# imo

## INDEPENDENT
## MARKET
## OPERATOR

# Fourth IT Roadmap

## 2016 – 2019

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# Executive Summary

The Independent Market Operator (IMO) administers and operates the Western Australian Wholesale Electricity Market (WEM) under the Market Rules. The IMO is also responsible for operating the Gas Services Information (GSI) under the GSI Rules, which includes a Gas Bulletin Board (GBB) for Western Australia.

To ensure these market systems and associated infrastructure evolve with regulatory and technology changes, a level of ongoing investment is required. Systems that support IMO's non-core business functions also require additional funding to ensure they continue to be fit for purpose.

The level of investment required for the three year period commencing 1 July 2016 is defined in this Fourth IT Roadmap. This strategic planning tool outlines IMO's systems and infrastructure capital investment strategy and forms the basis for IMO's Allowable Revenue submission for the same three year period.

The Fourth IT Roadmap has been created with IMO's Strategic Objectives in mind. The activities outlined in this document focuses on evolutionary changes to Wholesale Electricity Market Systems (WEMS) while also addressing systems and infrastructure that inadequately support the target capability or risk profile of the IMO.

The activities detailed in this roadmap have been categorised into six groups. They include:

1. **WEMS** – Focuses on developing Wholesale Electricity Market system components that may be retained if a constrained grid market model is adopted. Expenditure is driven by projects that provide value to IMO's stakeholders, reduce operational risks, and support Market Rules compliance.

2. **WEMS – Metering and Settlements** – Ensuring availability and supportability of the software which performs a critical function of the IMO.

3. **Gas Services Information –** Maintaining the current availability of the GBB whilst adopting evolutionary changes which are invaluable to its stakeholders.

4. **Market Transparency –** Improving market data transparency to facilitate the efficient operation of the WEM and GSI.

5. **Infrastructure – Market Systems –** Ensuring that the IT infrastructure that supports the operation of the WEM and GBB provide the required levels of availability, performance, security and redundancy.

6. **Corporate Support –** Maintaining systems and infrastructure that support IMO's non-core business functions.

Although the Fourth IT Roadmap has not considered the impact of the Electricity Market Review (EMR), investment in the activities defined in Section 5 will keep the IMO strategically and technologically well placed to adopt any regulatory changes that may result from the EMR.

Projects stemming from the EMR will be funded and managed independently of the Fourth IT Roadmap. Depending on the scale of these projects, the deliverability of the items outlined in this roadmap may be impeded.

The depreciation model uses five years for computer software and three years for computer hardware (this was changed from 5 years in 2014/15), to reflect their current useful life. The targeted capital expenditure required to support the Fourth IT Roadmap would be a reinvestment of 55%-60% of the IMO's current asset depreciation.

# Contents

# Terms, Abbreviations and Acronyms

| Term | Definition |
|------|------------|
| ABB | ABB Group, Provider of original WEMS in 2006. |
| CAST | Compliance And Surveillance Tool |
| DTF | Department of Treasury and Finance |
| EMR | Electricity Market Review |
| ERA | Economic Regulation Authority |
| ESOO | Electricity Statement of Opportunities |
| IP | Intellectual Property |
| GBB | Gas Bulletin Board |
| GSI | Gas Services Information |
| GSOO | Gas Statement of Opportunities |
| Market Pulse | An interactive representation of market metrics on the IMO homepage. |
| MOSMI | Market Operations System Monitoring Interface |
| POMAX EDM | Energy Data Management software provided by Brady PLC, and used by the IMO to monitor, maintain and collate information about interval meters provided by Western Power Metering. |
| POMAX Settlement | A software component provided by Brady PLC used by the IMO to settle the Wholesale Electricity Market. |
| Public Data Site | A section of the IMO website where a range of market data can be accessed. |
| PUO | Public Utilities Office |
| SPARTA | The IMO's accounting system used to settle all trading within the WEM, and to produce real-time Invoice not paid data for the calculation of Prudential risk. |
| SWIS | South West Interconnected System |
| System Management | Ring fenced unit of Western Power responsible for dispatching the power system. |
| WDV | Write Down Value |
| WEM | Wholesale Electricity Market |
| WEMS | Wholesale Electricity Market System |

