the STEM Fortran code base replacement and for this reason the ERA approves capital expenditure \$448,000 equivalent to the resource and platform costs for this project.

### **Hardware and software lifecycle support project**

As stated in AEMO's proposal, the hardware and software lifecycle support project involved the "occasional, and relatively minor, uplift to accommodate capacity demand for disk space, CPU or network bandwidth".<sup>103</sup> Systems running on legacy operating system and software versions require maintenance and upgrades to mitigate risks.

AEMO has considered alternatives to upgrading existing systems such as implementing new computing platform infrastructure as part of the digital roadmap project. However, there was expenditure on new and existing IT infrastructure in the AR4 period. AEMO has demonstrated that making upgrades to existing hardware and software is the least-cost approach until any new infrastructure platform is well established.

AEMO's AR5 proposal forecast capital expenditure of \$904,000 for the WEM portion of this project, which included a 30 per cent contingency.

### *Draft decision*

Maximising use of existing systems before transferring to new infrastructure installed through the digital roadmap project demonstrates a prudent approach to IT system utilisation and the ERA's draft decision was to approve forecast capital expenditure of \$696,000 for the WEM component of this project.

### *Response to the draft decision*

In AEMO's AR5 response to the ERA's draft decision, AEMO is seeking approval for a lower project contingency of 22 per cent for the Hardware and software lifecycle support project. AEMO considers it is prudent to include a reasonable contingency in the capital forecast due to hardware requirements being likely to vary from the forecast over the AR5 period. The bulk of the contingency is associated with this risk due to detailed hardware requirements not able to be quantified accurately at this time. This project will also source a significant amount of hardware from overseas vendors which means there is also the risk that exchange rate variations may impact the eventual costs of the hardware purchased. AEMO considers this is further justification to include the project contingency in the capital forecast.

AEMO has also shifted \$15,000 of the platform cost of this project from the GSI component to the WEM component. This has increased the WEM component of this project to \$711,000. The overall project cost including the GSI component has remained the same.

---

<sup>103</sup> AEMO, 2019, 2019-22 allowable revenue and forecast capital expenditure submission to the Economic Regulation Authority, P. 66. ([online](#))

*Consultant's view:*<sup>104</sup>

IES recognised that current WEM systems would require additional updating to serve growing requirements of storage and computing capacity for AEMO's WEM and GSI systems and supported AEMO's approach to estimating costs. AEMO had considered its "forecast requirements, and a review of its asset register and end of life upgrade or replacement timings. Costs are matched against supplier details which are tested via AEMO's regular testing of market through competitive tender processes."

IES's recommendation was for the ERA to approve forecast capital expenditure but with a lower contingency of 15 per cent. This was because updating hardware and software support was a standard process and AEMO had the necessary information to "accurately assess the growth requirement and corresponding resources required to maintain current systems infrastructure".

*Final determination*

The ERA's final determination is to approve the \$864,000 of forecast capital expenditure.

**Enhanced control room tools project**

AEMO has proposed a project to develop a suite of new control room tools to provide improved situational awareness of real time issues. AEMO intends to develop prototypes of these tools to test if the information captured and the method for doing so meets AEMO's requirements, before developing more robust tools in-house. The proposed tools are a new system controller logging tool (MIAMI), an inertia monitoring tool, Volt/VAr tool to manage system voltage during low load periods and a system strength tool to identify areas where system strength is weak. The project is costed at \$304,000 in capitalised resource costs and includes a 30 per cent contingency.

Controllers are currently required to log events. There are several audit findings that recommend the electronic logbook guidelines should be consistently followed.<sup>105</sup> AEMO has proposed introducing a new electronic logging tool (MIAMI), but has not provided information on alternative options such as implementing procedural changes to encourage controllers to correctly use the existing electronic logbook.

The ERA is aware of the changing nature of the electricity system and that the electricity system is becoming increasingly challenging to manage.<sup>106</sup> However, the enhanced control room tools project does not identify the tools that would be developed, nor why they are needed over and above changes that will form part of the WEM reform and the digital roadmap projects.

<sup>104</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.39, ([online](#))

<sup>105</sup> Robinson Bowmaker Paul, 2018, *Australian Energy Market Operator Independent Assurance Report on AEMO's Compliance with the WEM Rules and Market Procedures*, PP. 15,17,74-77. ([online](#))

<sup>106</sup> Economic Regulation Authority, 2019, *Report to the Minister for Energy on the Effectiveness of the Wholesale Electricity Market 2018 Final Report*, PP. ii-iii. ([online](#))

*Draft decision*

The draft decision was to not approve forecast capital expenditure of \$304,000 for AR5. This project appears too early in its lifecycle to have a clear scope and robust costings to meet identified business needs.

