2016–19 ALLOWABLE REVENUE SUBMISSION TO THE ECONOMIC REGULATION AUTHORITY

AUSTRALIAN ENERGY MARKET OPERATOR

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AEMO
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IMPORTANT NOTICE

Purpose

AEMO has prepared this submission to the Economic Regulation Authority (ERA) in Western Australia as required by clause 2.22A.2 of the Wholesale Electricity Market Rules and Clause 108A and Division 2 part 3 of the Gas Services Information Rules. This submission is part of the process to set the level of revenue that can be recovered from market participants for the Wholesale Electricity Market (WEM) Market Operations and Systems Management functions, and the Gas Services Information (GSI) function, for a period of three years to 2016–19.

EXECUTIVE SUMMARY

The Australian Energy Market Operator (AEMO) is providing this submission to the Economic Regulation Authority (ERA), as part of the process to set the level of revenue that can be recovered from market participants for the three-year period from 1 July 2016 to 30 June 2019, for:

- The Wholesale Electricity Market (WEM) Market Operations and Systems Management functions.
- The Gas Services Information (GSI) function.

This is AEMO's first submission for the functions under the WEM Rules and GSI Rules, since assuming responsibility for these functions as part of the Western Australian Government's energy reform program, aimed at delivering a more efficient energy sector in the state.

- Benefits of the market reforms, include increased competition, transparency, and co-optimisation, estimated by the Public Utilities Office to be between $190 million to $375 million.[1]
- AEMO is seeking total allowable revenue for operating expenditure in the three-year period of $114.346 million. This period includes the new market going live on 1 July 2018.
- Forecast Business As Usual (BAU) operating costs are 4% lower than the previous regulatory period.
- As well as BAU operating and capital costs, the submission also forecasts operating and capital costs for:
  - The transfer of the WEM System Management function to AEMO.
  - Market reform costs, including depreciation of the new market from 1 July 2018, reform project costs such as planning and training, and additional operating costs (such as license costs) associated with the new market.
- When determining the WEM BAU, System Management Transfer, Market Reform costs and GSI BAU expenditure, AEMO's existing efficient operations in the National Electricity Market (NEM) and eastern and south-eastern gas markets have been used as a reference.
- AEMO forecasts that WEM fees will remain virtually flat for the first two years and increase by 15% in 2018–19 following the commencement of the new market, but will leverage off its current processes and systems to increase efficiency and minimise future fee increases.
- AEMO forecasts a reduction of 15% in GSI revenue over the review period resulting in lower fees due to efficiencies and lower depreciation.
- Forecast capital expenditure for the regulatory period is $51.263 million, which includes the establishment of the new market.

[1] The PUO's *Final Report: Design Recommendations for Wholesale Energy and Ancillary Service Market Reforms* estimated efficiency benefits and avoided costs associated with the reform of the energy and ancillary service markets to be between $190 million and $375 million in present value terms. Available at http://www.finance.wa.gov.au/cms/uploadedFiles/Public_Utilities_Office/Electricity_Market_Review/Final-Report-Design-Recommendations-for-Wholesale-Energy-and-Ancillary-Market-Reforms.pdf
Additional benefits are also expected from the introduction of a constrained network model and changes to the Reserve Capacity Mechanism.

Allowable revenue

AEMO is seeking approval of allowable revenue across the review period of $114.346 million (M). The breakdown by function and year is shown in the table below.

Table 1 Allowable revenue

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
WEM Market Operations	$17,121	$16,214	$20,638	**$53,973**
WEM System Management	$17,652	$18,675	$18,168	**$54,495**
Gas Services Information (GSI)	$2,040	$2,151	$1,687	**$5,878**
Total	**$36,813**	**$37,040**	**$40,493**	**$114,346**

Allowable revenue includes:

- BAU operating costs for all functions ($90.8M). These are the costs to provide the services in their current form. Outlining these separately allows comparison against prior period activities and the identification of efficiencies or additional costs.
- The costs of transferring the system management function from Western Power to AEMO ($8.1M). This will reflect additional expenditure in separating these functions from Western Power to create an Independent Market and System Operator in the WEM.
- The operational costs of market reform projects ($15.4M). This expenditure has been separately identified to show the financial impacts of the market reform over the following three years.

BAU operating costs

Proposed BAU operating costs are 4% lower than in the previous determination, as summarised in Table 2 below.

Table 2 BAU operating costs – variance since previous determination by function and total

BAU for function	AR3 (previous three-year determination) (000s)	AR4 (proposed three-year submission) (000s)	Variance $ (000s)	Variance %
WEM Market Operations	$48,776	$44,768	-$4,008	-8%
WEM System Management	$39,405	$40,197	$792	+2%
Gas Services Information (GSI)	$6,919	$5,878	-$1,041	-15%
Total	**$95,100**	**$90,843**	**-$4,257**	**-4%**

The key factors in these BAU changes are:

- WEM Market Operations – the decrease (-8%) is due mainly to reduced depreciation, and cost savings through efficiencies identified through the integration of functions into AEMO (including finance systems, software licenses, removal of duplication of corporate governance requirements, and consolidation of systems).
- WEM System Management – the costs are slightly higher than the previous determination (+2%) and include the accelerated depreciation of assets that will become obsolete when the new market starts.
- GSI – costs decrease (-15%) due to the establishment costs for the WA Gas Bulletin Board being fully written off, and increased efficiencies.

WEM System Management transition operating costs

The estimated cost of transferring the system management function from Western Power to AEMO is $8.1M. The key components include:

- Additional staff for a stand-alone control room security desk. The current approach of only one controller is not consistent with that of comparable systems operators, and was highlighted as part of a recent independent market audit[2].
- Costs associated with transferring from the current East Perth office and data centre, along with communication links back to Western Power.

Market reform operating costs

The following table summarises operational costs related to market reform, including depreciation of the new market from 1 July 2018, market reform project costs that must be classified as operating rather than capital expenditure, and additional costs of $4.3M in 2018–19 to operate the new, more sophisticated market.

These costs will provide for the new systems and capabilities that will underpin the significant benefits to be realised from the Market Reforms.

Table 3 Market reform operating costs

Function	Depreciation (from 1 July 2018) (000s)	Borrowing costs (from 1 July 2018) (000s)*	Market reform planning (000s)	Training and travel (000s)	Other (000s)**	Total (000s)
WEM Market Operations	$3,058	$585	$250	$939	$4,373	**$9,205**
WEM System Management	$1,317	$253	$740	$1,062	$2,811	**$6,182**
Total	**$4,375**	**$838**	**$990**	**$2,001**	**$7,185**	**$15,388**

* Borrowing costs of approximately $0.9M incurred before market go-live have been capitalised. This operating expenditure includes additional borrowing costs of $0.9M that will be incurred in the 2018–19 financial year.
** Includes data centre operating costs, additional licensing costs, and additional personnel required for obligations under the new market that are not required now, such as market analysis, IT development, grid systems and modelling, and system capability.

Capital expenditure

AEMO is also seeking approval of forecast capital expenditure of $51.3M across the review period, with the breakdown by function and year shown in Table 4 below. BAU activities account for $7.9M of this amount ($2.8M less than the previous determination), with System Management transition $3.2M, and the WA Market Reform Program $36.1M. Forecast capital expenditure includes $4.0M related to the new AEMO Perth Office. In the current Perth property market, AEMO expects to secure lease incentives that cover most of its fit out costs.

[2] PA Consulting Final Report: Independent Assurance Report: Compliance of System Management with the Market Rules and Market Procedures provided further comments in relation to the number of system controllers in the current system management structure. The report is available at: http://www.aemo.com.au/-/media/Files/Gas/WA_Gas_Services/GSI-Register/2016/FINAL-REPORT--PA-Consulting-Group--IMO--2015-Audit-Report-4-SM-Elect.ashx

Table 4 AEMO forecast capital expenditure proposal

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
WEM Market Operations	$15,562	$13,752	$2,216	**$31,530**
WEM System Management	$9,912	$7,238	$1,467	**$18,618**
Gas Services Information (GSI	$228	$496	$392	**$1,115**
Total	**$25,702**	**$21,486**	**$4,075**	**$51,263**

Table 5 below breaks down AEMO's forecast capital expenditure proposal again**,** to clearly show the BAU versus market reform and transition costs.

Table 5 AEMO forecast capital expenditure proposal

	AR3 (previous three-year determination) (000s)	AR4 (previous three-year determination) (000s)	Variance $ (000s)
Market Reform Project	-	$36,142	+$36,142
Market Operations BAU	$6,274	$4,786	-$1,488
System Management BAU	$3,999	$2,205	-$1,794
System Management Transition	-	$3,213	+$3,213
Gas Services Information BAU	$461	$917	+$456
WA office fit-out	-	$4,000	+$4,000
Total	$10,734	$51,263	$40,529

In preparing the submission, AEMO has based capital expenditure on existing systems on a support and maintain approach until the new market systems have been developed.

Estimated impact on fees for market participants

WEM Market Operations and System Management fees

AEMO's WEM fees (combining Market Operations and System Management) move over the review period from the current (2015–16 level) of $0.876/MWh to a projected rate of $1.013/MWh in 2018–19. There is limited movement in fees over 2016–17 and 2017–18, and an increase in 2018–19 at the commencement of the new market.

AEMO intends to reset the 2016–17 fee following the ERA decision on AEMO's allowable revenue. The table below outlines the movements in market fees resulting from the proposed expenditure. WEM estimated market fee impact ($/MWH and % variance).

	2015–16	2016–17	2017–18	2018–19
Market Operations	0.504	0.416	0.384	0.539
System Management	0.372	0.472	0.493	0.474
Total	0.876	0.889 **(+1%)**	0.8765 **(-1%)**	1.103 **(+15%)**

Other points to note

AEMO has included comments on expenditure related to the future retail market functions in the Market Reform chapter of this submission. While not subject to approval by the ERA, this detail has been provided to the ERA for information purposes.

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1. ABOUT AEMO

1.1 Background

As the national energy market operator, planner and forecaster, AEMO plays an important role supporting the industry to deliver a more integrated, secure and cost effective energy supply.

AEMO's vision is to deliver energy security for all Australians. This is consistent across AEMO's roles in supporting operation of the markets, system operation, longer-term planning and forecasting activities, and providing secure financial market transactions, which ultimately support delivery of energy security for Australian consumers.

The energy market landscape is undergoing rapid transformation. Consumers are demanding greater control and choice, while technologies and consumer behaviour are driving changes in generation, metering, storage, products and service. AEMO is working with its stakeholders across Australia to identify issues and opportunities for strengthening energy markets into the future, focusing on flexible market solutions that contribute to meeting the long-term best interests of consumers.

As is the case for AEMO's stakeholders, the efficient management of costs in the current economic climate continues to be a key focus, with emphasis on reducing duplication of effort and streamlining processes without affecting service delivery. AEMO continues its commitment to apply commercial discipline to control operating costs to reduce the impact of fee increases to market participants.

1.2 AEMO's national functions

As the National Energy Market Operator, in addition to its functions in Western Australia (WA), AEMO:

- Operates the wholesale and retail gas and electricity markets across eastern and south-eastern Australia, including the National Electricity Market (NEM), the Declared Wholesale Gas Market in Victoria, the gas Short Term Trading Market, the Wallumbilla and Moomba Gas Supply Hubs, and energy retail markets.
- Oversees the system operations and security of the NEM interconnected grid and the Victorian gas transmission network.
- Develops and publishes independent energy forecasts and planning information for the electricity and gas networks of eastern and south-eastern Australia.
- Supports emergency response systems and initiatives for the electricity and gas networks of eastern and south-eastern Australia.
- Works collaboratively with industry participants, the Australian Energy Regulator (AER), the Australian Energy Market Commission (AEMC), and the Council of Australian Governments (COAG) Energy Council, providing expert technical support for reform initiatives that are improving innovation, competition, efficiency, and productivity to benefit Australian energy consumers.

AEMO operates on a cost recovery basis, as a company limited by guarantee under the *Corporations Act (2001)*.

AEMO has a strong record of managing costs and fees for market participants. In its largest market, the NEM, the benchmark fee has trended down in real terms since AEMO was established in 2009. This result has been achieved despite the impact of declining electricity usage.

1.3 AEMO's Western Australian functions

On 30 September 2015, the WA Minister for Energy announced the transfer of Market and System Management functions to AEMO, as part of the WA Government's Electricity Market Review (EMR).3 The announcement indicated that consolidation of these functions, including responsibility for the Gas Bulletin Board, Gas Statement of Opportunities, and retail market operations, will bring financial and operational efficiencies over future years.

AEMO is taking on these responsibilities progressively, in accordance with regulatory changes being executed by the WA Government:

- Responsibility for operating the Wholesale Electricity Market (WEM) in the South West Interconnected System (SWIS), and the Western Australian Gas Bulletin Board and Gas Statement of Opportunities, transferred from the Independent Market Operator (IMO) to AEMO on 30 November 2015.
- Responsibility for System Management functions transferred from Western Power to AEMO on 1 July 2016, with Western Power continuing to provide these services to market participants on behalf of AEMO under an operating agreement until October 2016. System Management personnel are expected to transfer to AEMO on 31 October 2016. AEMO will then perform the System Management functions from Western Power's control room under a service level agreement until September 2017, at which time AEMO is scheduled to consolidate all WA staff into a new AEMO Perth office.
- Responsibility for retail market operation will transfer from Western Power to AEMO on 1 July 2018.

1.4 AEMO's market reform capability

AEMO is committed, capable, and well placed to support the realisation of the EMR Market Reform vision and consequential financial benefits to WA stakeholders. Working closely with the Public Utilities Office (PUO), AEMO will deliver the required activities to implement the new reforms and ensure the desired outcomes are achieved by bringing these value propositions:

- Ability to leverage the existing market expertise that AEMO has within its existing markets. This expertise will be brought to bear in the early design phase, working with the PUO to define the new rules and market solutions.
- Leverage existing NEM market solutions already tested, proven and in place. This will ensure overall implementation costs of the new market design are minimised, but also limit future expenditure that would otherwise be required with a bespoke WEM solution.
- Utilising existing AEMO national experience from implementing market solutions previously. This will help ensure a prudent market design as well as minimise implementation risks associated with deploying technical system solutions.
- AEMO have experience in managing and deploying significant market solutions, from previous WEM and NEM implementations. Again this will help deliver the desired EMR outcomes in the most effective, efficient and risk mitigated manner.
- Significant economy-of-scale savings that will accrue from the consolidation and integration of Market Operations and System Management into the existing AEMO environment, including:
  - Efficiency gains in corporate support functions such as HR, Payroll, IT, and Finance.
  - Significant reduction in IT hardware and software licensing costs via economies of scale, system consolidations and elimination of duplicate / obsolete systems.