# 1.    Introduction

The purpose of the Fourth IT Roadmap is to define a clear IT framework to achieve IMO's Strategic Objects detailed in the table below:

| IMO'S STRATEGIC OBJECTIVES |
| --- |
| **1.  OPERATE MARKETS**<br><br>The IMO operates reliable and efficient markets and information services with integrity and transparency. |
| **2.  EVOLVE THE WEM AND GSI**<br><br>The IMO leads short term improvement and supports long term development of the WEM and GSI, using robust analysis, objective reasoning and consultation. |
| **3.  BUILD AND MAINTAIN STRONG RELATIONSHIPS**<br><br>The IMO develops enduring relationships with customers and stakeholders based on trust, collaboration and open communication. |
| **4.  MAINTAIN STRONG FINANCIAL RESPONSIBILITY AND RISK MANAGEMENT**<br><br>All financial transactions have prudent governance oversight, with corporate risks proactively managed. |
| **5.  DEVELOP OUR SKILLS AND RESOURCES**<br><br>The IMO has the skills and resources to operate professionally and meet stakeholders' expectations. |

Specifically, the Fourth IT Roadmap aims to:

1.  Define IMO's approach to the application of technology;

2.  Define IMO's approach to selective outsourcing;

3.  Present a baseline portfolio of capital work to support the IMO's strategic objectives in the three years commencing 1 July 2016; This work proposed can be adjusted as the IMO's business needs change; and

4.  Provide a robust framework for the IMO's ERA Allowable Revenue submission for 2016/17, 2017/18 and 2018/19 financial years.

# 2.    History

At IMO's inception, the IMO operated the WEMS on the Department of Treasury and Finance (DTF) IT infrastructure. Due to the misalignment of system availability requirements between the IMO and DTF, the IMO experienced several significant market outages due to infrastructure failures that occurred outside of normal business hours.

In light of these outages, the First IT Roadmap was established in December 2008. This roadmap focussed on the removal of IMO's dependency on DTF's infrastructure and

associated support. Significant investments in server and network infrastructure was made during this period, much of which remains in place today.

The Second IT Roadmap, which covered the three years commencing 1 July 2010, focussed on improvements to the WEMS application suite. This included:

- The replacement of the ABB reporting interface;

- The transition to a new user security mechanism; and

- Upgrade of the Metering and Settlements applications.

In April 2011, the Market Evolution Program commenced in earnest and was given priority over the work streams detailed the Second IT Roadmap. This program of work provided an opportunity for the IMO to deliver more substantive changes to the WEM while adopting stronger governance framework than previously planned.

The Third IT Roadmap delivered new systems as well as significant advancements in the operational maturity of the existing systems which support IMO's core business functions. Notably, the IMO delivered the GBB during this period and continues to support ongoing development of this system. Additionally, the IMO made significant inroads to providing greater data transparency with the new IMO website design, the development of data visualisations and the creation of a central repository for market data.

# 3. Context

## 3.1 Electricity Market Review

On 6 March 2014, the Minister for Energy launched the Electricity Market Review. The review aimed to examine the structures of the electricity generation, wholesale and retail sectors within the SWIS. The review aimed to explore the incentives in place for industry participants to make efficient investments and to minimise costs.

The Electricity Market Review was split into two phases. Phase 1, completed in December 2014, comprised of an assessment of the strengths and weaknesses of the current industry structure, market institutions and regulatory arrangements. This included an examination of options for reform to achieve the Electricity Market Review objectives.

On 24 March 2015, the Minister for Energy launched Phase 2 of the Electricity Market Review to undertake detailed design work on a set of reforms identified in Phase 1. The outcomes of Phase 2 represents significant change to IMO's core business functions and will require a large body of work to implement.

Phase 2 will likely be conducted through several standalone work programs which will look to evolve the wholesale electricity market. This will likely include:

- Implementation of a constrained grid market model;

- Adoption of System Management's responsibility by the IMO;

- Transition to full retail contestability; and

- Implementation of advanced metering.

These work programs will be funded and managed independently of the Fourth IT Roadmap.

In the event that these projects significantly alter IMO's IT strategy, this roadmap will be re-established.

## 3.2    Stakeholders

The IMO has a diverse range of stakeholders which include WEM participants, GSI participants, the PUO, the ERA and System Management. The IMO aims to maintain a consistent level of service to all stakeholders irrespective of their size, position, level of knowledge or operational maturity.