*Response to the draft decision*

In AEMO's AR5 response to the ERA's draft decision, AEMO has provided further justification for implementing the MIAMI electronic logging tool for system controllers in the WEM. Currently WEM controllers use a Microsoft Excel spreadsheet for shift logging of all events, phone calls and equipment faults. These individual files are then saved after each shift into the AEMO document management system. The shortcomings of the current Microsoft excel spreadsheet is there is no clear auditable history of events short of manually reviewing each individual day of events. The MIAMI tool will enable system controller records to be searched and interrogated more easily. This would also lead to better tailored training programs for controllers and greater tracking of power system historical events.

*Consultant's view:<sup>107</sup>*

IES recommended that the ERA reject forecast capital expenditure for this project "until AEMO is able to provide evidence off-the-shelf (plus support cost) are indeed more costly." IES also suggests that AEMO should consider "whether it would be worthwhile to build in data mining capabilities into the existing MIAMI tool."

*Final determination*

AEMO has identified three tools it would like to develop and deploy: system inertia, Volt/VAr, and system strength. Two of the three tools identified appear to overlap Western Power's responsibility. The tools would allow controllers to over-ride economic dispatch without any apparent consideration of guidelines or criteria for intervention. AEMO has also not indicated whether the data the tools might provide could be collected from Western Power.

The ERA recommends that AEMO identifies any situational awareness tools needed that may not be enabled through the WEM reform, the Digital Roadmap and the Distributed Energy Roadmap projects, considers options to address those needs and then defines a capital project or projects to deliver the required tools for the control room.

The ERA agrees that AEMO requires a better system to enable controllers to log real time operational events that occur during each shift, and recognises the benefits this new logging tool will have. The ERA views the implementation of the MIAMI logging tool represents both an efficient and least cost solution given AEMO already uses this tool in the National Electricity Market. The ERA's final determination is to approve forecast capital expenditure of \$69,000 equivalent to the costs for the MIAMI electronic logging tool (including project contingency). The ERA does not approve forecast capital expenditure for the system inertia, Volt/VAr, and system strength tools as the operational needs and benefits of these tools were not clearly identified.

---

<sup>107</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.35, [\(online\)](#)

## ***Demand and renewable energy forecasting project***

There is over 1,000 MW of rooftop solar currently installed in the South West Interconnected System (SWIS) and this is forecast to grow at 8.7 per cent a year. The output from rooftop solar varies with the weather. Improving information on distributed energy resources such as rooftop solar was a recommendation from the Finkel independent review of the national electricity market.<sup>108</sup> The ERA supported this recommendation in its 2016/17 WEM report to the Minister for Energy.<sup>109</sup> Improved forecasting accuracy will:

- Enable system operators to make better informed generator dispatch and ancillary service decisions.
- Inform market participants bidding decisions.

Currently, AEMO regularly receives one solar photovoltaic forecast and two solar irradiance forecasts and then manually incorporates this information into its demand forecasting process. AEMO is also running a pilot project in the National Energy Market and the WEM, “which aims to capture and visualise a range of data sources that can be used to improve DER and renewable energy forecasting.”<sup>110</sup>

This project will determine how best to integrate more than one possible source of distributed energy resources information, and historical data, into the SWIS forecasting tools. AEMO has costed its resource requirement plus a 30 per cent contingency. There is also an annual charge for data from a third-party provider.

### *Draft decision*

The ERA’s draft decision was to approve forecast capital expenditure of \$69,000 for AR5, equivalent to the capitalised resource cost for the project. AEMO has demonstrated a prudent least cost approach by utilising an internal resource, the demand forecasting system (implemented through the Power System Operation project) and the benefits from running the pilot project.

### *Response to the draft decision*

In AEMO’s AR5 response to the ERA’s draft decision, AEMO has updated the project contingency required for the demand and renewable energy forecasting project to 29 per cent. AEMO states even though it plans to use an existing forecasting tool and internal resources to deliver this project, a small project contingency is required in the event external resources are needed. The risk of integrating new forecasting tools could also prove more complex than anticipated and therefore AEMO believe it is prudent to include contingency in the capital forecast for this project. The capitalised resource cost for the Demand and renewable energy forecasting project has remained the same.