[3] https://www.mediastatements.wa.gov.au/Pages/Barnett/2015/09/Electricity-reform-gains-momentum.aspx.

1.5 The benefits of change

The energy market landscape is shifting, and AEMO continues its commitment to apply commercial discipline to control total operating costs, and where possible, reduce the impact of fee increases to market participants.

Through its established WA Market Reform Program, AEMO is well placed to assist the realisation of the EMR directives and vision by delivering benefits and efficiencies for market participants and consumers. These include:

- Major changes to the Reserve Capacity Mechanism (RCM), including increased responsiveness to changes in the level of excess capacity and the reduction of the reserve capacity. These will reduce the cost of the RCM and therefore costs of energy to consumers.
- Greater competition and enhanced market transparency in the WEM.
- Increased flexibility and improved efficiencies to the WEM and the supporting systems.
- Harmonised demand and supply side resources in the market, by progressively reducing the demand side capacity prices and requiring increased availability for dispatch.
- More efficient scheduling, market and investment outcomes by replacing the current unconstrained market design and manual network congestion management approach with a constrained market design.
- Harmonised market arrangements with eastern states.
- Quality tools and processes for the appropriate management of prudential risk.
- A cost-effective pathway to Full Retail Contestability (FRC), utilising the existing NEM retail market framework.
- Common, Rule-compliant systems for the WEM and NEM, reducing ongoing IT development and support costs.
- Introduction of a transmission Network Outlook will provide more information on existing and future network capability and congestion, enabling WEM participants to make more informed and cost effective operational and investment decisions.
- Resolution of System Management issues and maintenance of up-to-date operational procedures and key systems.
- Enhancement of the current WEM market design that has been showing signs of limitation, highlighted through significant out of merit payments for network outages and limited competition in Load Following ancillary services markets.
- Correction of market inefficiencies from having a separate system management and market operator.

1.6 Stakeholder engagement

Stakeholder engagement is a core AEMO value. Improving on this engagement is one of AEMO's Strategic Initiatives, with two key focus areas in particular:

- Engagement with stakeholders on ideas and solutions.
- Building collaborative and proactive stakeholder relationships.

AEMO is committed to ensuring that stakeholders have the opportunity to engage and participate in the ongoing planning, development and operation of Australian energy markets. To facilitate this, AEMO has established open consultative forums to allow energy stakeholders to discuss issues and share information. AEMO also has dedicated Stakeholder Engagement Managers to further improve and strengthen communication and relationships with key stakeholders.

Since assuming responsibilities in WA in November 2015, AEMO has established the WA Electricity Consultative Forum and WA Gas Consultative Forum. Targeted working groups will be launched during the second half of 2016 to support the WA Market Reform Program, which is implementing the changes from the WA Government's EMR.

Specifically in relation to the WA Market Reform Program (WAMRP), AEMO is in the process of developing a comprehensive Stakeholder Engagement plan. This plan will encompass critical components including working with the PUO on market rule amendments, and working with all market participants to ensure their readiness for the new market commencement.

1.7 Governance

AEMO is incorporated as a company limited by guarantee under the Corporations Act. Membership is made up of Australian governments (60 per cent) and industry participants (40 per cent).

AEMO operates under the governance of a Board comprising an independent Chairman, the Managing Director[4] (who is also the Chief Executive Officer), and seven non-Executive Directors. Collectively the Board possesses the core skills and experience prescribed in the AEMO Constitution.

The board has delegated the day-to-day management of AEMO to the Managing Director and Chief Executive Officer, assisted by the Executive Leadership Team (ELT).

In addition to these permanent governing bodies, a temporary AEMO WAMRP Steering Committee, comprising five of the eight executives, has been set up specifically for the WAMRP. This committee has been established for the purposes of providing direction and assurance for the program team, and to provide financial stewardship over the funds outlined in this submission for the duration of the Program.

The AEMO Board has considered the content of this Allowable Revenue and Forecast Capital Expenditure submission at its September 2016 Board meeting, endorsing the approach and delegating final approval and submission of the proposal to the acting CEO.

[4] After the passing of Matt Zema in July 2016, Karen Olesnicky has been appointed acting CEO while a search for AEMO's next CEO and MD is undertaken.

2. FOURTH ALLOWABLE REVENUE (AR4) SUBMISSION OVERVIEW

2.1 Background

The Wholesale Electricity Market Rules (WEM Rules) and the Gas Services Information Rules (GSI Rules) require AEMO to seek approval of its allowable revenue and forecast capital expenditure from the Economic Regulation Authority (ERA) for the performance of its functions under these instruments.

Allowable revenue is the required through fees to meet the operating costs to perform AEMO's services to the market. Forecast capital expenditure is defined as the predicted sum of capital expenditure required for a three-year review period.

This submission includes AEMO's proposed allowable revenue and forecast capital expenditure under both the WEM Rules and the GSI Rules.

This submission covers the review period 1 July 2016 to 30 June 2019 and provides relevant information to the ERA to facilitate its assessment of the proposed allowable revenue and forecast capital expenditure. It is the fourth such submission for the WEM Market Operator and System Management functions, and the Second for the GSI functions, although the first to be submitted by AEMO.

This document provides an overview of AEMO's projected allowable revenue and forecast capital expenditure requirements for the review period. More comprehensive supporting documents are included with this submission (a list of these documents is included in Appendix B).

This submission has been delayed in accordance with transitional provisions in both the WEM Rules and GSI Rules, in light of the recent conferral of market and system operation functions on AEMO. AEMO is required to submit its proposal by 16 September 2016 and the ERA is required to finalise its determination by 16 December 2016.

Before submitting these costs to the ERA, AEMO has:

- Undertaken a thorough internal review and referenced back to existing AEMO NEM and eastern and south-eastern gas market operations, to ensure estimates are based on the most efficient practicably sustainable cost of providing the services.
- Obtained endorsement from the AEMO Executive Leadership Team and approval from the AEMO Board.

2.2 Basis of submission

The WA electricity industry is undergoing substantial change through the WA Government's EMR. In particular, the reforms being developed by the Wholesale Electricity Market Improvements work stream of the EMR[5] will materially change the design and operation of the WEM.

These reforms will materially change the scope and specifics of AEMO's role during this Review Period. To account for the significant changes taking place during this review period, this submission separately identifies the following three categories of expenditure (both operational and capital):

- Business As Usual (BAU) – costs incurred in continuing to provide existing services in their current form, encompassing the WEM Market Operations and System Management and GSI functions.

[5] The WEM Improvements work stream includes the Reserve Capacity Mechanism and Energy Market Operations and Processes projects. The announced reforms are available at: http://www.finance.wa.gov.au/cms/Public_Utilities_Office/Electricity_Market_Review/Wholesale_Electricity_Market_Improvements.aspx.

- System Management transfer – costs associated with the progressive transfer of System Management functions and personnel from Western Power to AEMO. This component reflects the additional expenditure associated with separating these functions from Western Power to create an Independent Market and System Operator in the WEM, and setting up a security desk in the new AEMO Perth office.
- Western Australian Market Reform Program – these are the planning and establishment costs associated with AEMO's development and implementation of new procedures and systems to comply with the amended WEM requirements. Specifically, this includes the Wholesale, Settlements and Power System Operations work streams in AEMO's WA Market Reform Program which will run over the next two to three years.

2.3 Structure of submission

This document is structured so the above components are incorporated into broad categories, based on how the operating and capital expenditure items are built into the allowable revenue and forecast capital expenditure components and finally to the respective market fees.

This framework enables the submission to be transparent and clear to both the ERA and market participants:

- Operating and capital expenditure for the WEM (Market Operations and System Management) functions are covered in Chapter 3. This includes BAU and System Management transition costs.
- Program costs for the WA Market Reform Program (WAMRP) are outlined separately in Chapter 4.
- Overall indicative market fees for the WEM functions are detailed in Chapter 5.
- Operating and capital expenditure for the GSI functions are covered in Chapter 6.
- Chapter 7 summarises key principles and assumptions used in costings.

3. WHOLESALE ELECTRICITY MARKET (WEM)

This section provides details of AEMO's forecast costs for market and system management costs for the WEM. These costs are shown on a business as usual basis in this section. Costs associated with the WA Market Reform Program are shown separately in Chapter 4 of this submission.

3.1 General overview

3.1.1 Legislative framework

The key role and functions of AEMO in respect of its WEM obligations are set out in the following instruments:

- *Electricity Industry Act 2004*.
- *Electricity Industry (Wholesale Electricity Market) Regulations 2004.*
- Wholesale Electricity Market Rules.

3.1.2 WEM objectives

The *Electricity Industry Act 2004* sets out the objectives of the Wholesale Electricity Market in s122(2):

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

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

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

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

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

3.1.3 WEM allowable revenue and forecast capital expenditure approval mechanisms

In accordance with Rule 2.22A.2 of the Wholesale Electricity Market Rules (WEM Rules), AEMO must seek approval of its allowable revenue and forecast capital expenditure from the Economic Regulatory Authority (ERA) for the Review Period, for each of the services listed in WEM Rule 2.22A.1.

These services are defined as:

- Market Operations.
- System Planning (Capacity Planning).
- Market Administration.
- System Management (this includes any amount that is payable to a system operator in accordance with Rule 2.22A.2A).

The AEMO budget is based on the costs that would be incurred by a prudent provider of the defined services, acting efficiently, while effectively promoting the WEM Objectives.

If an annual AEMO budget proposal is likely to result in revenue recovery (over the Review Period) being greater than 15% of the allowable revenue determined by the ERA, AEMO is required to apply to the ERA for a reassessment of its Allowable Revenue.

Similarly, if an annual AEMO budget proposal is likely to result in forecast capital expenditure (over the review period) being greater than 10% of the forecast capital expenditure approved by the ERA, AEMO is required to apply to the ERA for a reassessment.

3.1.4 WEM allowable revenue by service

The Market Rules (2.22A.1) requires AEMO to seek approval of its allowable revenue for each of the services it provides, based on the associated operating expenditure, as outlined in the below table.

Table 6 WEM allowable revenue by service

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
WEM Market Operations	$12,974	$11,577	$13,418	**$37,969**
WEM System Planning	$3,870	$4,317	$5,203	**$13,391**
WEM Market Administration	$276	$320	$2,017	**$2,614**
Total WEM Market Operations	**$17,121**	**$16,214**	**$20,638**	**$53,973**
WEM System Management	$17,653	$18,674	$18,169	**$54,496**
WEM allowable revenue	**$34,774**	**$34,888**	**$38,807**	**$108,469**

3.2 WEM Market Operator – BAU allowable revenue

3.2.1 Operating expenditure 2016–17 to 2018–19

These are the costs to provide the services in their current form. This provides a comparison against prior period costs.

Table 7 Market Operator BAU cost summary

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
WEM Market Operations	$16,379	$13,709	$14,680	**$44,768**

3.2.2 Expenditure categories

Costs are classified into the following five operating expenditure categories, shown in the table below.

Table 8 Market Operator BAU costs by category

	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
Employee benefits expenses	$5,168	$5,122	$5,917	**$16,207**
Accommodation	$767	$939	$735	**$2,441**
Supplies and services	$4,867	$5,135	$5,425	**$15,427**
Borrowing	$154	$120	$143	**$417**
Depreciation	$5,423	$2,392	$2,459	**$10,275**
Total	**$16,379**	**$13,709**	**$14,680**	**$44,768**

3.2.3 Cost comparison to prior period

Table 9 Market Operator BAU expenditure comparison to prior period

	2013–14 to 2015–16 ERA approved (000s)	2016–17 to 2018–19 Submission (000s)	Increase/decrease (000s)	Increase/decrease %
Employee benefits expenses	$17,521	$16,207	-$1,313	**-7%**
Accommodation	$2,251	$2,441	$190	**8%**
Supplies and services	$14,851	$15,427	$576	**4%**
Borrowing	$1,277	$417	-$860	**-67%**
Depreciation	$12,877	$10,275	-$2,601	**-20%**
Total	**$48,776**	**$44,768**	**-$4,008**	**-8%**

A simple comparison of the ERA-approved expenditure for the previous allowable revenue period for the WEM Market Operator and the submission for the next review period reflects a decrease in expenditure of $4.01M (or 8%). Significant movements in costs are explained below.

Employee benefits

Labour costs decrease in the 2017–19 period by $1.31M (7%) compared to the 2013–16 period, attributable to a number of factors:

- Reductions due to some functions remaining with the IMO (5 full time equivalents (FTEs).
- Staff utilised on (and costed to) the WAMR program, where their substantive BAU role will not be backfilled during their time on the WAMR program.
- Reduction in average FTEs allocated to the electricity market operator functions over the review period, falling from 38.8 FTEs per annum to 36.2 FTEs per annum.
- Synergies gained by sharing a single corporate services team across all three functions (Market Operator, GSI functions, and System Management).
- These savings are partially offset by remuneration increases in line with AEMO's Enterprise Bargaining Agreement (EBA).

Accommodation

Accommodation costs include office rental, cleaning, electricity, maintenance, and car parking, which are apportioned across the three functions. These costs increase in the 2017–19 period by $0.91M (8%) compared to the 2013–16 period.

AEMO plans to relocate in September 2017 to a single site with appropriate security and services for a 24/7 operator. The cost to the Market Operator function will be similar to the current lease cost, however a provision of $0.18M has been allowed to return the current premises to their initial condition.

Supplies and services

This category encompasses Operations and Technology, System Capacity, Market Development, and Corporate Services costs. There is a net increase in the 2017–19 period of $0.58M (4%) compared to the 2013–16 period, due to factors summarised below.