The IMO is responsible for developing and maintaining systems used by our stakeholders to participate in the WEM and GBB. These systems allow users to extract WEM and WA gas network data in a timely manner which facilitates the efficient operation of the WEM and GSI respectively. The IMO looks to continually improve these systems while maintaining technological impartiality to facilitate and encourage participation of existing and prospective participants.

For the non-participant stakeholders, the IMO serves as a repository public for WEM and GBB data. The IMO web site has seen significant improvements with several new features such as the data visualisations and data site, however further improvements to the accessibility and representation of data can still be made.

## 3.3    IMO Operations

The IMO is responsible for developing and maintaining the systems and processes which facilitate the operation of the WEM and GBB. The IMO must provide a reliable, efficient and round the clock service to its stakeholders while ensuring the availability and accuracy of the systems.

Historically, several tasks which support the operation of the WEM have been resource intensive and repetitive in nature. Systemisation of these tasks have improved resource utilisation however there are further automation and optimisation which still can be achieved, particularly with respect to the Reserve Capacity Processes.

Market Participant compliance with the respective rules continues to be an important function of the IMO and IT Systems have been extended to support this business requirement. As with the Reserve Capacity Processes, compliance monitoring processes will benefit from automation, particularly in the detection of non-compliant events.

## 3.4    Current Environment

### 3.4.1    Hardware and Infrastructure

The IMO owns (or manages under licencing agreements) all IT infrastructure used to meet its regulatory obligations. A large portion of this infrastructure is housed across two data centres which provides redundancy capabilities in the event of failure at one data centre. The process of testing this capability occurs every quarter, where IMO's core business functions are transferred between the data centres.

With the regulatory responsibilities to operate and maintain the WEM and GBB, the IMO places great emphasis on ensuring system availability and data integrity. By focussing on these areas, it promotes confidence in IMOs ability to perform these functions while encouraging participation in the market.

### 3.4.2 Software and Systems

The IMO's core business functions are defined by the Electricity Industry (Wholesale Electricity Market) Regulations 2004 (Market Rules) and the Gas Services Information Regulations 2012 (GSI Rules). The IMO meets the requirements of these functions primarily through the WEMS and GBB market systems.

Originally, WEMS was a suite of applications developed by ABB at market start to facilitate the operation of the WEM. As the WEM evolved, IMO's regulatory obligations have grown. This required the IMO to develop new functionality, independent of the original ABB implementation to ensure IMO's ongoing compliance with its regulatory obligations.

WEMS currently comprises of a number of core systems that exist to ensure the IMO are compliant with the Market Rules. They include a market engine, management tools, Market Participant Interface (MPI), POMAX Metering, POMAX Settlement and SPARTA.

To support the GSI rules, the GBB website was developed to show the supply, demand and transmission of gas in Western Australia. This website went live in August 2013 and services gas participants, the general public and the Coordinator of Energy.

The IMO also manages a number of supporting systems which are in place to meet IMO's Strategic Objectives. They include the Market Pulse, CAST, MOSMI and the Public Data Site.

The IMO systems are supported by a number of internal applications which manage the development and deployment process to ensure continuous integration and automation of the software.

# 4. Principles and Strategy

Based on the current operating environment, the following principles and strategy has been applied in the development of the Fourth IT Roadmap.

## 4.1 Principles

### 4.1.1 Stakeholder Focus

While all activities undertaken must support the efficient operation of the WEM and GSI, the IMO must ensure its stakeholders have access to systems, processes and customer service that meet their requirements.

### 4.1.2 Markets Must Run

IT infrastructure and systems are critical to the operation of the WEM and GSI. As an IT failure could have significant consequences to the market outcomes, the IMO needs to focus on maintaining infrastructure and systems availability while also ensuring that any IT failures are handled gracefully.

Recovery and availability must be well defined, understood and tested to meet expectations of disaster recovery and IMO's business continuity plan.

Backup systems, failover setups and application design all are designed to support down-time of less than two hours from point of IT systems failure.

### 4.1.3 Proactive Management

Infrastructure and systems require sufficient monitoring capability to ensure that the IMO can respond to issues prior to failure. To support this objective, a combination of integration and advance capacity planning is required with all system changes.

IMO seeks to maintain systems with the latest patches and firmware upgrades which will assist in achieving industry best practices.

Security of IMO's IT systems will be subject to independent verification, testing and, if required, remedial actions to address any issues identified.