<sup>108</sup> Finkel, A, 2017, *Independent Review into the Future Security of the National Electricity Market Blueprint for the Future*, P. 25 ([online](#))

<sup>109</sup> Economic Regulation Authority, 2019, *Report to the Minister for Energy on the Effectiveness of the Wholesale Electricity Market 2018 Final Report*, PP. 32-37, ([online](#))

<sup>110</sup> AEMO, 2019, *2019-22 allowable revenue and forecast capital expenditure submission to the Economic Regulation Authority*, P. 60, ([online](#))

*Consultant's view:<sup>111</sup>*

IES did not dispute the benefits of additional data contributing to improved forecasting accuracy. However, the consultant concluded AEMO had not demonstrated that what had been proposed was the “lowest cost or the best solution to achieving similar outcomes”. The recommendation was for the ERA to reject the capital expenditure until “AEMO are able to provide additional details around the accuracy improvements and benefits, and high-level cost estimates for alternative options”.

*Final determination*

The ERA considers that AEMO has demonstrated that it has sought the least practicably sustainable cost for this project. The ERA's final determination is to approve forecast capital expenditure of \$89,000 equivalent to the forecast costs for the demand and renewable energy forecasting project.

## **Market Operator interface project**

AEMO's market operator interface (MOI) provides the following four functions:

- Wholesale Electricity Market System (WEMS) event management
- Updates of global market parameters
- Message log and participant activity monitoring
- Outage monitoring

The MOI is a legacy system that is written using Java applet technology, which is no longer supported by major browsers. AEMO uses workarounds such as Citrix to mitigate its security concerns.

AEMO proposes to rewrite the MOI front-end application to add screens to existing applications in the WEMS system that use secure and contemporary web technologies to increase the security and reliability of the MOI.

AEMO's AR5 proposal costed this project at \$420,000 using in-house resources and included a 56 per cent project contingency. AEMO had considered alternative options before proposing this project.

*Draft decision*

The draft decision was to not approve forecast capital expenditure of \$420,000 for AR5. This is because AEMO had not fully justified why this project was necessary in the AR5 period. The WEM reform project is expected to replace this MOI system in three to five years. There was insufficient explanation of the frequency and consequence of risks that may arise from maintaining existing arrangements for the next few years that justifies the project expenditure as being least practicable sustainable cost.

*Response to the draft decision*

In AEMO's response to the ERA's draft decision, AEMO highlights that its inability to remove applets from the WEMS codebase prevents AEMO from updating the entire WEM systems to

---

<sup>111</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.34, ([online](#))

a supported version of Java. If the MOI is not modified, AEMO will be operating all WEM market systems with unsupported software by platform vendor Oracle increasing operational risk especially if a serious Java defect occurred.

AEMO has updated the project costs for the MOI project to \$363,000 using in-house resources. This includes a reduced 12 per cent project contingency. This reduction is due to greater certainty on the costs of various resourcing strategies. AEMO states that there does remain some risk that additional scope and effort will be necessary during implementation, which may require additional resources. AEMO's response states this additional risk justifies the need to include the 12 per cent contingency for this project.

*Consultant's view:*<sup>112</sup>

IES supported AEMO's approach to removing the cyber security risks posed by the Java applet technology. IES acknowledges that the alternative option to "re-write the MOI based on the newer Java version which is not viable solution." IES supports the rectification of compliance and support risks associated with maintaining the current MOI even though this system is likely to be replaced under the WEM reform program. IES views the instances of out of merit order dispatch in 2018 non-compliance "as material and generally propose remediation in a timely manner based on our systems audit experience". IES supports AEMO's selection of the least-cost option for this project and recommends that the ERA approve forecast capital expenditure.

*Final determination*

AEMO has considered alternative options, including building a new long-term asset, however given the upcoming WEM reforms this would be an inefficient option. The ERA agrees with the plan to rewrite only the MOI user interface using contemporary front-end technologies is the most practicable and least cost solution.

For these reasons, the ERA's final determination is to approve forecast capital expenditure of \$363,000.

## **PASA process improvement project**

AEMO has initiated a project to improve the content and timely reporting of short-term and medium-term Projected Assessment of System Adequacy (PASA) forecasting.<sup>113</sup> This initiative is a response to audit findings and feedback from market participants.

AEMO advised that it had developed this project in response to the 2018 WEM Audit, which identified several problems with the content and timing of short and medium-term PASA publication. The four audit issues identified were:<sup>114</sup>

- The exclusion of the availability of demand-side management capacity when assessing outage levels.