Operations and Technology

This category incorporates the following costs:

- WEM system and Settlements maintenance and support.
- Data centre hosting by specialist service providers.
- High speed fibre links between offices and data centres.
- Specialist database support.
- IT desktop and infrastructure support.
- Telecommunications and internet access costs.

The costs for Operations and Technology increase by $2.36M between review periods. The most significant factor is the costs of several new data links that will need to be implemented and operated for the new markets. These costs are allocated across the System Management and Market Operator functions, as they are required for both. From a Market Operator perspective, the three relevant data links are:

- Connecting the new AEMO WA data centre to the AEMO east coast data centres which operate as secondary locations for Market and Power Management Systems.
- Connecting the Perth office to the WA data centre for purposes of system backup and disaster recovery. These are local links between the office and datacentre and have the advantage of guaranteed availability when there is a complete loss of mains power in the area.
- Connecting Market participant access to Market systems in WA, comprising the MarketNet Telstra link and local Internet access.

The second major factor relates to increases in software licencing and maintenance as well as hardware maintenance costs. These costs will increase, partly due to reliance on end-of-life systems before the new market systems are deployed, and partly due to higher rates payable to critical system vendors. AEMO is mitigating these cost increases by focusing heavily on efficiency cost savings, and has negotiated lower Oracle software licencing fees as well as reducing some of its software maintenance contractor costs. It has also consolidated Austraclear licences between its roles as both NEM and WEM Market Operator and System Manager.

System Capacity

System Capacity costs rise by $0.27M, mainly related to additional consultancy costs required to support the work done on the WA Electricity Statement of Opportunities (ESOO). These costs fluctuate depending on cyclical reviews required under the Market Rules. To assist with these reviews, when required, AEMO engages specialist services to supplement internal resources to ensure the highest quality input at an efficient cost.

Market Development

Costs reduce by $0.67M between the two review periods. A reduction of $0.19M relates to rule development and changes, as this function did not transfer from the IMO to AEMO. There is also a reduction of $0.49M related to formal reviews, including Board-initiated reviews, not required in the current period.

Corporate Services

Corporate costs reduce by $1.37M between the review periods. AEMO's prudent focus on costs has resulted in significant corporate cost savings, generated from a shared corporate services team supporting both the electricity market operator as well as the system management functions. AEMO has leveraged economies of scale to generate savings in costs relating to staffing, corporate management functions, and general administration (such as finance and payroll systems and processes).

Borrowing

Borrowing costs will be lower than the previous period by $0.87M (67%), driven by:

- Lower capital expenditure, as AEMO focuses on maintaining existing assets until the transition to a new electricity market structure in 2018 and the reduction in loan balances related to the existing depreciating market systems.
- The impact of accelerated depreciation on some existing and new assets which are expected to be retired in 2018 following the transition to the new market.
- Zero borrowing costs attributable to the fitout of the new office, as this is offset by the commercial terms of the lease incentive.

Borrowing costs related to WA Market Reform have been included in Chapter 4.

Depreciation

Depreciation costs reduce by $2.60M (20%) compared to the previous period for the following reasons:

- The majority of this reduction is attributable to the depreciation related to the Market Evolution Program (MEP). This cost reduces by $3.93M between the two review periods, as the project expenditure was capitalised over five years from July 2012. This is offset by depreciation on the new AEMO Perth office and control room fitout which commences in this review period, with the Market Operator allocation amounting to $0.45M over the AR4 period.
- IT spend will focus on maintaining existing systems until migration to new market systems in 2018, so minimal capital expenditure is expected during the AR4 period. However, the depreciation expenditure ($1.40M) incurred on maintaining existing systems will be accelerated as these assets are expected to be retired in 2018.

Depreciation related to WA Market Reform systems, which will commence in 2018–19, has been included in the WA Market Reform section of this document (Chapter 4).

3.3 WEM Market Operator – BAU forecast capital expenditure

3.3.1 Forecast Capital expenditure 2016–17 to 2018–19

AEMO uses its IT Project Requirements to support WA BAU Activities document as the primary planning document to ensure the planning, delivery, management, and use of IT systems optimally support BAU requirements. The level of investment required is to maintain the systems at the required level of performance, and the focus is on maintaining existing systems until migration to new market systems.

The capital expenditure applicable to the WEM Market Operator is summarised in the table below, with details to support significant expenditure following the table.

Table 10 WEM Market Operator BAU forecast capital expenditure

	2016 –17 (000s)	2017 –18 (000s)	2018 –19 (000s)	TOTAL (000s)
WEMS	$185	$650	$650	**$1,485**
WEMS metering and settlements	$40	$40	$424	**$504**
Infrastructure – market systems	$136	$136	$299	**$572**
WA integration	$407	-	-	**$407**
Architectural alignment of infrastructure	$954	$440	$220	**$1,614**
Corporate support	$57	$62	$85	**$204**
New office fitout	-	$1,502	-	**$1,502**
Total	**$1,780**	**$2,830**	**$1,678**	**$6,288**

Wholesale Electricity Market System (WEMS)

WEMS is designed to operate in compliance with the Market Rules and associated Market Procedures. From time to time AEMO will require changes to the WEMS to ensure ongoing compliance as a result of manifest errors. (The errors are typically in the Rules themselves, corrected through the rule change process, or in the system interpretation of a Rule.)

This funding is required to ensure WEMS is compliant with the Market Rules in all aspects by correcting any manifest errors that are identified. These changes will be implemented as fast track Rule changes according to the Market Rules.

This also allows for the implementation of changes that reduce operational risks apparent in the management of WEMS. This includes mandatory changes following the outcomes of security reviews, and technology refreshes to allow AEMO to adopt a more maintainable framework.

WEMS metering and settlements

The settlement process undertaken by AEMO in WA is currently supported by third party software provided by Brady PLC. In addition to the Brady software, peripheral functions within WEMS are required to support the necessary data feeds for accurate and timely settlement of the market.

Funding is required for software changes, technology refreshes, and metering data management.

Infrastructure – market systems

AEMO's core functions to operate the WEM and GSI are supported through the WEMS and Gas Bulletin Board (GBB) market systems respectively. These systems rely on an array of supporting infrastructure to ensure the availability and accuracy of the markets operated by AEMO.

Further investment is required to maintain AEMO's ability to effectively and efficiently operate the market with a high level of service. This funding will, in particular, allow the AEMO data analysis, forecasting, and modelling tools currently used in the NEM to be extended so they are fit for purpose for the WA market.

WA integration

This relates to an allocation of the overall AEMO System Resilience IT costs (apportioned across Market Operator and System Management). These costs bring significant benefits in terms of the overall reliability, security, and cost-effectiveness of the AEMO IT systems landscape.

Architectural alignment of infrastructure

The infrastructure used to support WA services has previously been designed and deployed to support the requirements of the WA environment only. Following the transition of services to AEMO, broader IT principles are now required. While a number of transition and integration activities have been completed, the future state of the environment will be designed around these established standards.

Planned expenditure relates to hardware refreshes and infrastructure upgrades which will comply with AEMO standards. These standards are in place to ensure a robust, stable, and reliable technology platform as well as to protect all underlying data.

Corporate support

This covers projects required to provide corporate support to AEMO's WA functions, and includes the refresh of end user workstations.

New office fitout

This is an allocation of the capital costs incurred for the new Perth office fitout. In the current Perth property market, AEMO expects to secure lease incentives that cover most of its fit out costs.

3.4 WEM System Management – BAU allowable revenue

This section details the proposed allowable revenue associated with System Management BAU functions. AEMO is delegating some System Management functions back to Western Power for the start of the review period, under agreements outlined in Section 3.4.1 below. A portion of the System Management allowable revenue is therefore directly attributable to Western Power providing services as a System Operator.

3.4.1 Scope of System Management functions during the review period

On 1 July 2016, AEMO became legally accountable for the System Management functions in the SWIS, as conferred by WEM rules. To build capability and provide a seamless transition, AEMO and Western Power agreed to enter a series of contractual arrangements, which can be summarised as:

- Between July 2016 and October 2016, AEMO and Western Power entered into an Operating Agreement for AEMO to appoint Western Power to exercise the System Management function on its behalf.
- On 31 October 2016, System Management staff who accepted AEMO's employment offer, will transfer to AEMO, but continue to reside in Western Power control centre until AEMO builds a control room in Western Australia (expected to occur by September 2017). The transfer of staff will align with the termination of the Operating Agreement and be replaced by a Services Agreement.
- The Services Agreement will provide AEMO staff with access to current Western Power facilities (primary and back up control room), the use of operational systems and, if required, a secondee service. This secondee service will cover any roles where a System Management employee has declined an offer to join AEMO, until such time as AEMO is able to replace that employee. The Services Agreement also include provision for a residual operating service, which covers any operating services that may have been provided under the Operating Agreement but do not fit into any of the above arrangements.

Tables 12 and 13 below show, for transparency, the costs paid to system operator Western Power under both the Operating Agreement and Services Agreement as required under WEM rule 2.22A.2A.

3.4.2 BAU Operating expenditure 2016–17 to 2018–19

Table 11 WEM System Management BAU operating expenditure summary

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
WEM System Management	$5,833	$9,390	$10,390	**$25,613**
WEM System Operator (Western Power)	$8,812	$5,130	$641	**$14,584**
Total	**$14,645**	**$14,521**	**$11,031**	**$40,197**

3.4.3 Expenditure categories

Costs are classified into five operating expenditure categories and split between System Management and System Operator.

Table 12 WEM System Management BAU operating expenditure by category

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
Employee benefits expenses – WEM System Management	$4,006	$6,576	$5,803	**$16,385**
Employee benefits expenses – WEM System Operator (Western Power)	$2,003	-	-	**$2,003**
Accommodation – WEM System Management	-	$417	$489	**$906**
Accommodation – WEM System Operator (Western Power)	$456	$175	-	**$631**
Supplies and services – WEM System Management	$1,204	$1,665	$3,366	**$6,236**
Supplies and services – WEM System Operator (Western Power)	$5,643	$3,775	$521	**$9,940**
Borrowing – WEM System Management	-	-	-	**-**
Borrowing – WEM System Operator (Western Power)	-	-	-	**-**
Depreciation – WEM System Management	$623	$732	$732	**$2,087**
Depreciation – WEM System Operator (Western Power)	$710	$1,180	$120	**$2,010**
Total	**$14,645**	**$14,521**	**$11,031**	**$40,197**

3.4.4 Cost comparison to prior period

Table 13 WEM System Management BAU expenditure comparison

	2013–14 to 2015–16 ERA approved (000s)	2016–17 to 2018–19 Submission (000s)	Increase/decrease (000s)	Increase/decrease %
Employee benefits expenses	$16,790	$18,388	$1,598	**10%**
Accommodation	$926	$1,537	$611	**66%**
Supplies and services	$9,142	$16,175	$7,033	**77%**
Borrowing	$2,205	-	-$2,205	**-100%**
Depreciation	$10,343	$4,097	-$6,246	**-60%**
Total	**$39,405**	**$40,197**	**$792**	**2%**

A simple comparison of the approved expenditure for providing System Management services in their current form, reflects an increase in net expenditure of $0.79M (or 2%).

It should be noted that, as a result of the transfer of the System Management function from Western Power to AEMO, some costs previously directly incurred by Western Power are now being provided as a service under a commercial agreement, and are therefore reported in a different cost category. Taking this into account, movements in specific cost categories are explained below.

Employee benefits

The cost increase between review periods of $1.60M (an average annual increase of 3%) is consistent with existing enterprise agreements in place, and performance incentives that have taken place.

Western Power employees are expected to transfer to AEMO on 31 October 2016, and these costs are also included.

Note that AEMO will incur additional labour costs during the transfer of system management functions to AEMO, which have been included in the Transfer of Function section of this document. AEMO will also incur additional labour costs in the WA Market Reform program to manage the transition to new markets, which have been included in the WA Market Reform program costs.

Accommodation

Accommodation costs increase between review periods by approximately $0.61M (66%) with the following key points to note:

- AEMO will continue to operate the System Management function from the control room in Western Power premises till September 2017, at which time all Perth staff will move into a single new AEMO Perth office.
- Provision has been made for the potential use of the Western Power control room as a back-up control room until June 2018 at an estimated cost of $0.12M.
- AEMO will also incur additional rental costs amounting to $0.49M compared to the previous allowable revenue period, based on the expected cost allocations from Western Power (who own their aged facilities), and the System Management portion of costs of new premises.

Supplies and services

Over the two review periods there is an increase of $7.03M in supplies and services costs. AEMO has an Operating Agreement with Western Power until October 2016, which specifies the amount that is payable to Western Power.

AEMO and Western Power are currently negotiating a Services Agreement which will be applicable from 31 October 2016 onwards and specifies the monthly amount payable to Western Power for services. These costs are separately itemised as required by the WEM rules to identify those payments made to a System Operator.

Existing System Management assets will continue to be owned by Western Power, who will charge AEMO a service fee based on a Service Level Agreement between Western Power and AEMO (note that this is offset by a lower depreciation charge and lower borrowing costs to AEMO).

Under the Service Level Agreement, additional ICT expenditure of $1.71M will be paid to Western Power for access and maintenance of the existing systems used by System Management until the new market systems are in place in 2018, but retained for 6 months as a contingency and to continue to have data available for the existing market systems. In addition, system enhancements and hardware changes on the existing system will be treated as operating costs as these will be undertaken by Western Power as a service through the Services Agreement.

AEMO will not incur any depreciation charges on existing Western Power assets, but the cost of $4.55M to cover Western Power's depreciation costs will be incorporated into the Western Power Service Agreement until June 2018. The Western Power service charges will also include $0.36M to cover Western Power's borrowing costs on their existing assets.

Borrowing

The reduction in borrowing costs compared to the previous review period is $2.20M, due to the following:

- As detailed above, AEMO will pay a service charge to Western Power based on a Services Agreement, which will include the costs of borrowing.
- Loan values associated with these assets have also been reducing for the Market Evolution Program over the previous review period leading to lower borrowing costs.
- There are no borrowing costs on the fitout of the new office, as it is offset by commercial terms of the lease incentive.