### 4.1.4 Mainstream Technology

The IMO has a key strategic driver to use mature, widely used and well supported technologies. The IMO has a preference to use the latest or recent version(s) of technologies that have Perth based support readily available.

### 4.1.5 Consolidate Technologies

Focus on reducing disparate and out of date technologies (including mainstream technologies), and thereby reduce maintenance costs to the IMO. As much as possible, the IMO seeks to maintain a commonality of technologies and versions across IT systems. Technologies utilised to meet or exceed best practices for its type.

### 4.1.6 Keep it Simple

The application of technology follows a 'keep it simple' approach. Due to the size of the organisation, processes need to be lean, intuitive, and cost effective. Where appropriate, automation should be introduced to reduce repetition.

### 4.1.7 Knowledge Capture

Ensure all critical processes, systems and designs are well documented and widely understood to avoid single point of dependency.

### 4.1.8 Resourcing

Although the IMO maintains control of all strategic IT decisions, due to the small size of the organisational and the requirement to support a large range of IT systems there is not sufficient scale or work to provide a range of these services in-house. In these circumstances, the IMO supplements the skills of permanent staff with specialist service providers.

Currently the following services are outsourced:

- All infrastructure managed services (server, storage, network and desktop);

- Communications;

- Two data centres;

- Data archival;

- Capital IT development;

- Market application support;

- Independent security reviews; and

- Testing and certification services.

## 4.2    Strategy

The Fourth IT Roadmap endeavours to achieve IMO's Strategic Objectives (see Section 1) through the adoption of the following strategies.

|  | Strategy | IMO Strategic Objective(s) | | | | |
|---|---|---|---|---|---|---|
|  |  | 1 | 2 | 3 | 4 | 5 |
| 1. | Provide robust and secure IT systems in support of the core business functions of the IMO | ✓ |  |  |  |  |
| 2. | Evolve IT systems and processes |  | ✓ |  |  |  |
| 3. | Adopt processes, systems and infrastructure that reduce risk, effort and provide tangible benefits | ✓ |  |  | ✓ |  |
| 4. | Provide and improve access to systems and data in relation to the WEM and GSI | ✓ | ✓ |  | ✓ |  |
| 5. | Remove obsolete and unsupported technologies |  |  |  | ✓ | ✓ |

# 5.    The Roadmap

This section details the areas which the IMO will be allocating its capital investment during this roadmap. For a summary of how each roadmap item meets IMO's proposed strategy, please see Appendix A - Roadmap Summary.

## 5.1    WEMS

The Wholesale Electricity Market System (WEMS) is a suite of software components that provide business critical support to the IMO's ongoing operation of the WEM.

A continued investment in WEMS will allow the IMO to reduce and manage the risk profile of the legacy components.

Activities that facilitate the development of WEMS will be prioritised taking into account the implications of the introduction of a constrained grid market model. Development associated with components which can be reused under this new market model will be prioritised over components which are unlikely to be retained.

### 5.1.1    Rule Changes

Strategy ① ② ③ ④ ⑤

Rule changes, including those which are driven by the Electricity Market Review, will be required. This funding will allow for the implementation of these required changes and those detailed in the Market Rule Evolution Plan[1], and will ensure that WEMS remains compliant with the Market Rules.

### 5.1.2    Incremental Evolutionary Improvements

Strategy ① ② ③ ④ ⑤

This budget allocation will allow the IMO to redevelop the legacy WEM components which will reduce the likelihood of the Legacy System Risk[2] impacting on the ability of the IMO to meet its market obligations.

This includes a technology refresh for the MPI which allows the IMO to adopt a more maintainable framework. The IMO will be able to utilise similar techniques used in the data visualisations to provide a more effective presentation of important information for market participants.

Legacy ABB components of WEMS accounts for approximately 70% of the total WEMS codebase. From a functionality perspective, these components perform about 10% of the WEMS functionality. The IMO plans to undertake further work to minimise effort and risk with these components.

Further extensions to the automated certification testing developed as part of the Third IT Roadmap will be implemented. This will support the safe replacement of legacy business critical functions that require independent certification.

This body of work will segregate the core WEMS components which support key functions of the IMO, including Registration and the Reserve Capacity Mechanism. This will allow for the possible reuse of these components in an evolved market engine.