<sup>112</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.37, ([online](#))

<sup>113</sup> Projected Assessment of System Adequacy (PASA) is a forecasting study. It is divided into Long, Medium, and Short Term PASA. The Short and Medium Term PASAs (ST PASA and MT PASA) are undertaken by system management. The MT PASA details the system adequacy and generation requirements on a weekly basis for the three-year horizon, and is published monthly. The ST PASA details the system adequacy and generation requirements on a six-hourly basis for the three-week horizon, and is published weekly.

<sup>114</sup> Robinson Bowmaker Paul, 2018, *Australian Energy Market Operator Independent Assurance Report on AEMO's Compliance with the WEM Rules and Market Procedures*, PP. 53-55. ([online](#))



- The risk of errors from manually incorporating transmission outage information in PASA forecasts.
- Not publishing updates to short-term PASA when material changes occur.
- Not including transmission constraint information in PASA forecasts.

The ERA agrees with AEMO's audit findings, which rate these matters as low risk. These issues have also existed for some time with no evidence of any material consequences for market participants.

AEMO proposes to improve the PASA process by developing a tool that uses a suite of Microsoft applications and operational databases. AEMO has investigated several options including off-the-shelf alternatives and adapting the PASA tool used in the National Electricity Market. The estimated capital cost is \$216,000 with a 30 per cent project contingency.

Market participants' support for improved short-term and medium-term PASA forecasting is clear from the notes of AEMO's procedure change workshop. However, market participants do not appear to have been advised of the options to deliver improvements, nor the likely costs of these improvements.

#### *Draft decision*

The ERA found that some of the issues identified by the audit could also be addressed by improving internal AEMO processes with adequate oversight to ensure the quality and completeness of forecasts prior to publishing short-term and medium-term PASA forecasts. However, AEMO does not appear to have considered alternative approaches to managing these low risk audit findings. The draft decision was to not approve forecast capital expenditure of \$216,000 for the PASA process improvement project in the AR5 period.

#### *Response to the draft decision*

In AEMO's response to the ERA's draft decision, AEMO has provided a revised contingency of 26 per cent for this project. AEMO states the contingency is still required for this project as the prototype is yet to be tested with market participants. There is also a risk that the scope of the final tool will increase or will require additional effort in order to deliver what market participants want. The risk of integrating new data sources such as transmission information, may prove more challenging than originally anticipated. For these reasons, AEMO believe it is prudent to include contingency in the capital forecast for this project.

The \$166,000 estimated capitalised resource cost has remained the same for the PASA process improvement project.

#### *Consultant's view:*<sup>115</sup>

IES noted that "the tool will be developed after the system management system transition project is complete" and therefore "the actual requirements and detailed costing will not be finalised until June 2020 and would still require market participant feedback." Consequently, IES recommend the ERA does not approve any forecast capital expenditure until AEMO provides "a more certain solution design and related cost breakdown."

---

<sup>115</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.36, [\(online\)](#)

*Final determination*

Because no project alternatives were provided, the ERA cannot determine if the development of the PASA tool is the least cost option. For this reason, the ERA's final determination is to not approve forecast capital expenditure of \$209,000.

**System Management application remediation project**

The System Management System Transition project is to replicate the functionality from systems currently in Western Power onto AEMO's IT infrastructure by December 2019. AEMO proposed to follow this project with the System Management application remediation project. This seeks to address shortcomings of the existing systems including poor security, poor performance and capacity limitations. This remediation work will commence after the completion of the SMST project but before the same systems will be replaced or upgraded in the WEM reform program.

AEMO's AR5 proposal estimated the cost for the system management application remediation project is \$406,000 and includes a 29 per cent project contingency.

AEMO listed the audit findings<sup>116</sup> that justified the need for this project as:

- Currency of, and support for, control room tools needs more focus.
- Not using the latest balancing merit order due to IT system issues.
- Market operations data preparation processes are heavily manual.

The ERA has carried out its own investigations of some of these audit findings, such as non-compliances resulting from not using the latest balancing merit order. The ERA did not identify any material consequences from these non-compliances and noted that there has been a reduction in the frequency of these types of events occurring.

*Draft decision*

The ERA's draft decision supported the assessment from IES that there is a lack of detail on what changes or enhancements AEMO wants to undertake on these short-lived systems, which is why the first task has been identified as producing a remediation roadmap. There is insufficient detail to identify these capital cost estimates as meeting the approval requirements in the market rules and so the draft decision was to not approve forecast expenditure of \$406,000 for AR5.