Depreciation

The reduction in depreciation compared to the previous review period is $6.25M, due to the following:

- There is no depreciation charge on existing System Management assets owned by Western Power. As detailed above, AEMO will pay a service charge to Western Power based on a Services Agreement, which will include depreciation costs.
- While minimal capital expenditure is expected to be incurred, as the focus is on maintaining existing systems until migration to new market systems in 2018, accelerated depreciation on these assets will occur as they are expected to be retired in 2018. The value of this accelerated depreciation is $1.41M.

3.5 WEM System Management – forecast capital expenditure

3.5.1 Capital expenditure 2016–17 to 2018–19

Table 14 WEM System Management BAU forecast capital expenditure summary

Function	2016 –17 (000s)	2017 –18 (000s)	2018 –19 (000s)	TOTAL (000s)
WEM System Management	$905	$1,180	$120	**$2,205**

The level of investment requested is to maintain the System Management systems at the required level of performance, with the focus on maintaining existing systems until migration to the new market systems.

System Management systems support

System Management has established interfaces at many levels across a number of stakeholders. These include the Western Power distribution and transmission network business units, power generation facility operators, and energy retailers.

A number of projects are required within the AR4 review period for System Management to continue to provide effective management and operation of the WA power network, including:

- Enhancements to the Dispatch Training Simulator (DTS) system which is used to train controllers and other staff in a real-time environment (including dispatch of participants and scheduling of generation).
- Improvements to System Management operational systems to ensure critical systems are secured to an industry acceptable standard, as defined by AEMO.
- Specify, design, and implement small-scale changes to Operational Systems to ensure they are fit-for-purpose to manage dispatch and system security.
- Addressing the risks of obsolete and/or unsupported hardware through a remediation program of the critical System Management Operational Systems.

Note that the above IT costs have been minimised to the extent possible, reflecting that the majority of the current systems will be replaced as part of the market reform program.

3.6 WEM System Management – transfer of function

3.6.1 Transfer of function – overview

A key EMR objective is AEMO becoming the single integrated System and Market Operator for the WEM.

The transfer of System Management from Western Power to AEMO includes expenditure to ensure continuity of the service without additional risk to either AEMO or customers. One of the key strategic risks identified by System Management in previous allowable revenue submissions was a critical key-man dependency in the control room 24-hour staffing arrangements. This risk was also raised in a recent independent market audit, which highlighted that the current practice of having one controller is not consistent with that of comparable system operators internationally and recommended that there should be one controller for dispatch and one controller for security. The level of risk in the current approach is unacceptable, based on:

- A key-person dependency in a single critical shift resource (generation controller).
- A lack of identified succession capability.
- No other shift staff to support operations or instigate emergency protocols should the generation controller become incapacitated during an overnight or weekend shift.
- An inability to adequately manage system security as the network and system control becomes more complex with the move to a constrained network via the market reform. This will become particularly apparent at times of system stress such as peak load periods or environmental works.
- An inability to operate as an Independent System Operator and ensure decisions and actions are best for all participants.

To mitigate the above, additional shift employees will need to be recruited and onboarded to staff the new security desk in the new control room. This will assist in providing enhanced operational support to

functions (such as pre-dispatch, security monitoring and management, and liaison with market participants), and immediate coverage for critical control functions in the SWIS should injury or illness befall the generation controller.

These new employees will need to be trained and equipped with comprehensive operating procedures. The costs associated with these new controllers and other support staff will be partly offset by efficiency gains through the integration of System Management into AEMO, and the ability to leverage off existing infrastructure and support functions.

With the introduction of the WAMR Program reforms in 2018, AEMO will be fully operational in the new market, leveraging NEM Power Systems to meet the System Management functions. In the interim, as detailed above, existing Western Power systems will be utilised and paid for under a Services Agreement, including the applicable third party licensing costs. As none of the current IT systems will transfer to AEMO, a final payment, applicable to the residual asset values, will be paid to Western Power as part of the System Management transfer.

A new, fit-for-purpose office facility, capable of housing all employees and the necessary infrastructure, will provide the workspace and environment for AEMO to develop standalone systems and prepare for the new market structures to be introduced in July 2018.

System Management and Market Operations will relocate in a staged manner to the new premises, ensuring that appropriate testing and fallback arrangements are in place to reduce the impact to power system security or market activity through relocation

An initial depreciation cost for the new office facility and control room, communication links to Western Power, and the two data centres are also included in this System Management transfer expenditure category. Adequate communications links between the new AEMO premises and the East Perth Control Centre need to be established so Western Power Operations systems can be utilised until the new market commences in July 2018. After this date, the links will be re-purposed in the new market to connect Western Power and AEMO's operational systems.

3.6.2 Transfer of Function – allowable revenue

This section details the proposed allowable revenue associated with the transfer of System Management functions. The expenditure applicable to the Transfer of Function is summarised in the tables below, followed by details for each expenditure category.

Table 15 WEM System Management Transfer of Function allowable revenue

	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
Employee benefits expenses	$2,019	$1,560	$1,658	**$5,237**
Supplies and services	-	$737	$1,541	**$2,278**
Depreciation	-	$273	$328	**$601**
Total	**$2,019**	**$2,570**	**$3,526**	**$8,116**

Table 16 WEM System Management breakdown of Transfer of Function costs

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
WEM System Management functions undertaken by AEMO	-	$2,570	$2,858	**$5,429**
WEM System Management functions delegated to Western Power as System Operator	$2,019	-	$668	**$2,688**
Total	**$2,019**	**$2,570**	**$3,526**	**$8,116**

Employee benefits

A significant component ($5.2M) of the transition cost relates to additional personnel:

- Six control room staff to enable the running of a stand-alone security desk. This requires an increase from the current level of eight controllers to 14 Controllers (sufficient to staff two independent 24x7 desks in the control room, and providing back up for one another and ensuring AEMO can independently manage system security particularly in the new constrained market/network).
- Two additional FTEs for the ongoing development and support of operating procedures, IT project management, training, and independent security review of network outage requests, and transfer of other activities from Western Power (such as marginal loss factors and generator performance testing). This incorporates synergies from similar functions being undertaken in the NEM and will enable AEMO to fulfil the functions of an Independent System Operator.
- An allowance for the onboarding of new employees and a handover training period to cover those System Management employees who do not transfer to AEMO has also been included. At this stage, it is envisaged that Western Power will provide a secondee service to fill any resource gap until suitable replacements can be recruited and trained.

Supplies and services

Major factors are:

- Payment to Western Power based on the written down value of System Management assets as at 30 June 2018, which is estimated at $0.67M. No existing Western Power assets are expected to be transferred to AEMO as part of the transfer of functions.
- Redundant communications links are required between the new AEMO Perth Office, Western Power, and the two Perth Data Centres, to support the ongoing utilisation of Western Power operational systems by AEMO for management of the SWIS. These links will also be required for the ongoing transfer of operational SCADA controls following the introduction of the new market structures in 2018 (via the EMR), and will be re-purposed.

Depreciation

Allocation of depreciation costs for both the new office and the new control room is based on floor space as well as proportion of employees assigned to the functions, and taking into account higher control room fitout costs which are allocated entirely to the transfer of function costs.

3.6.3 Transfer of Function – forecast capital expenditure

The capital expenditure applicable to the System Management Transfer of Function is summarised in the table below, followed by details about each category.

Table 17 WEM System Management Transfer of Function forecast capital expenditure

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
WA integration	$390	-	-	**$390**
Software licensing	$2,823	-	-	**$2,823**
New office fitout	-	$2,299	-	**$2,299**
Total	**$3,213**	**$2,299**	**-**	**$5,512**

WA integration

A number of activities were undertaken in 2015–16 to integrate the Market Operation functions into AEMO. However, these activities were prerequisites to allow full connectivity to AEMO's corporate systems. Now connectivity is in place, a number of additional activities can occur to complete the integration process. These include System Resilience activities which ensure the integrity and reliability of the IT landscape, and are apportioned across Market Operator and System Management functions.

Software licensing

These costs relate to licensing arrangements that are required for access to System Management systems owned by Western Power (such as PI (OSI), XA 21 (GE), and Oracle), following transfer to AEMO. The existing license arrangements held by Western Power do not support outsourcing arrangements, therefore additional licensing will be required (subject to final vendor negotiations).

New office fitout

This is an allocation of the capital costs incurred in the office fitout, including the main office and the control room. In the current Perth property market, AEMO expects to secure lease incentives that cover most of its fit out costs.

4. WA ELECTRICITY MARKET REFORM

4.1 Proposed changes to the WA Electricity Market

On 6 March 2014, the WA Minister for Energy launched the EMR Program, which was established to achieve three fundamental objectives:

- Reduce the costs of electricity without compromising safe and reliable supply.
- Reduce government exposure to market risks and reduce government investment.
- Attract substantial private investors to invest in the energy market.

Phase 1 of the EMR (which has been completed) examined the structures of electricity generation, the Wholesale and Retail sectors within the South West interconnected System (SWIS), and incentives for industry participants to make efficient investments and minimise costs.

Phase 2 of the EMR was launched on 24 March 2015, with the direction from the government to undertake detailed design work on a selected set of reforms identified in Phase 1, within four key work streams:

- Network Regulation.
- Market Competition.
- Institutional Arrangements.
- Wholesale Electricity Market Improvements.

In response to the EMR, AEMO has mobilised the Western Australian Market Reform Program (WAMRP). The WAMRP will manage all AEMO effort required to support implementation of the EMR reforms.

To most efficiently achieve these objectives, the WAMRP has been structured along three work stream lines, supported by an overall Program and Change Management framework. Each of the work stream objectives is summarised below, and all are aligned to the EMR work streams above.

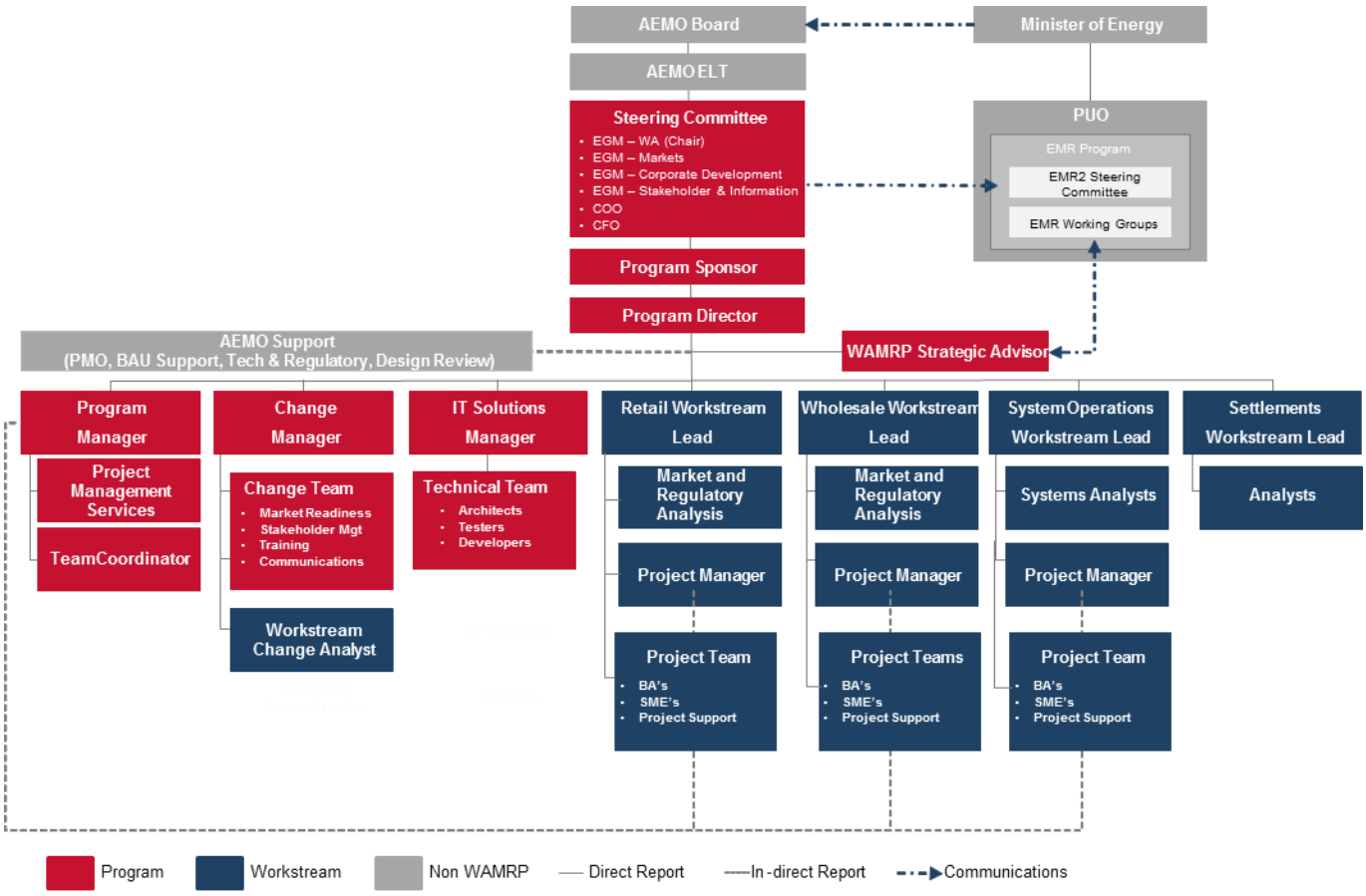
1. The **Wholesale** work stream will facilitate transitional arrangements for the Reserve Capacity Mechanism (RCM), prepare a RCM Auction, and implement market systems to support the new energy and ancillary service markets in the WEM from 1 July 2018. This work stream will also establish settlements and prudentials processes and systems that are aligned with the new Retail and Wholesale market systems.
2. The **System Operations** work stream will implement processes and systems required by AEMO to manage power system security under the new wholesale market arrangements commencing on 1 July 2018.
3. The **Retail** work stream will implement processes and systems required by AEMO to function as the Retail Market Operator from 1 July 2018 and be prepared for a future implementation of Full Retail Contestability (FRC).

Further information in relation to the intent, scope, and benefits of the work streams is provided in section 4.5 below, with full details contained in the individual project scopes and the WAMRP Program Management Plan (PMP).

4.2 Program structure

The WAMRP structure shown below will be established for the Market Reform Program.