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[1]        http://www.imowa.com.au/home/electricity/rules/market-rules-evolution-plan
[2]        Risk Number 1.1 of the IMO Risk Register

### 5.1.3  Priority Enhancements and Security Patches

This budget allocation allows for the implementation of changes that improve the operation and service that the IMO provide. Priority will be given to changes that are of value to Market Participants and key stakeholders of the IMO.

Proactive changes instigated by the IMO are also included in this activity. This includes mandatory changes following the outcomes of security reviews.

### 5.1.4  IMS Interface

Replacement of business-to-business data exchange mechanism between the IMO and System Management for more accurate, efficient and complete exchange of data. These changes will support further opportunities for improvements to data transparency and streamline the mechanism which information is transferred.

### 5.1.5  Automated Regression Testing

The IMO performs thorough regression testing of software changes to WEMS. This requires an ongoing manual level of effort which is not an efficient use of resources. There is an opportunity for the IMO to address this with the further use of automated testing techniques.

The IMO has successfully applied this technique through the automated certification test suite as well as across several software components including SPARTA (approximately 65% coverage) and GBB (approximately 70% coverage).

Significant benefits could be realised in the automation of WEMS testing which, being a large legacy system, has not benefited from this approach to date as such further work is required in this area.

This funding will cover the implementation of a framework for testing targeted components of WEMS that require a significant effort to test properly. Priority will be given to implementing tests for high risk areas, or to areas undergoing significant changes.

## 5.2    WEMS – Metering and Settlements

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

A sustaining investment is required to ensure the continuation of these critical functions.

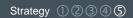### 5.2.1    POMAX Metering and Settlement Upgrades

Strategy ① ② ③ ④ ⑤

POMAX Metering and Settlement are discrete software components provided to the IMO by Brady PLC. The IMO does not have technical control of these software components and must align with the support windows of Brady PLC.

From time to time the IMO will require changes to this software to align the settlement process with the evolving rules and with IMO's business requirements, or to improve the end-to-end settlement processes.

A level of funding is required to ensure that the IMO continues to use supported versions of POMAX Metering and POMAX Settlement. Each of these components has its own discrete software versioning and each will require a discrete funding project. Testing and certification requirements form a significant cost for each upgrade.

### 5.2.2    POMAX Settlement Technology Refresh

Strategy ① ② ③ ④ ⑤

Brady has indicated to the IMO that a technology refresh is required in the medium term so that they can continue to support this software.

The IMO will leverage this opportunity to take steps toward minimising bespoke functionality within the POMAX Settlement software. Historically much of this bespoke functionality was implemented at the request of the IMO, but would be more efficient for the IMO to manage within our own software. Goal is to reduce functionality to a 'core engine' with well-defined interfaces.

### 5.2.3    Metering Data Management

Strategy ① ② ③ ④ ⑤

Prior to this Roadmap, the IMO is rebuilding the mechanism to obtain metering data from Western Power. The IMO will now receive all metering data, including non-contestable metering. Continuing improvements to this interface will improve the overall settlement processes.

A level of funding is required to build up a comprehensive metering database that will contain up-to-date and accurate metering information for the WEM. This will further support full retail contestability, when adopted as a part of the EMR.

Strategy ① ② ③ ④ ⑤

### 5.2.4    Prudential Security

The prudential security management currently is undertaken by a combination of defined reports and managed calculations by the Operation's team. This process needs to be revisited to ensure that further automation and reporting can be provided to participants of the WEM.

Currently prepayments can be made by market participants to reduce their prudential risk. This prepayment process could be performed on a daily basis, thereby minimizing each market participants' daily exposure and overall market risk. A level of funding will be required to support any such changes.

### 5.2.5  Clearing

The clearing process is currently handled by ASX's Austraclear. With existing transaction volumes this has met the requirements of the WEM.

The IMO may require support for more frequent clearing transactions, as flagged under improvements to prudential security. With Austraclear as the clearing provider, this is likely to be prohibitive due to the high per-transaction costs (this cost is irrespective of transaction size).

Alternatives to Austraclear will need to be investigated to potentially realise the benefits of shorter settlement cycles.
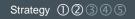
## 5.3 Gas Services Information

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

### 5.3.1 *Rule Changes*

Strategy ① ② ③ ④ ⑤

This funding will allow for the implementation of GSI rule changes, and will ensure that the GBB remains compliant with the GSI Rules.