*Response to the draft decision*

In AEMO's response to the ERA's draft decision, AEMO has provided greater detail and high-level cost estimates of the currently planned remediation activities. These are:

- Automation of checking and correcting ex-ante and ex-post outage values if a facility is commissioning or an intermittent generator is on outage. The estimated cost of this work is \$52,000 including contingency.
- Remediation of security concerns whereby internal services are not authenticated nor protected by Transport Layer Security. The estimated cost of this work is \$109,000 including contingency.

<sup>116</sup> Robinson Bowmaker Paul, 2018, *Australian Energy Market Operator Independent Assurance Report on AEMO's Compliance with the WEM Rules and Market Procedures*, PP. 10-11. ([online](#))

- Remediation of the system operations control centre user interface (SOCCUI). The estimated cost of this work is \$179,000 including contingency.
- The remaining funds (\$62,000) are a provision for any other critical remediation work identified during the remainder of the transition.

In AEMO's response to the ERA's draft decision, AEMO has provided a contingency of 26 per cent for this project. AEMO states this contingency is required due to AEMO's lack of familiarity with the migrated systems. The system management remediation project is reliant on the completion of the SMST project. This means there is a risk the actual remediation requirement may be more complex than currently envisaged, or that external resources may be required to undertake the work. AEMO will review the remediation project forecast when the SMST is complete, however AEMO states it is prudent to include a contingency at this time to accommodate potential scope complexity.

*Consultant's view:*<sup>117</sup>

IES acknowledges that "there are significant risks associated with the systems operations control centre user interface particularly around the regular failures of the system and its potential impact on market outcomes". IES recognises that the SOCCUI "is a critical service used to perform various tasks such as adding constraints, change demand forecasts which impacts dispatch, and generating pre-dispatch plans. AEMO has advised that the systems operations control centre user interface regularly fails and requires frequent updates and is hard to implement changes." IES recommends that the ERA approves the \$179,000 for remediation work for the SOCCUI in its final decision.

IES states that the "the other components do not have enough information to establish whether the cost proposed would result in higher cost savings in the interim." IES is "unclear whether the proposed cost for the other components meets the approval requirements without additional information around the costs or existing risks associated with maintaining existing processes in place". For these reason IES recommend the ERA do not approve forecast capital expenditure for the remaining System Management application remediation project costs.

*Final determination*

The ERA's final determination acknowledges IES technical advice and approves the \$179,000 including contingency equivalent to the costs of the SOCCUI remediation project. The ERA approves no further forecast capital expenditure for the System Management application remediation project.

## **Spinning reserve cost allocation rule change**

The spinning reserve cost allocation rule change is to allocate spinning reserve costs to generators in a more granular way, on a causer-pays principle. The current method is to allocate 'blocks' of spinning reserve costs which can distort generators' bidding behaviour in the balancing market as they seek to restrict output to avoid triggering the allocation of a new block of spinning reserve costs.

<sup>117</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.43, ([online](#))

This rule change<sup>118</sup> was initiated in November 2018. AEMO provided cost information to inform the draft rule change report that was published 27 February 2019. This information included the cost (\$176,000) of making changes to the current settlement system to accommodate the rule change start date of 1 September 2019. The zero-cost alternative was to include the new spinning reserve cost allocation into the new settlement system<sup>119</sup> due to be delivered between July and September 2020. The Rule Change Panel's determination was that the additional benefit (\$1 million) to the market of delivering the rule change on the existing settlement system was sufficient to justify the expenditure.

AEMO has brought forward the start of this project into the 2018/19 financial year and reduced the project contingency in response to increased confidence in the scope of the rule change. The rule change was broadly supported by the market and there were no material changes adopted in the draft rule change report following the first consultation period. These changes have reduced the forecast capital cost to \$137,000 for AR5.

#### *Draft decision*

AEMO provided enough detail on this capital project for the ERA to approve forecast capital expenditure of \$114,000 in the draft decision.

#### *Response to the draft decision*

In AEMO's response to the ERA's draft decision, AEMO has submitted an updated 13 per cent contingency required for the spinning reserve cost allocation rule change project. AEMO states this contingency is required to accommodate the risk that the solution provider (Brady) has underestimated the requirements and complexity of the solution, or that edge cases occur. There is also the risk that the internal resources proposed to test the solution would have to be replaced with a labour hire recruit. For these reasons, AEMO states it is prudent to include this 13 per cent project contingency. The capitalised resource cost for this project has remained the same.