Figure 1 WAMRP structure



This structure:

- Is designed to leverage off existing skills and expertise across AEMO.
- Highlights interfaces with external stakeholder bodies, as well as the internal AEMO governance boards that will provide strong assurance and direction throughout the program life cycle.

Wherever possible, existing internal AEMO support functions (such as HR, Legal, and Commercial) will be utilised. This internal support will be supplemented where appropriate with external resourcing to ensure no adverse effects on BAU activities or impact on existing AEMO functions.

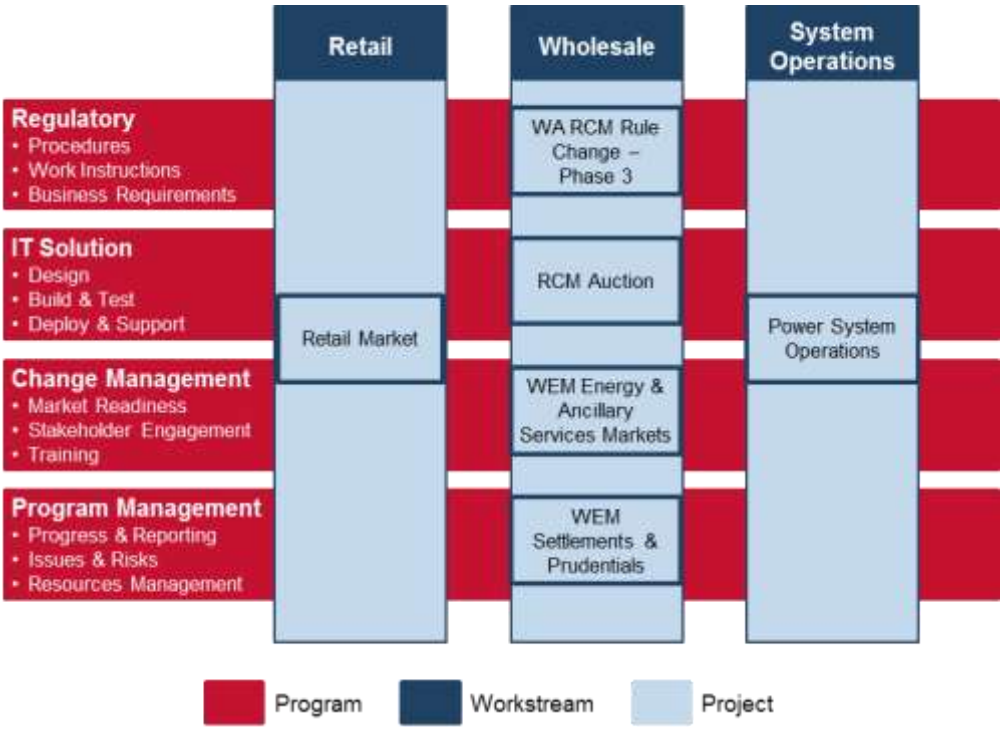
4.3 Program delivery model

The WAMRP is applying a very structured, integrated approach to successfully achieving the desired program outcomes for AEMO, and has designed a clear delivery model to support this. The model is based on assigning the program outcomes to three specific work streams (as detailed in Section 4.1), with those work streams undertaking all the requisite Regulatory, IT Solutions, and Change Management functional activities to deliver these outcomes.

A dedicated program management framework will be integrated seamlessly into this delivery model to ensure overall quality, time, and cost parameters are adhered to throughout the program lifecycle.

Below is a pictorial representation of the delivery model, and further detail in relation to each of the functional areas.

Figure 2 WAMRP delivery model



4.3.1 Regulatory

AEMO understands and is well-positioned to deliver on the new market, as designed by the regulatory body, and underpinned by new rules and policies. The regulatory focus of all work streams is to ensure that these new rules are understood, and that AEMO has in place procedures, work instructions and other documentation to comply with them.

The primary regulatory body that the work streams will be engaging with throughout the program is the PUO. The PUO is responsible for developing the new design for the WEM and corresponding Rules, and AEMO is responsible for establishing and maintaining relevant market procedures and guides. The approach taken to regulatory work across the projects will be:

- Engagement with the PUO during specification of the high level design and Rules drafting.
- Development and updating of new and existing Market Procedures respectively, in consultation with industry participants.
- Publication of market guides to assist participants in their understanding of the business processes established to meet specific requirements of the Rules.

Note the WA RCM Rule Change – Phase 3 Project in the Wholesale work stream (see Section 4.5.1) is focused on implementing Rule changes which have already been determined by the PUO.

4.3.2 IT solution

In many cases, the rules, policies, and procedures to comply with the new market design will need to be underpinned by a robust, fit-for-purpose IT solution. For WA, the program philosophy is to establish the new WEM systems based on the systems currently used in the NEM, with modifications as required.

The IT solution will require a cross work stream collaboration and will be led by the IT Solutions Manager and supported by business Subject Matter Experts (SMEs) working together with business analysts and in consultation with the IT SMEs.

It is assumed the technical solution design, build, and testing will be undertaken by internal AEMO IT SMEs with a modest level of support from external resources. The User Acceptance Testing (UAT) resources will be provided by the relevant business functions to ensure the solution ultimately supports the regulatory requirements as designed.

4.3.3 Change management

Technical solutions, and new procedures and work instructions to meet regulatory requirements, will not be 100% effective unless AEMO staff and market participants are ready, willing, and able to use them. This is the core role of the Program Change Management component of the delivery model.

A rigorous approach to change management will be taken across all work streams to ensure AEMO has implemented appropriate activities to support both AEMO and market participants' readiness to adopt the new market.

The Change Management Program involves the following components:

- Internal and external stakeholder identification and engagement.
- Change impact assessment and management.
- Program communications.
- Internal and external capability training.
- AEMO Readiness Assessments.
- Market Readiness activities including Readiness Assessments.

A formal readiness framework will be developed to ensure that, before any of the component solutions are deployed, a structured go-no go review process and is undertaken, and that the decision to proceed is only made on the basis that all stakeholders are ready.

4.3.4 Program management

A consistent approach to program management will be taken, to support all the work streams and ensure ultimate delivery of the desired outcomes while complying with all internal and external governance requirements. The Program Office in Perth will manage the overall program, co-ordinate work stream activities, and interface with the AEMO WAMRP Steering Committee.

Throughout the program, the work stream leads will be supported by project management resources across the following areas in their projects:

- Monitoring and reporting on progress, risks, issues, and assumptions.
- Coordination of input to the PUO.
- Coordination and management of stakeholder engagement activities.
- Coordination and management of the regulatory activities.
- Coordination and management of the IT solution activities.
- Coordination and management of the market readiness activities.
- Integration with other work streams.

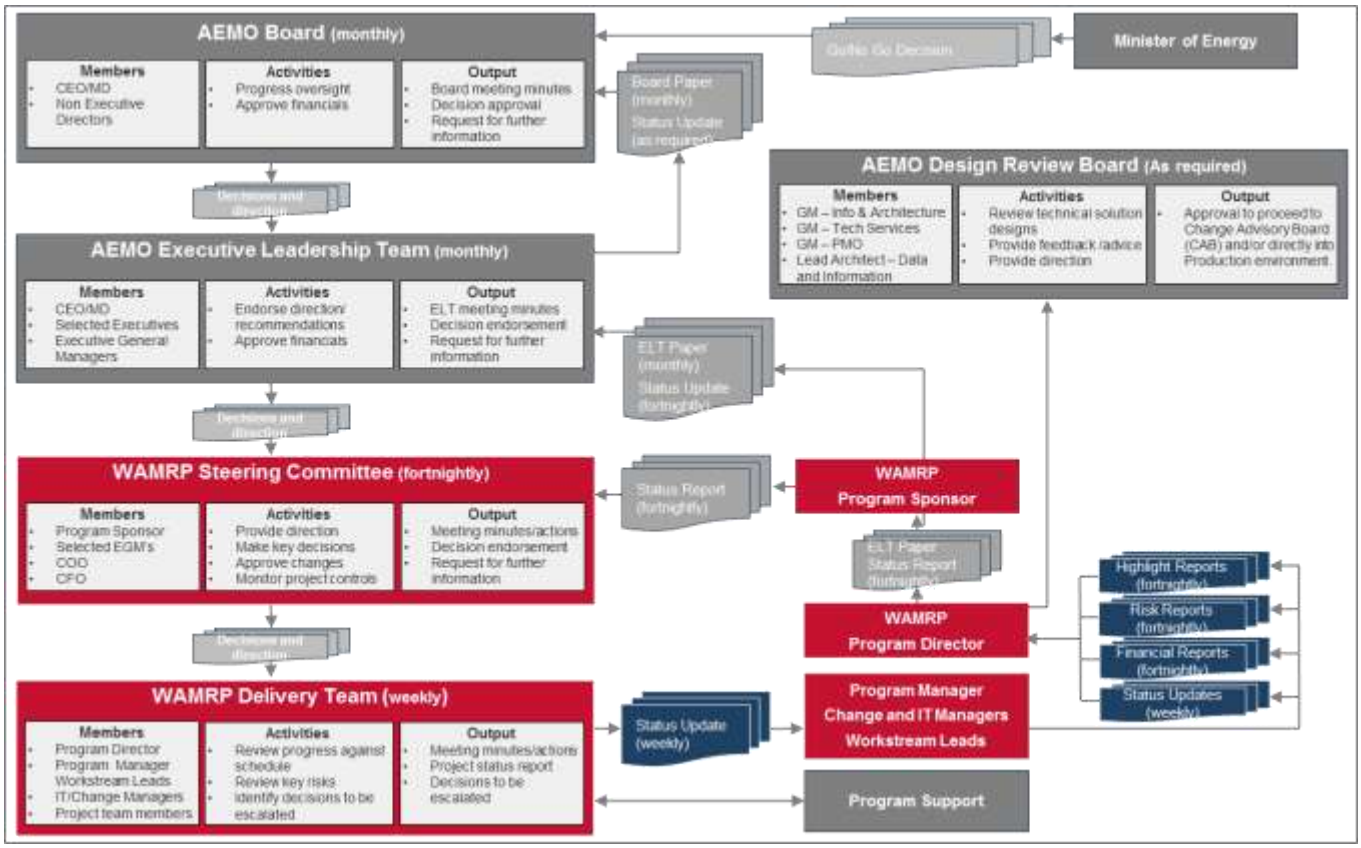
4.4 Program governance

The WAMRP has developed a governance framework to support the overall program delivery and provide direction, support, and assurance oversight as necessary.

Structured progress reporting will flow from the project level through the program and up to the AEMO WAMRP Steering Committee, ELT, and AEMO Board. Where necessary for IT solutions, the AEMO Design Review Board (DRB) will play an assurance role to protect the integrity of the AEMO production systems.

Escalation processes are defined for issues, risks, and scope change items that may arise, with the AEMO WAMRP Steering Committee being the core review forum for items that require resolution outside of the program team.

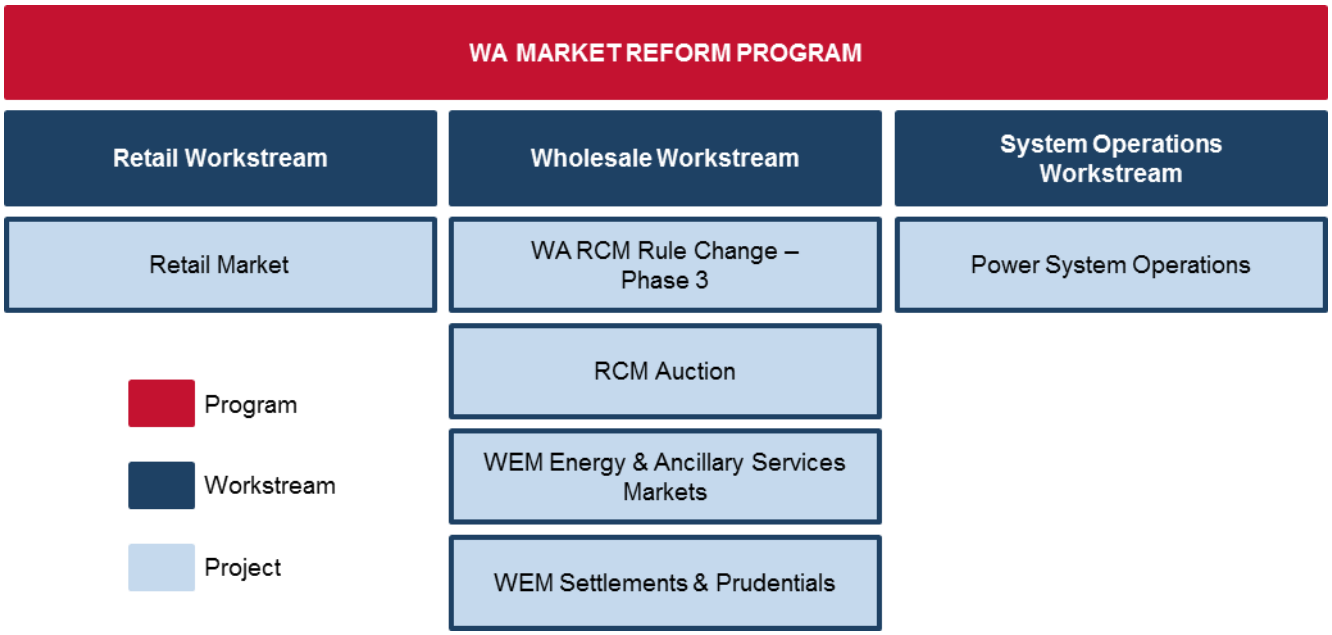
Figure 3 WAMRP program governance framework



4.5 Individual project summary

As mentioned, the WAMRP is structured into three work streams, with the Wholesale stream further broken into four projects. Details of each of the projects, in terms of overall intent, scope, and expected benefits are outlined below.

Figure 4 WAMRP structure



4.5.1 Wholesale work stream

PUO has embarked on major reform of the Western Australian (WA) Wholesale Energy and Ancillary Service (AS) Markets. The current Wholesale Electricity Market (WEM), which covers the South West interconnected System (SWIS), has an unconstrained market design with network congestion largely managed manually by System Management. With the expectation of increased future network congestion, the PUO has foreseen that the current market design will result in inefficient scheduling, market, and investment outcomes.