### 5.3.2 *Enhancements*

Strategy ① ② ③ ④ ⑤

It is proposed to allocate a capital program to allow for enhancements of the GBB. This may entail further integration in more established parts of IMO IT systems, or implementation of enhancements that fall outside a rule change progress.

## 5.4    Market Transparency

One of the key objectives of the IMO is to operate an efficient markets, of which, market transparency is an essential component. Significant enhancements have been achieved during the Third IT Roadmap, however further investment is required to realise the potential in the electricity information collected and calculated by the IMO.

With an appropriate level of investment, the IMO has an opportunity to become the hub for WA energy sector for all market and related data.

A number of areas of development are proposed:

- Publication of information associated with retail data is currently restricted due to limitations in the market rules. These restrictions are under review and rule change process and if implemented funding is required to improve transparency in this area.

- The IMO has an informal agreement with System Management to publish certain information on their behalf. Funding is required to facilitate this opportunity which potentially includes outage information associated with a more extensive equipment list and associated data feeds.

- Leveraging improvements to metering data management, IMO intends to publish raw metering data to Market Participants. Summarised information can be provided to the general public in support of overall transparency improvements.

- In addition to public market transparency, the IMO has the opportunity to significantly improve the transparency of confidential market information to registered participants, in particular in relation to settlement outcomes. By improving settlement calculation transparency, market participants will be able to understand their settlement outcomes in relation to their market participation.

- Funding is sought to further improve transparency of information relating to the WA gas pipeline network, including but not limited to the outcomes of the GBB zone review.

## 5.5 Infrastructure – Market Systems

The IMO's core functions to operate the WEM and GSI are primarily supported through the WEMS and GBB market systems respectively. These systems rely on a vast array of supporting infrastructure to ensure the availability and accuracy of the markets operated by the IMO.

Further investment is required to increase IMO's ability to effectively and efficiently operate the market with a high level of service.

### 5.5.1 Compliance Monitoring

Strategy ① ② ③ ④ ⑤

In the Third IT Roadmap, the IMO delivered the initial Compliance and Surveillance Tools (CAST) to the Compliance team. Further improvements and extensions to the CAST toolset need to be provided to the Compliance team to enhance their ability to identify and investigate non-compliance for both WEM and GSI participants.

The IMO intends to provide self-service compliance monitoring tools to participants. This will assist in the proactive management of common rule breaches or compliance issues.

The Short Run Marginal Cost (SRMC) Model was developed by and is currently supported by external providers. The SRMC model is used by the Compliance team to check whether participants are pricing themselves in accordance with the Market Rules. Transitional work should move forward to ensure development and support is conducted in house to reduce this key risk for the support of this model as it is an ongoing requirement for the IMO.

### 5.5.2 Operational Support Software Tools

④ ⑤

Strategy ① ② ③

The IMO actively manages and monitors the ongoing operations of the WEMS and GBB software. Supporting tools assist in the more effective and efficient monitoring of these applications on a 24x7 basis.

Significant effort was invested in streamlining the processes behind building, testing and deploying software during the Third IT Roadmap. All software that is directly managed by the IMO now goes through a clearly defined path before being released. Further investment will be required in this area to ensure that the IMO continues to follow contemporary practices in this area.

### 5.5.3 Market Operations Tools

Strategy ① ② ③ ④ ⑤

The Third IT Roadmap has delivered marked improvements in the level of automation in the repetitive tasks performed by the Market Operations team. Further funding is required to realise the benefit of automating the remaining repetitive tasks, including those which are more sophisticated.

Strategy ① ② ③ ④ ⑤

### 5.5.4 Data Analysis, Forecasting and Modelling Tools

The IMO are required to perform a number of forecasting and modelling functions, including the ESOO and GSOO, under the Market and GSI Rules. This funding will enhance IMO's forecasting and modelling capabilities through the adoption of the appropriate statistical and optimisation software. These tools will allow a wider range of IMO staff to undertake more

sophisticated market analysis which will assist the IMO to better meet its stakeholders' requirements.

### 5.5.5   *Evolution of Infrastructure*

**Facilities and external network links**

To fulfil the objectives of the Principles and Strategies of the Fourth IT Roadmap, the IMO will move core infrastructure to fully certified or accredited data centres.

Currently, the majority of the infrastructure is hosted across two third-party Data Centres. While the two providers provide adequate services, an investigation with subsequent migration of infrastructure and services needs to occur. The new data centres must possess industry recognised certification for facilities of their type. In addition both data centres are at near full capacity which will impact IMO's ability for further growth.