#### *Consultant's view:*<sup>120</sup>

IES concluded AEMO had considered two implementation options and reduced its project contingency following "participant support and increased confidence of the rule change" gained through the rule change process. It recommended the ERA approves forecast capital expenditure "to ensure the rule change can be implemented by the planned rule change start date."

#### *Final determination*

The ERA's final determination is to approve forecast capital expenditure of \$129,000 equivalent to the cost of the spinning reserve cost allocation rule change.

---

<sup>118</sup> Rule Change Panel, 2019, *RC\_2018\_06 Full Runway Allocation of Spinning Reserve Costs* ([online](#))

<sup>119</sup> This is the POMAX Settlements Replacement project.

<sup>120</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, PP. 45-46, ([online](#))

## **Administrative improvements to outage process rule change**

The aim of this rule change is to improve transparency on generator outages for market participants to consider when preparing their market bids and to simplify the outage logging process. The proposed rule change includes multiple changes that will:

- improve the processes for managing outages
- improve the process for recording outage quantities
- improve the calculation of adjusted outage quantities in the Reserve Capacity Mechanism
- clarify the use of outage quantities for different purposes under the Market Rules.

The rule change was initiated at the end of 2014 and then put on hold during the previous market reform program. The Rule Change Panel is now progressing this rule change after receiving support from the Market Advisory Committee.

The scope of the original rule change is being reconsidered. AEMO's proposal stated that the systems affected by the rule change have also changed since the original proposal and that any modifications required by this rule change would be made to the WEMS systems to minimise the effect on the SMST project that is currently under way. However, the ERA understands that this approach is currently being reassessed due to the delays in progressing the rule change proposal.

AEMO has estimated the cost of this capital project as \$408,000, including a project contingency of 30 per cent.

### *Draft decision*

The draft decision was to not approve forecast capital expenditure of \$408,000 for AR5 because AEMO will be submitting updated costings to the Rule Change Panel Support team in May 2019.

### *Response to the draft decision*

AEMO has been engaging with the Rule Change Panel Secretariat since submitting the AR5 proposal and has updated the costing of this rule change to \$759,000 based on the current understanding of the scope. AEMO will be providing these costings to the Rule Change Panel Secretariat shortly with final estimates to be provided in response to the Draft Rule Change Report. These updated cost estimates include a project contingency of 25 per cent reflecting that the scope and cost benefit analysis of this rule change is yet to be finalised.

The ERA has also received detailed development costs of this rule change for the proposed changes in outage quantities for WEMS and high-level cost estimates for the procedural changes for ex-ante consequential outages in the system management portal. A detailed project scope of the changes to outage quantities in WEMS has also been provided including:

- Modifying the Theoretical Energy Schedule (TES)<sup>121</sup> calculation to use capacity unadjusted outage data and recalculate TES when new outage information is received
- Changes to Outage submissions including data to be submitted as sent out generation and temperature independent

<sup>121</sup> TES represents the amount of energy, in megawatt hours (MWh), which should have been produced in an interval, by a Facility or the Balancing Portfolio and is calculated by AEMO to determine a Balancing Facility's Out of Merit quantities.

- Updating the outage rate calculation for non-scheduled generators
- Updates to equivalent planned outages
- Enable forced outages to be updated past fifteen business days

*Consultant's view:*<sup>122</sup>

IES made some observations on this project:

- The scope is yet to be finalised. The draft rule change report was extended and is not due until the end of 2019 and the final report won't be released until February 2020.
- This project is dependent on the timing of the System Management System Transition project as adjustments to it would need to be applied post-implementation. This is expected to be delivered by November 2019 and any delays to that project would delay the delivery of this rule change implementation.
- A 25 per cent contingency has been proposed with a project life of 3 years. The contingency is based on a 50% chance that the baseline scope may increase by up to 50%, but also as an equal chance of reducing by a similar amount.
- High level cost estimates based on resourcing was provided, however, AEMO acknowledge more accurate cost forecasts could be delivered with certainty of the full scope of rule change to be implemented. The next expected value of this is zero and the correct application would be to lower the base capex cost and only factor in a positive increase in cost impact from the expanded scope.
- There were no risks noted by AEMO for delaying this project and the rule change itself has been delayed since 2014. AEMO would be able to provide an indication of costs and benefits with a firmer scope following the release of the draft rule change report planned towards the end of 2019.

IES recommend the ERA do not approve forecast capital expenditure for this rule change in the interim and favour a "revised submission when there is more clarity on the scope of work which is expected by the end of this year". IES believe that "no material risks are associated with the existing process and provides comfort that a more prudent outcome can be achieved with a deferral of this capex item until more certainty can be achieved".