The PUO is also undertaking reform of the Reserve Capacity Mechanism (RCM) in response to concerns over the high annual cost of excess capacity to consumers. Transitional rules for the RCM have come into effect for the 2017–18 Capacity Year from October 2017, and further consequential changes to the RCM will occur as a result of the new energy and ancillary service markets. The PUO is also designing a capacity auction that will commence at some time from 2019. These reforms will necessitate changes to the RCM systems and market procedures.

The Wholesale work stream within the WAMRP has been divided into four distinct but related projects, based on the delivery timeframe requirements.

RCM Phase 3

Intent

The amended WEM Rules gazetted on 31 May 2016 introduced a number of reforms to the RCM, with the majority of changes commencing on different dates up to 1 October 2017. Due to the timeframes prescribed by the Market Rules, the RCM project was split into three phases:

- **Phase 1** has been completed. This included changes to the Certification of Reserve Capacity required for the 2016 Reserve Capacity submission cycle.
- **Phase 2** is currently under development. These changes relate to the Reserve Capacity bilateral trade processes, Demand Side Program load association workflow, and standing data collection, and will be in place before 1 October 2016.

- **Phase 3** is the subject of this project and covers the RCM changes required to be in place before 1 October 2017. The main changes relate to capacity pricing, Reserve Capacity refunds, and the treatment of demand side facilities.

Scope

The RCM Phase 3 work scope will:

- Introduce a dynamic refund regime.
- Implement changes to the dispatch of demand side facilities.
- Implement changes to the calculation of settlement outcomes relating to the RCM.
- Modularise the RCM functions to minimise cost, effort and risk associated with the broader market reforms commencing 1 July 2018.
- Update market procedures to reflect the RCM changes, including stakeholder consultation.

Benefits

The implementation of these initiatives will realise a number of benefits, including:

- Increased responsiveness of the existing RCM to changes in the level of excess capacity.
- Harmonising demand side resources with supply side resources in the market, by progressively reducing the demand side capacity prices and requiring increased availability for dispatch.

WEM energy and ancillary services

Intent

This project has been established to meet the WEM energy and ancillary services market component of the WAMRP. The overall intent of the project is to:

- Facilitate the high level design and implementation of a new Wholesale Energy and AS Market that largely mirrors the design of the NEM.
- Align participant and facility registration classes with those used in the NEM.
- Replace current Load Following, Spinning Reserve, and Load Rejection Reserve ancillary services with the frequency control ancillary services of the NEM.
- Implement changes to the RCM and day-ahead market to support the new WEM and dispatch arrangements.
- Introduce a real-time energy market design with 5-minute spot pricing and 30-minute pricing averages for settlement.

Scope

The WEM energy and ancillary services work scope will include:

- Delivery and configuration of real-time market and dispatch systems to support security-constrained co-optimised dispatch of energy and frequency control ancillary service markets, including capability for 5-minute dispatch, by 1 July 2018.
- Delivery and population of registration systems to support changes to participant and facility registration classes and standing data requirements for 1 July 2018.
- Delivery of systems for a day-ahead market that is integrated with other market and settlement systems, by 1 July 2018.
- Implementation of consequential changes to the RCM and Short Term Energy Market (STEM) to integrate them with the new WEM and dispatch arrangements.

- Updating market procedures to support the new WEM Rules, including stakeholder consultation.
- Ensuring internal and external participant education and operational readiness in preparation for 1 July 2018 cutover.

Benefits

The implementation of these initiatives will realise a number of benefits, including:

- More efficient scheduling, market, and investment outcomes and improved system security by replacing the current unconstrained market design and manual network congestion management approach with a constrained market design.
- Reduced cost of excess capacity to consumer costs by undertaking reform of the RCM.
- Amended RCM market procedures and systems which ensure compatibility with the new WEM design.
- Harmonised market arrangements with eastern states.
- Facilitating entry of participants and enhancing competition in the WEM.
- Improved competition and efficiency through introducing ancillary services markets, co-optimisation of energy and ancillary services dispatch, shorter gate closure and dispatch intervals.

RCM auction

Intent

The intent of this project is to implement a capacity auction within the RCM to determine the allocation and pricing of Capacity Credits, consistent with the auction design developed by the PUO.

Scope

The RCM Auction work scope will:

- Establish an auction for the pricing and allocation of capacity credits.
- Provide support to PUO for the high level design and rule development for the RCM auction.
- Update market procedures as required to support the RCM auction, including stakeholder consultation.
- Ensure internal and external participant education and operational readiness for the RCM auction.

Benefits

The implementation of these initiatives will realise a number of benefits, including:

- Reduced excess reserve capacity in the SWIS.
- Reduced cost of the RCM (and hence the cost of energy) for consumers.

WEM settlements and prudentials

Intent

The settlements and prudentials project is intended to deliver a range of processes, procedures, and systems to settle the energy, capacity, day-ahead and ancillary service markets from 1 July 2018. These will enable AEMO to determine and maintain sufficient prudential collateral to manage financial risk.

Scope

The settlements and prudentials works scope will:

- Provide NEM look-alike systems and processes for settlement, billing, and prudentials to support WEM3, modified to take into account substantial differences between the NEM and WEM3 (particularly the day-ahead market, RCM, constrained-on compensation and differences in ancillary services cost allocation).
- Update market procedures to support the changes to settlements and prudentials processes, including stakeholder consultation.
- Ensure internal and external participant education and operational readiness in preparation for the 1 July 2018 cutover.

Benefits

The implementation of these initiatives will realise a number of benefits, including:

- Efficient settlement of wholesale market transactions and retail market fees in systems that leverage the current NEM system capability.
- Settlement capability to meet specific WAMRP requirements, for example:
  - Frequency Control Ancillary Service (FCAS) market with new recovery mechanisms.
  - RCM payments and refunds.
  - Individual Reserve Capacity Requirement (IRCR) recovery.
  - Constrained on compensation.
  - STEM.
- Provision of quality tools and processes for the appropriate management of prudential risk.

4.5.2 Power System Operations

Intent

This work stream builds on the foundation established by the delivery of the System Management Transfer and the WA Office Move Projects to deliver the systems, tools and training required to implement AEMO's Power System Operation components of the new electricity market of the SWIS on 1 July 2018.

Scope

The Power Systems Operations works scope will:

- Deliver key systems for power system operations under WEM3, based on systems used in the NEM, including a new energy management system, constraint automation tools, Operations and Planning Data Management System (OPDMS), Australian Wind Energy Forecasting System (AWEFS), and Australian Solar Energy Forecasting System (ASEFS).
- Establish a Dispatch Training Simulator.
- Establish a Regional Operating Procedure to define boundaries and responsibilities between AEMO and Western Power.
- Update power system operating procedures to support the new operations, including stakeholder consultation.
- Ensure readiness of operational staff for new market operation.
- Interface with Western Power systems.

Benefits

The implementation of these initiatives will realise a number of benefits, including:

- Long-term cost efficiencies, without compromising power system security or reliability.
- Increased private investment in the energy market, through harmonisation with NEM systems and processes to the extent possible in the WEM.
- Productivity improvements and cost savings delivered via the use of a common Energy Management System (EMS) platform for both the NEM and the WEM. This will reduce future IT development and support costs compared to having separate solutions for the WEM and NEM.

4.5.3 Retail Market Operations

The future Retail Market functions will be undertaken by AEMO from July 2018. The comments included below are provided for information purposes only, as the Retail Market functions will have a different funding approval process which does not fall within the ERA scope for this submission.

Intent

The Retail work stream will implement processes and systems required by AEMO to function as the Retail Market Operator (RMO) and be prepared for a future implementation of Full Retail Contestability (FRC). As announced by the Minister for Energy, the RMO responsibility will transfer from Western Power to AEMO on 1 July 2018.

Scope

The Retail Market work scope will:

- Implement the NEM retail market framework and systems in the SWIS in accordance with Chapter 7 of the National Electricity Rules (NER), including the Market Settlement and Transfer Solution (MSATS), B2B Hub and Shared Market Protocol.
- Implement the NEM metering framework to Western Australia.
- Transfer and cleanse National Meter Identifier (NMI) standing data and consumption data from Western Power to support wholesale and retail market functions from 1 July 2018.
- Ensure internal and external participant education and operational readiness for the new Retail Market arrangements.
- Establish or update market procedures to support the operation of retail and metering rules that will apply in the SWIS, including stakeholder consultation.

Benefits

The implementation of these initiatives will realise a number of benefits, including:

- Providing a cost-effective pathway to FRC (and the benefits of greater competition this will provide) by utilising the existing NEM retail market framework.
- Removing the current Retail Market Operator functions from Western Power to allow this business to focus on its core role as a network service provider.
- Reduced barriers to entry, so retailers and metering businesses are more easily able to participate in the WA retail market.

4.6 Overall Market Reform Program costs

The total proposed budget for the Market Reform project is summarised below. This total includes both operational and capital expenditure, and also costs associated with the Retail stream (not subject to ERA approval).

Table 18 Total proposed costs of the Market Reform Program

Work stream	Capital expenditure (000s)	Operational expenditure (000s)	Total project costs
Wholesale	$25,242	$1,382	**$26,624**
Power Systems	$10,899	$1,771	**$12,670**
Retail[6]	$4,412	$368	**$4,780**
Total	**$40,554**	**$3,521**	**$44,075**

4.7 Market Reform allowable revenue 2016–17 to 2018–19

Market Reform operating expenditure includes project costs that are required to be classified as operating expenditure (highlighted in the above table), depreciation of the new market from 1 July 2018, and additional costs in 2018–19 to operate the market.

4.7.1 Market Reform – operating expenditure 2016–17 to 2018–19

The table below breaks down Market Reform operating expenditure by financial year.

Table 19 Market reform operating costs (excluding Retail stream)

Function	Depreciation (from 1 July 2018) (000s)	Borrowing costs (from 1 July 2018) (000s)	Market reform planning (000s)	Training and travel (000s)	Other (000s)	Total (000s)
WEM Market Operations	$3,058	$585	$250	$939	$4,373	**$9,205**
WEM System Management	$1,317	$253	$740	$1,062	$2,811	**$6,182**
Total	**$4,375**	**$838**	**$990**	**$2,001**	**$7,185**	**$15,388**

Depreciation

This expenditure relates to the depreciation of the new market systems that have been deployed to support and deliver the new functions arising from WEM market reforms.

Borrowing Costs

Borrowing costs of approximately $0.9M incurred prior to the market go-live have been capitalised as part of the project. Additional borrowing costs of $0.84M will be incurred in the 2018-19 financial year and have been classified as operating expenditure.

Market Reform Planning

Market reform planning costs comprise $0.99M and relate to the planning of the market reform program of work.

[6] Expenditure for the Future Retail Market functions has been provided for information purposes only as they are not subject to approval by the ERA.

Training and Travel

Approximately $2.00M of the total Operating Expenditure relates to a combination of training and travel activities. The majority of this is comprised of training material design and production, and the delivery of training to market participants and AEMO staff in the new functions, systems and procedures delivered as part of this program. This is critical to help ensure the overall readiness of the participants for the new market to go-live.

Other

Other WAMRP expenditure includes:

- Technology costs ($4.03M) relating to operating the data links for the new WA to data centres (connecting to operating systems in Western Power and AEMO East Coast), and additional licensing fees to support new market systems.
- Operating personnel and support services ($3.15M) required to meet AEMO's additional obligations and the systems to support these for the new market. In addition, this also includes provision of temporary post production support for new systems. New roles include IT Developers, Market Analysts, Grid System Engineers, System Capability Engineers and Grid Modelling Engineers. The majority of the activities within these roles aren't presently undertaken in today's less mature and more simplistic market (for example, constraint equations and system planning). Remaining activities will be provided by Western Power for the current operational systems under the service level agreement, with these costs reducing once the current operations systems are retired.

Table 20 Market reform operating expenditure (excluding Retail stream)

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
WEM Market Operations	$743	$2,505	$5,958	**$9,206**
WEM System Management	$988	$1,583	$3,611	**$6,182**
Total	**$1,731**	**$4,088**	**$9,569**	**$15,388**

4.7.2 Forecast Capital expenditure 2016–17 to 2018–19

Table 21 WAMRP forecast capital expenditure (excluding Retail stream)

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
WEM Market Operations	$13,782	$10,922	$539	**$25,243**
WEM System Management	$5,083	$4,469	$1,347	**$10,899**
Total	**$18,865**	**$15,391**	**$1,886**	**$36,142**

Cost estimates were developed during the planning phase of the project using a bottom-up approach, where tasks, durations, and resources were itemised along with overall IT development and system testing. Allowances have also been made for regulatory components of work such as rule drafting, procedural development, and consultative processes, as well as market and participant readiness.

Throughout the planning phase a number of peer assist and peer review workshops were undertaken to challenge and strengthen the accuracy of these estimates. The AEMO WAMRP Steering Committee also provided further review prior to submitting these to the ELT, AEMO Board, and ultimately the ERA.