Prior to the commencement of this Roadmap, there is an immediate requirement to simplify the network configuration. The current inter-site links (100Mb/s Amcom) are insufficient to provide the high levels of data replication that would be required to improve automation, Disaster Recovery and High Availability requirements. To remediate this, there is potential for the expansion of the current links or the introduction of dedicated Dark Fibre.

The external Internet links at all three sites are inconsistently configured which provides varying performance and availability for all external facing services. There have already been outages caused by loss of this service, including an unplanned loss of service of 35 minutes.

The level of improvement required should be a consideration in conjunction with and Data Centre changes.

**Server and Storage Vendor**

The current hardware vendor for all server and storage infrastructure is Dell and has not been reviewed for ten years. Alternate vendors may provide superior value and should be investigated. This is especially true for storage where IMO could take advantage of the lowering costs of SSD drives to greatly enhance performance.

**Active Directory Remediation**

A 2014 assessment of IMO's IT Infrastructure identified significant weaknesses with the Active Directory environment and a project to consolidate and remediate is required to reduce support costs associated with this implementation. This project will include the migration of current services and the decommissioning of obsolete infrastructure.

**Data and Service Availability and Integrity**

The availability and integrity of IMO's data and services is integral to IMO's ability to operate. This capability requires a number of components across technologies and processes to ensure that the organisation meets its Business Continuity, Disaster Recovery, and Data Retention requirements.

Much of the enhancements already identified, above, will help facilitate that; however some additional services are required to meet the standards required. Synchronous storage replication, DR Automation tools and Continuous Availability features will improve the time to

failover between Data Centres and ensure greater data currency; while proactive identification and remediation of Single Points of Failure will manage the ongoing Risks.

**Database**

A project to upgrade the IMO's Oracle infrastructure will be required to ensure versions stay within vendor support windows. IMO's Database requirements may be reassessed to give due consideration to alternate products or moving to the Oracle appliance product (Exadata).

**Security**

IMO uses RSA to provide two-factor authentication for secure remote access to the environment. When the current version reaches End of Life, an upgrade will be needed or a move to an alternate two-factor authentication needs to occur.

Allocation of capital work is required to upgrade anti-virus and associated tools during the Fourth IT Roadmap.

## 5.6 Corporate Support

This area includes all projects that directly support IMO's administration activities.

### 5.6.1 Public Website

Strategy ① ② ③ ④ ⑤

The IMO public website was refreshed during the Third IT Roadmap. The website will continue to evolve, driven by market transparency and efficiency.
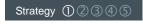
The Content Management System 'Sitefinity' was implemented during the Third IT Roadmap to manage website content. Its use will be maintained in this roadmap. The software will need to be upgraded to ensure the version remains within vendor support windows.

### 5.6.2 Document Management System (DMS)

Strategy ① ② ③ ④ ⑤

IMO needs to operate under the State Records Act for WA. Assessment, tool selection, project planning and implementation of a DMS need to occur to ensure that the IMO remains compliant. Funding is required for a DMS be piloted by Operations and Technology before deploying company wide.

### 5.6.3 Corporate System Enhancements

Strategy ① ② ③ ④ ⑤

Corporate support will identify small capital projects that will be required to extend and enhance corporate system functionality. A small budget allocation has been requested to allow for the execution of these initiatives as opportunity presents.

Finance systems including MYOB will be managed by the finance team. HR systems are offered by a cloud provider. IT only provides the infrastructure to support this.

Strategy ① ② ③ ④ ⑤
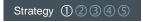
### 5.6.4 End User Computing

IMO will continue to refresh PC's as required; however greater consideration will be given to evolving end user technologies such as virtual desktops (which are already available as part

of the current Citrix environment) and address the industry's growing adoption of BYOD and applications delivered as services. .

At the moment, the biggest risk to the IMO's PC environment is their inconsistent configuration and the subsequent management. The introduction of a Standard Operating Environment (SOE) will centralise the management of the environment.

### 5.6.5   Telephony

Strategy ① ② ③ ④ ⑤

IMO's current IP Telephony solution, Cisco Business Edition, reaches end of life in late 2016 and will need to be replaced. At this time the implementation of a full Unified Communications solution is proposed. At this time, a Computer Telephony Integration (CTI) solution will be considered for the Operations team and should further integrate with the CRM solution identified above.