#### *Final determination*

Due to the well-defined scope of the changes in outage quantities for the WEMS component of this rule change, the ERA approves the 75 per cent forecast capital expenditure which is allocated to Market Operations. The ERA does not approve the procedural changes for ex-ante consequential outages in the system management portal of this rule change because it is not prudent to approve these high-level cost estimates till a more defined scope is agreed upon. This rule change process is also still ongoing with final costings not yet finalised. For these reasons, the ERA's final determination is to approve capital expenditure of \$553,000.

### ***Identity and access management project***

AEMO has identified the need to increase the resilience of its systems in order to cope with more sophisticated cyber-attacks. A core component of AEMO's digital roadmap cyber

<sup>122</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, PP. 46-47, ([online](#))



security work stream is the identity and access management project that commenced during the final year of the AR4 period. Work on this project will continue in the AR5 period.

AEMO's AR5 proposal forecasted capital expenditure of \$1.045 million for this project which included a 29 per cent project contingency.

#### *Draft decision*

The ERA's draft decision was to approve forecast capital expenditure of \$112,000 for AR5. This is because AEMO has since provided a revised project costing of \$168,000 for the work to be undertaken in AR5. The project's costs as revised by AEMO exclude contingencies and are shared between AEMO's WEM and GSI functions. The WEM share is calculated to be \$112,000. The cost reduction is attributed to the project being ahead of schedule in AR4 and the removal of costs incorrectly attributed to Western Australia.

#### *Response to the draft decision*

In AEMO's AR5 response to the ERA's draft decision, AEMO has not provided any further updates to the scope and costs for the identity and access management project. There is no contingency required as the project is almost complete.

#### *Consultant's view:*<sup>123</sup>

IES recommended the ERA approves the lower forecast capital amounts to complete the project in AR5. This was to recognise that the project was nearly complete and would inform cyber security in the digital roadmap project.

#### *Final determination*

The ERA's final determination is to approve forecast capital expenditure of \$112,000.

---

<sup>123</sup> IES, 2019, *Review of AEMO's 2019-22 Allowable Revenue and Forecast Capital Expenditure proposal*, P.40, ([online](#))

## Appendix 2 Legislative requirements

### *For the Wholesale Electricity Market*

The ERA is responsible for determining the allowable revenue and forecast capital expenditure AEMO can recover for the services it provides to the WEM; these are to:

- Operate the WEM and carry out system management functions, as defined in the market Rules.<sup>124</sup>
- Prepare and implement Wholesale Electricity Market and Constrained Network Access Reform.<sup>125</sup>

The approved allowable revenue is the basis for the annual budgets that AEMO uses to determine annual market fees and charges. AEMO must publish its annual budgets, market fees and charges on its website. Market fees and charges are based on the forecast volume of energy generated or consumed by market participants. Market fees and charges are adjusted annually for surpluses or deficits in collected revenue, arising from differences between forecast and actual expenditure.

The market rules require AEMO to apply to the ERA for a reassessment of its allowable revenue and forecast capital expenditure if AEMO's budget for a financial year is likely to result in:

- Revenue recovery being at least 15 per cent greater than the allowable revenue approved by the ERA for the relevant three-year review period.<sup>126</sup>
- Capital expenditure being at least ten per cent greater than the forecast capital expenditure approved by the ERA for the relevant three-year review period.<sup>127</sup>

The ERA must take the following factors into account when approving allowable revenue and forecast capital expenditure.

- The allowable revenue must be sufficient to cover the forward-looking costs of providing the relevant services in accordance with the following principles:
  - Recurring expenditure requirements and payments are recovered in the year of expenditure.
  - Capital expenditure is to be recovered through the depreciation and amortisation of the assets acquired by the capital expenditure in a manner consistent with good accounting principles.
- The allowable revenue and forecast capital expenditure must include only those costs that would be incurred by a prudent provider of the services, acting efficiently, seeking to

<sup>124</sup> Clauses 2.1A and 2.2 of the market rules provide a list of AEMO's functions and responsibilities.

<sup>125</sup> Clause 1.20 applies until 1 October 2022. Wholesale Electricity Market and Constrained Network Access Reform is defined as any proposed change to the operation of the Wholesale Electricity Market or related network access arrangements, or the regulatory regime applying to the Wholesale Electricity Market (including the Electricity Industry Act, the Regulations and the market Rules) that has been endorsed by the Minister, whether or not legislations has been made to implement it and includes reform initiatives as set out on the Public Utilities Office's [website](#).