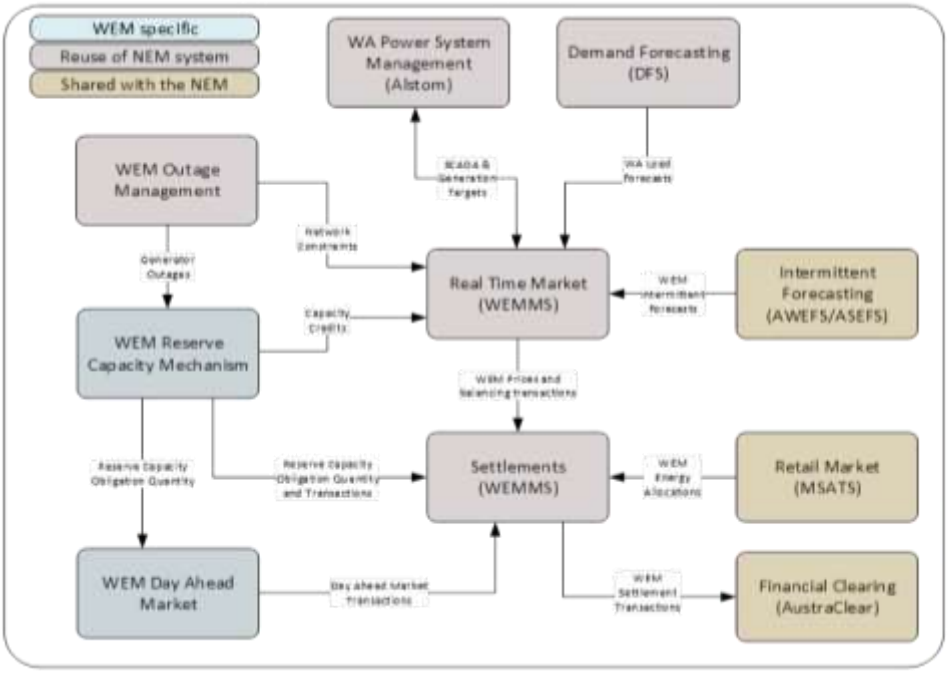
The changes to the WA Market are significant, to AEMO and broadly to market participants. A key component of the program is to ensure that AEMO and all participants fully understand the changes, are regularly engaged with, and are well prepared to comply with the new reforms. The above estimates encompass not just system implementation costs but also costs required for readiness support activities which will ensure a seamless transition to the new market.

AEMO intends to optimise and leverage the current expertise in the organisation to develop the new WA reform solutions in line with existing NEM systems. This utilisation of existing systems and internal expertise will minimise the cost to market participants compared with building a completely new stand-alone WEM solution. The bulk of costs in the above estimates relate to the necessary customisation needed to meet the unique requirements of the WA energy market, and leveraging off AEMO's systems, processes, and expertise.

This leverage is important from an allowable revenue perspective, in that it covers not just the establishment costs associated with the design, build, and deployment of the new WEM systems, but also the ongoing savings from being able to utilise the extensive experience of the AEMO support network, both locally and nationally. Without this support, the additional costs from external consultancies and other vendors and contractors would increase the market fees for participants.

The program proposes to reuse as much as possible of the existing AEMO systems supporting the NEM to avoid unnecessary duplication and provide opportunity for future consolidation as the WEM and NEM Rules converge. Reuse of the east coast retail system has the additional benefit of allowing retailers to have the same interface to both east and west coast markets under future FRC. The proposed leverage between NEM and WEM systems is shown below.

Figure 5 WAMRP NEM/WEM enterprise architecture overview



Appendix A provides an overview of other market reform projects for comparison purposes.

5. ESTIMATED IMPACT ON WEM MARKET FEES FOR REVIEW PERIOD 2016–19

5.1 Notes on market fees

Until the ERA makes a determination on this submission, AEMO continues to charge the 2015–16 Market Operations fee ($0.504/MWh) and the 2015-16 System Management fee (0.372/MWh).

In accordance with the WEM Rules, AEMO is an agent for the collection from market participants of market fees for the IMO's market administration services in 2016–17. The estimated costs for these services, based on the IMO's 2015–16 Operational Plan, is $1.4M, which will equate to an indicative market fee rate of $0.037/MWh. The IMO costs and corresponding market fees do not form part of the AEMO cost estimates or allowable revenue submission.

5.2 Estimated fees over review period 2016–19

The table below summarises the estimated fee changes over the regulatory period. Tables 24 and 25 then provide a further breakdown of each of the fees.

Table 22 WEM estimated market fee impact ($/MWH and % variance)

	2015–16	2016–17	2017–18	2018–19
Market Operations	0.504	0.416	0.384	0.539
System Management	0.372	0.472	0.493	0.474
Total	0.876	0.889 **(+1%)**	0.877 **(-1%)**	1.013 **(+15%)**

Table 23 Consolidated Market Operator market fees

	2016–17	2017–18	2018–19
UNADJUSTED MARKET FEE RATE			
Unadjusted allowable revenue ($000s) – excluding inter period adjustments and interest and other income	$17,121	$16,214	$20,638
Unadjusted market fee rate ($/MWh)	0.458	0.428	0.539
ADJUSTED MARKET FEE RATE			
Unadjusted allowable revenue ($000s)	$17,121	$16,214	$20,638
Adjusted for inter period adjustment	-$1,569	-$1,668	tbd
Adjusted allowable revenue ($000s)	$15,552	$14,546	$20,638
Adjusted market fee rate ($/MWh)	0.416	0.384	0.539

Table 24 Consolidated System Management market fees

	2016–17	2017–18	2018–19
UNADJUSTED MARKET FEE RATE			
Unadjusted allowable revenue ($000s) – excluding inter period adjustments and interest and other income	$17,652	$18,675	$18,168
Unadjusted market fee rate ($/MWh)	0.472	0.493	0.474
ADJUSTED MARKET FEE RATE			
Unadjusted allowable revenue ($000s)	$17,652	$18,675	$18,168
Adjusted for inter period adjustment[7]	tba	tba	tbd
Adjusted allowable revenue ($000s)	$17,652	$18,675	$18,168
Adjusted market fee rate ($/MWh)	0.472	0.493	0.474

[7] Inter period adjustments will apply to the System Management fee, however these figures will be provided as part of the transfer of functions from Western Power.

6. GAS SERVICES INFORMATION (GSI)

6.1 General overview

On 30 November 2015, the accountabilities for the Gas Bulletin Board (GBB) and Gas Statement of Opportunities (GSOO) transferred to AEMO.

6.1.1 Legislative framework and GSI objectives

The *Gas Services Information Act 2012* sets out the objectives and primary purpose of the GBB and GSOO:

- Section 4(1) – *The gas bulletin board is a website the primary purpose of which is to include information relating to short and near term natural gas supply and demand and natural gas transmission and storage capacity in the State.*
- Section 5(1) – *The gas statement of opportunities is a periodic statement the primary purpose of which is to include information and assessments relating to medium and long term natural gas supply and demand and natural gas transmission and storage capacity in the State*.
- Section 6 – T*he objectives of the GBB and GSOO are to promote the long term interests of consumers of natural gas in relation to;*
  - *a) the security, reliability and availability of the supply of natural gas in the State;*
  - *b) the efficient operation and use of natural gas services in the State;*
  - *c) the efficient investment in natural gas services in the State; and*
  - *d) the facilitation of competition in the use of natural gas services in the State.*

6.1.2 Allowable revenue and forecast capital expenditure approval mechanisms

The GSI Services for determination of allowable revenue by the ERA are set out in Rule 107 of the GSI Rules:

a) to establish, operate and maintain the Gas Bulletin Board (GBB);

b) to register or deregister Registered Participants and Registered Facilities and to grant Exemptions;

c) to prepare and publish the Gas Statement of Opportunities (GSOO);

d) to make Amending Rules and Procedures, including the initial Rules made by the Minister under regulation 6 of the GSI Regulations;

e) [blank]

f) To support:

- *i) the ERA's monitoring of persons' compliance with the Rules or Procedures;*
- *ii) the ERA's investigation of breaches or possible breaches of the Rules or the Procedures (including by reporting possible breaches to the ERA); and*
- *iii) any enforcement action taken by the ERA under the GSI Regulations or the Rules;*

g) [blank]

h) to manage information gathering and disclosure functions under the GSI Regulations and the Rules; and

i) services deriving from the exercise of any other functions conferred on the AEMO under the GSI Act, the GSI Regulations or the Rules.

The AEMO budget for the GSI function is based on the costs that would be incurred by a prudent provider of the defined services, acting efficiently, while effectively promoting the GSI Objectives.

6.2 Gas Services Information (GSI) – allowable revenue

6.2.1 Operating expenditure 2016–17 to 2018–19

Table 25 GSI operating expenditure summary

	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
WEM GSI functions	$2,040	$2,151	$1,687	$5,878

6.2.2 Operating expenditure categories

Costs are classified into the five operating expenditure categories shown in the tables below, and discussed in the commentary following the tables.

Table 26 GSI Operating Expenditure by Category

	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
Employee benefits expenses	$717	$712	$803	**$2,232**
Accommodation	$102	$124	$97	**$323**
Supplies and services	$539	$551	$552	**$1,642**
Borrowing	$22	$32	$25	**$78**
Depreciation	$662	$733	$209	**$1,603**
Total	**$2,040**	**$2,151**	**$1,687**	**$5,878**

6.2.3 Cost comparison to prior period

Table 27 GSI operating expenditure comparison

	2013–14 to 2015–16 ERA approved (000s)	2016–17 to 2018–19 Submission (000s)	Increase/decrease (000s)	Increase/decrease %
Employee benefits expenses	$2,352	$2,232	-$120	**-5%**
Accommodation	$304	$323	$19	**6%**
Supplies and services	$1,985	$1,642	-$343	**-17%**
Borrowing	$379	$78	-$301	**-79%**
Depreciation	$1,899	$1,603	-$296	**-16%**
Total	**$6,919**	**$5,878**	**-$1,041**	**-15%**

A simple comparison of the approved expenditure for the previous review period for GSI and the submission for the next review period reflects a decrease in net expenditure of $1.04M (15%). Variances from the previous period are outlined below by category.

Employee benefits

Labour costs decrease between the review periods by $0.12M. The main reason for the decrease is the reduction in average employee numbers allocated to the GSI functions over the review period, falling from 6.1 to 5.1 full-time equivalent employees (FTEs) per annum.

This reduction is due primarily to synergies gained by sharing a single corporate services team across all three functions (WEM Market Operator, WEM System Management, and GSI functions).

Accommodation

Accommodation costs include office rental, cleaning, electricity, maintenance and car parking, which are apportioned across the three functions. These costs increase by a minimal amount of $0.02M over three years.

Supplies and services

This category encompasses Operations and Technology, System Capacity, Market Development, and Corporate Services costs. There is a net decrease in the 2017–19 period of $0.34M (-17%) compared to the 2013–16 period.

The major variances relate to:

- Operations and Technology savings of $0.17M on the cost of maintaining the GBB software, due to identified efficiencies.
- Savings in Corporate Services costs of $0.20M, due to AEMO's strong focus on cost control and efficiencies gained through the integration of functions into AEMO.

Borrowing

The major capital expenditure incurred in the previous period related to the development of the GSI and GBB software. The loan associated with this is due to be repaid in line with the five-year depreciation period of the asset. This will reduce associated borrowing costs by $0.30M between the two periods

Depreciation

Depreciation between the two periods is estimated to reduce by $0.26M. The development of the GSI and GBB software during the previous period will be fully depreciated during the next period. Other capital expenditure has been relatively small, with no significant projects undertaken.

6.3 Gas Services Information (GSI) – forecast capital expenditure

6.3.1 Forecast Capital expenditure 2016–17 to 2018–19

Table 28 GSI forecast capital expenditure summary

Function	2016 –17 (000s)	2017 –18 (000s)	2018 –19 (000s)	TOTAL (000s)
WEM GSI functions	$228	$496	$392	**$1,116**

The capital expenditure applicable to the GSI is summarised in the table below.

Table 29 GSI forecast capital expenditure detail

Function	2016–17 (000s)	2017–18 (000s)	2018–19 (000s)	Total (000s)
GSI	$88	$90	$202	**$380**
Infrastructure – Market Systems	$19	$19	$41	**$78**
Architectural alignment of infrastructure	$96	$180	$150	**$426**
Corporate support	$26	$8	$0	**$34**
New office fitout	$0	$199	$0	**$199**
Total	**$228**	**$496**	**$392**	**$1,116**

The major areas of capital expenditure are outlined below.

Gas Services Information Systems (GBB)

The GBB is one of two components of the GSI services provided by AEMO. The GBB will require sustained investment to maintain its current capability as well as to facilitate any evolutionary changes.

This funding will allow for the implementation of GSI Rule changes, and will ensure the GBB remains compliant with the GSI Rules. The allocation of a capital program to allow for enhancements of the GBB is also proposed. This may entail further integration in more established parts of AEMO IT systems, or implementation of enhancements including improved visualisations, that fall outside a Rule change progress.

Architectural alignment of infrastructure

The Infrastructure used to support WA services has previously been designed and deployed to support the requirements of the WA environment only. Following the transition of services to AEMO, there is a requirement to consider the organisation's broader IT principles. While a number of transition and integration activities have been completed, the future state of the environment will be designed around these established standards.

Planned expenditure also relates to hardware refreshes and infrastructure upgrades which will comply with AEMO standards. These costs bring significant benefits, in terms of the overall reliability, security, and cost effectiveness of the AEMO IT systems landscape.

New office fitout

This is an allocation of the capital costs incurred in the office fitout, including the main office. In the current Perth property market, AEMO expects to secure lease incentives that cover most of its fit out costs.

6.4 GSI fees

GSI Fees are collected on a quarterly in arrears basis split evenly between both Shippers and Producers.

- Gas Shippers are charged on the actual share of gas deliveries based on the aggregated daily actual flows for each Registered Production Facility Operator.
- Registered Production Facility Operators (Producers) are charged on the aggregated daily flow provided to the relevant Gas Shippers.