<sup>126</sup> Rule Change Panel, 2018, *Wholesale Electricity Market Rules (11 January 2019)*. Clause 2.22A.8, ([online](#))

<sup>127</sup> *Ibid*, Clause 2.22A.9

achieve the lowest practically sustainable cost of delivering the services in accordance with the market rules, whilst effectively promoting the wholesale market objectives.

- Where possible, the ERA should benchmark the allowable revenue and forecast capital expenditure against the costs of other market operators providing similar services in other jurisdictions.
- Where costs incurred by AEMO cover both the performance of functions in connection with the market rules and the performance of AEMO's other functions, the costs must be allocated on a fair and reasonable basis between:
  - Costs recoverable as part of AEMO's allowable revenue and forecast capital expenditure.
  - Other costs not to be recovered under the market rules.

### **For Gas Service Information functions**

The ERA is responsible for determining the allowable revenue and forecast capital expenditure AEMO can recover for the services it provides under the GSI rules; these are to:

- Establish, operate and maintain the Gas Bulletin Board;
- Register or deregister Registered Participants and Registered Facilities and to grant Exemptions;
- Prepare and publish the Gas Statement of Opportunities;
- Make procedures, manage information and any other functions conferred on AEMO under the GSI Act, the GSI Regulations or the GSI rules.<sup>128</sup>

Under the GSI rules,<sup>129</sup> AEMO to apply to the ERA for a reassessment of its allowable revenue and forecast capital expenditure if AEMO's budget for a financial year is likely to result in:

- Revenue recovery being at least 15 per cent greater than the allowable revenue approved by the ERA for the relevant three-year review period.
- Capital expenditure being at least ten per cent greater than the forecast capital expenditure approved by the ERA for the relevant three-year review period.

The ERA must take the following factors into account when approving allowable revenue and forecast capital expenditure.<sup>130</sup>

- The allowable revenue must be sufficient to cover the forward-looking costs of providing the relevant services in accordance with the following principles:
  - Recurring expenditure requirements and payments are recovered in the year of expenditure.

<sup>128</sup> Rule Change Panel. 2019, *Gas Service Information Rules*, clause 107 ([GSI Rules](#))

<sup>129</sup> *Ibid*, clause 111A(4) and (5)

<sup>130</sup> *Ibid*, clause 109

- Capital expenditure is to be recovered through the depreciation and amortisation of the assets acquired by the capital expenditure in a manner consistent with good accounting principles.
- The allowable revenue and forecast capital expenditure must include only those costs that would be incurred by a prudent provider of the services, acting efficiently, seeking to achieve the lowest practically sustainable cost of delivering the services in accordance with the GSI rules, whilst effectively promoting the wholesale GSI objectives.
- Where possible, the ERA should benchmark the allowable revenue and forecast capital expenditure against the costs of providing similar services in other jurisdictions.
- Where costs incurred by AEMO cover both the performance of functions in connection with the GSI rules and the performance of AEMO's other functions, the costs must be allocated on a fair and reasonable basis between:
  - Costs recoverable as part of AEMO's allowable revenue and forecast capital expenditure.
  - Other costs not to be recovered under the GSI rules.

## Appendix 3 List of Tables

Table 1:	AEMO’s proposed allowable revenue and capital expenditure for AR5 and the ERA’s draft decision and final determination (\$’000 nominal).....	viii
Table 2:	Proposed, draft and approved allowable revenue and capital expenditure for WEM Market Operations (\$’000 nominal) .....	ix
Table 3:	Proposed, draft and approved allowable revenue and capital expenditure for WEM System Management (\$’000 nominal) .....	x
Table 4:	Proposed, draft and approved allowable revenue and capital expenditure for GSI (\$’000 nominal).....	xi
Table 5:	Approved allowable revenue and forecast capital expenditure for AR5 (\$’000 nominal) .....	23
Table 6:	Proposed and final decision forecast capital expenditure by WEM capital project (\$’000 nominal) .....	41
Table 7:	AEMO estimated WEM fees for AR5 (\$/MWh nominal) .....	46
Table 8:	WEM fees for AR5 based on approved allowable revenue (\$/MWh nominal) .....	46
Table 9:	AEMO estimated GSI requirement for AR5 (\$’000 nominal) excl. ERA requirement.....	46
Table 10:	GSI fees base for AR5 based on approved allowable revenue (\$’000 nominal) .....	47

## Appendix 4 List of Figures

Figure 1	WEM AR5 approved allowable revenue by expense category .....	4
----------	--	---