7. KEY COSTING PRINCIPLES AND ASSUMPTIONS

7.1 Energy consumption in the WEM

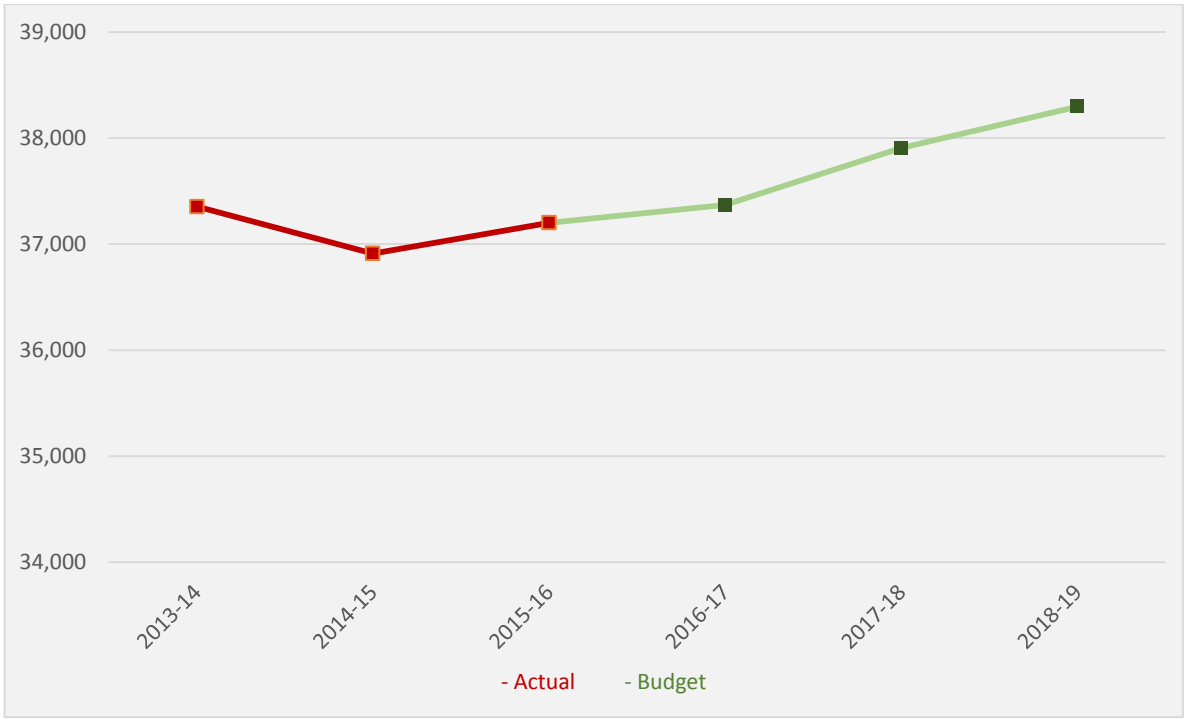
AEMO expects operational consumption to increase at an average annual rate of 1% over the next ten years, as shown in the table and figure below.[8] While low, the growth in operational consumption is predicted on current policy settings for the non-contestable customer segment. Changes to tariff and regulatory policies could further decrease operational consumption over the forecast horizon.

Table 30 WA actual and forecast electricity consumption 2013–14 to 2018–19 (GW)

	2013–14 actual	2014–15 actual	2015–16 actual	2016–17 forecast	2017–18 forecast	2018–19 forecast
Operational consumption	37,102	36,662	36,950	37,116	37,652	38,038
Loss factor adjusted energy*	37,355	36,912	37,202	37,369	37,908	38,297

* The Loss Factor Adjusted (LFA) energy represents the transmission losses of electricity priced in the market fee rate. It is the difference between the forecast of metered consumption (operational consumption) and total generation.

Figure 6 WEM actual and forecast electricity consumption 2013–14 to 2018–19 (GW)



7.2 Employee benefits

7.2.1 Salary increases

Salary increases have been estimated in line with AEMO's Enterprise Agreement (EA). The current AEMO EA provides for annual increases of 2.9%.

The current AEMO EA expires on 30 June 2018 and the salary rate increase is assumed to roll forward to 2018–19.

[8] AEMO. *Deferred WEM Electricity Statement of Opportunities*, June 2016. Available at: http://www.aemo.com.au/Electricity/Wholesale-Electricity-Market-WEM/Planning-and-forecasting/WEM-Electricity-Statement-of-Opportunities.

7.2.2 Internal costing methodology

While many costs are directly attributable to AEMO's functions under the WEM Rules, some overheads (like accommodation) are shared across all functions. Where this occurs, a costing methodology has been used to apportion costs.

A detailed split of approved full time equivalent positions is used to allocate payroll costs between the three functions.

AEMO plans to consolidate its WA market operator and WA system management function teams into a single office in September 2017. Accommodation costs are allocated across the functions based on position count.

AEMO intends to achieve cost synergies by utilising a single WA corporate services function. The costs of the corporate services team are accordingly allocated across all three WA functions.

7.3 Accommodation

The lease for AEMO offices on Level 17, 197 St Georges Terrace provides an area of 857m^2. The current lease agreement is for 10 years, with an option for AEMO to exit from the lease after five years.

AEMO plans to consolidate its WA market operator and WA system management teams into a single Perth office in September 2017, including the system management control room. The costs of the office move are included in the above cost estimates.

7.4 Annual indexation

This submission incorporates the annual indexation of costs, which have been based on the Department of Treasury advice of 2.50% across the review period. This is consistent with the rates used in State Budget estimates.

Excluded from this indexation are costs covered by fixed price contracts, where AEMO has received specific advice.

7.5 Borrowing

All capital requirements are funded at AEMO's cost of capital estimated at 3.30%, being Bank Bill Swap Bid Rate (BBSY) plus a margin.

Projected borrowing costs have been calculated based on existing loan facilities and the projected capital expenditure.

7.6 Depreciation

Depreciation is determined using the expected written down value of assets as at 30 June 2016, together with depreciation that flows from assets purchased over the review period. The expected useful life of assets is based on AEMO's fixed and intangibles asset policy, with specific consideration given to assets that may be impacted by the market reforms.

Depreciation on WA Market Reform establishment assets is based on an economic life of 10 years.

APPENDIX A. PROJECT BENCHMARKING

AEMO has, as part of performing its own due diligence on the WAMRP component of this submission, undertaken a number of reviews of similar market systems implementations. This review covers both AEMO specific projects and those undertaken by others, in both domestic and international electricity markets. The intent has been to obtain comfort, from an order-of-magnitude perspective, that the forecast expenditure requested from the ERA is prudent, and reasonable when compared to the timelines, scope, and costs of other similar undertakings.

The outcomes from the review are documented below, using four projects that allow for a benchmarking comparison.

A.1 BALANCING MARKET – WA 2012

In 2012, the IMO through its Market Evolution Program implemented Rule changes to implement a Balancing Energy Market (effectively a gross pool market) to add to the existing day ahead Short Term Energy Market (STEM). Prior to the introduction of the Balancing Market, STEM clearing positions provided a basis for dispatch of private generators (self-dispatch) with the remainder of balancing (due to load, renewables output, trip of generator) being picked up through central dispatch of the Synergy Portfolio. System Management only called on private generators if there was insufficient capacity within the Synergy Portfolio.

The introduction of the Balancing Market required all generators to bid in their full capacity in up to 10 tranches. They could modify these bids up to two hours prior to a trading interval. This enabled greater competition and a more efficient pool of generators for System Management to centrally dispatch. A Load Following Ancillary Services market was also introduced at this time.

The Market Evolution Program also required the IMO to make sizeable changes to its existing Market Systems (particularly the creation of a Balancing Merit Order, changes to data exchange with participants and System Management, changes to settlements, and constrained on/off payments). The total capital expenditure cost incurred by the IMO for the program was approximately $10.0M.

More substantial changes were required at System Management (within Western Power), with additional systems added to somewhat rudimentary legacy market systems and manual processes. Automation was added via a Real Time Dispatch Engine to enable dispatch to the Balanced Merit Order (BMO), changes to data exchanges with IMO, improved real-time communications with generators, and increased compliance monitoring. The total capital expenditure cost was $14.0M, bringing the total program costs to approximately $24.0M between the key parties.

The scope of the 2012 Balancing Market compares broadly to certain components of the Wholesale work stream, and the 2012 System Management changes to the System Operations work stream, of the WAMRP. Note that from a System Management component this only really captures the forecasting and dispatch related elements (that is, it excludes the e-Terra, Network Outage Systems (NOS) and Projected Assessment of System Adequacy (PASA) components).

A.2 EMS UPGRADE 2016

XA 21 is the Energy Management System (EMS) used by Network Operations and System Management to monitor, manage, and control the entire distribution network. This is similar in nature to the E-terra system that is in place and used by AEMO to manage the NEM network.

Western Power undertook two separate upgrades of the XA21 system, at a combined cost of $14.7M. This total expenditure was for two fairly standard new-release upgrades over a six-and-a-half-year period, with the first upgrade costing approximately $6.0M in 2013, and the second costing approximately $8.5M in 2016.

There were significant issues and challenges with both upgrades, predominantly attributable to the extent to which Western Power had customised the standard configuration / system design.

Following the challenges with the XA21 upgrade, Western Power is now looking to phase it out and move to the Power on Fusion system currently used to manage and monitor the transmission network.

This scope broadly compares to what the WA Market Reform program is implementing in terms of the following project scope:

- Build/commission of EMS production and test environments.
- Recommission linkages to market systems.
- Full functional and user acceptance testing.
- User training.

This scope of work is roughly equivalent to the e-Terra portion of the System Operations WAMRP work stream. However, the e-Terra component involves more than just an upgrade, as it encompasses developing displays/databases from scratch, commissioning linkages to Western Power, recommissioning interfaces to market participants, and developing new training systems and processes.

A.3 AEMO Short Term Trading Market 2008

The STTM (Short Term Trading Market) is also a useful benchmark for the WAMRP work scope. In consultation with policy makers and the industry, the STTM project involved the development of new market arrangements trading and settlement arrangements, and IT systems and interfaces.

The objective of the STTM Establishment Project was to design and implement the STTM for natural gas in South Australia and New South Wales and the market infrastructure required to operate it.

The STTM project cost approximately $22.0M over slightly longer than two years. The scope of the project was very much focused on the Wholesale sector of the electricity market, compared to the WAMRP which also encompasses Retail, Settlements, and Power Systems Operations components. Although AEMO is planning on leveraging systems and processes from the NEM, this is still a much broader and more complex program than the STTM.

Similarly to the WAMRP, the STTM project also involved obtaining and fitting out new office space, as well as building and operating new data links.

At its peak, the STTM project had almost sixty dedicated project resources working full-time on the project. The WAMRP is looking to utilise resources across projects as much as possible, and as such is not anticipating this level of resourcing throughout the entire program.

The STTM project also had some challenges in relation to deploying the clearing engine technology and reporting solution, which led to delays in the original deployment timeline. The challenges were less associated with the specific technical solution, and more with market participants needing to be convinced that the new market design would work as planned.

A.4 ERCOT New Market Program

ERCOT, a North American system operator, introduced significant changes in market design as part of a strategic move in transitioning from a zonal to a nodal market operation, commencing in early 2006.

The Texas nodal program existed to facilitate the transition from a zonal to a nodal market, and affected many business processes and systems. The move to a nodal system was partly a strategy to avoid having to spend an estimated US$175.0M to fix the antiquated and outdated zonal systems.

The ERCOT project involved the design, build and deployment of key technology solutions including:

- Energy Management System.

- Market Management System.
- Day-ahead market (DAM).
- Network Model Management System.
- Commercial Systems.
- Congestion Revenue Rights System.
- Early Delivery System.
- Enterprise Data Warehouse.

For a number of reasons, the original budget of US$263.0M was significantly exceeded, with the final cost of the project coming in at approximately US$510.0M. The most significant cost overruns were in the IT Infrastructure (US$62.0M or 100%) and the Market Management System (US$45.0M or 171%). The program commenced in April 2006, with an original targeted go-live date of 1 January 2009. ERCOT eventually went live with the Nodal solution on 1 December 2010, nearly two years late.

Key findings from the project found the following were key contributors to time and cost overruns:

- Understated complexity of the new solutions, which had never been undertaken previously.
- The original timeline and budget were understated for political reasons, and were grossly unrealistic.
- Delays from software development and integration problems.
- Program management and governance was lacking.
- Dysfunction in ERCOT Contributed to the failed program management.

AEMO has a very good understanding and knowledge of the ERCOT experience and has taken this into account in the timeline, budget, and implementation approach for the WAMRP, particularly in relation to the WEM Energy and Ancillary Services scope components, which align closely with the ERCOT program.

There are definite scope similarities between ERCOT and the WAMRP, with the latter including design, build, and deployment of Energy Management Systems and the Day Ahead Market System, and the design and build of the supporting technical infrastructure.

As with ERCOT, there will also be requirements to undertake significant systems integration, end-to-end testing, and data conversion program activities as part of deploying the new solution. In addition, there are a significant number of market participants that need to be engaged, trained, and supported leading up to the new market going live.

AEMO will also take on the Independent System Operator functions and the necessary systems and procedures to support those functions, as is the case with ERCOT.

APPENDIX B. REFERENCE DOCUMENTS

These documents are available to the ERA to support any queries or clarifications as part of this AR4 submission.

Table 31 List and description of reference documents

Reference	Description
Program Control	
A1. 1	Program Management Plan (PMP)
Project Briefs	
B2. 1	Retail Market Project Brief
B2. 2	WA RCM Rule Change - Phase 3
B2. 3	RCM Auction Project Brief
B2. 4	WEM Energy & Ancillary Services Markets Project Brief
B2. 5	Power System Operations Project Brief
B2. 6	WA Settlements & Prudentials Project Brief
B2. 7	System Management Transfer Project Brief
B2. 8	WA Office Move Project Brief
Change Management	
C1. 1	Change Management Plan (CMP)
C1. 2	Stakeholder Engagement Plan
Technology Solutions	
D1. 1	WA Market Systems Proposal
D1. 2	AEMO IT Project Requirements to support WA BAU Activities
D1. 3	AEMO Data Centre Strategy Paper
Miscellaneous	

MEASURES AND ABBREVIATIONS

Units of measure

Abbreviation	Unit of measure
GJ	Gigajoule
GWh	gigawatt hour
MWh	megawatt hour

Abbreviations

Abbreviation	Expanded name
AEMO	Australian Energy Market Operator
CAB	Change Advisory Board
DRB	Decision Review Board
ELT	(AEMO) Executive Leadership Team
EMR	(Western Australia) Electricity Market Review
ERA	Economic Regulation Authority
EPCC	East Perth Control Centre
ESOO	Electricity Statement of Opportunities
FRC	Full Retail Contestability
GBB	Gas Bulletin Board
GSI	Gas Services Information
GSOO	Gas Statement of Opportunities
IMO	Independent Market Operator
NA	not applicable
NEM	National Electricity Market
NER	National Electricity Rules
PUO	(Western Australia) Public Utilities Office
RCM	Reserve Capacity Mechanism
RMO	Retail Market Operations
SMT	System Management Transfer
STTM	Short Term Trading Market
TARC	Technical and Regulatory Committee
WAMR	Western Australia Market Reform
WAMRP	Western Australia Market Reform Program
WEM	Wholesale Electricity Market