# 6.    Capital Budget

## 6.1    Intellectual Property

Under the IMO's licence agreement with ABB, in addition to the relevant source code, ABB also retains ownership of the intellectual property (IP) over all derivative code delivered for WEMS.

The IMO considers that:

- The IMO owns the IP in the code relating to all investment in the following components of the IT Roadmap: Corporate Support, Infrastructure - Market Systems, Market Transparency and Gas Services Information. The majority of these systems would be retained or modified as part of a rebuild and as such no write-off of capital would be required in the event of a rebuild;

- The IMO owns the IP in that part of the WEMS code created to support the IMO's second IT Roadmap and the Market Evolution Program;

- ABB owns the IP in all derivative code related to Reserve Capacity auction and STEM activity; and

- Brady owns the IP in all code related to the POMAX Settlement and POMAX Metering.

## 6.2    Capital Request Summary

The targeted capital expenditure required to support the Fourth IT Roadmap, along with the relevant depreciation assumptions are defined in this section.

Capital estimates were formed based on the following high level process:

1. For each roadmap item in section 5, define one or more high level projects.

2. Classify each project as either a small (~3 person team), medium (~5 person team) or large (~9 person team) project.

3. Estimate the duration of each project and scheduled in one or more financial quarters between July 2016 and June 2019.

Capital estimates are based on current hourly rates, with a 2.5% CPI applied annually.

The following capital request assumptions to support IMO's Fourth IT Roadmap are:

- The current depreciation rates applied are five years for computer software and three years for hardware. This was updated during the second half of 2014-15 to recognise a more rapid replacement strategy required going forward of all hardware and infrastructure.

- WEMS rebuild would end current license agreement with ABB.

- In the event of a WEMS rebuild, any capital write down will need to be recognised as a cost in the income statement in the year it was shown to have no value.

The table below is a summary of the CAPEX, Depreciation and Write-down Value (WDV) for the WEM, non-WEM and GBB.

| CAPEX, Depreciation and WDV | | | | |
|---|---|---|---|---|
| | 2014/15 | 2015/16 | 2017/18 | 2018/19 |
| **WEMS** | | | | |
| Opening WDV | $ 9,619,000 | $ 7,084,000 | TBA | TBA |
| Total CAPEX | $ 1,500,000 | $ 2,417,532 | $ 2,192,239 | $ 3,018,857 |
| Total Depreciation | $ 4,035,000 | | | |
| Closing WDV | $ 7,084,000 | $ 9,501,532 | TBA | TBA |
| | | | | |
| **Non-WEMS** | | | | |
| Opening WDV | $ 325,000 | $ 924,916 | TBA | TBA |
| Total CAPEX | $ 828,916 | $ 1,716,505 | $ 1,317,179 | $ 1,204,927 |
| Total Depreciation | $ 229,000 | | | |
| Closing WDV | $ 924,916 | $ 2,641,421 | TBA | TBA |
| | | | | |
| **GSI** | | | | |
| Opening WDV | $ 1,841,000 | $ 1,411,170 | TBA | TBA |
| Total CAPEX | $ 142,170 | $ 180,542 | $ 185,055 | $ 189,681 |
| Total Depreciation | $ 572,000 | | | |
| Closing WDV | $ 1,411,170 | $ 1,591,712 | TBA | TBA |

The table below summarises the estimated expenditure required to support each of the six roadmap items. Yearly CAPEX budgets will be confirmed as part of IMO's annual planning cycle and individual project budgets will be confirmed during initiation stage of the project.

# Appendix A – Roadmap Summary

The following table summarises the links between the roadmap strategy (Section 4.2) and each individual roadmap item (Section 5).

| Roadmap Item | Roadmap Strategy | | | | |
|---|:-:|:-:|:-:|:-:|:-:|
| | 1 | 2 | 3 | 4 | 5 |
| **5.1 WEMS** | | | | | |
| 5.1.1 Rule Changes | ✓ | | | | |
| 5.1.2 Incremental Evolutionary Improvements | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5.1.3 Priority Enhancements and Security Patches | ✓ | | ✓ | | |
| 5.1.4 IMS Interface | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5.1.5 Automated Regression Testing | | ✓ | ✓ | | |
| | | | | | |
| **5.2 WEMS – Metering and Settlements** | | | | | |
| 5.2.1 POMAX Metering and Settlement Upgrades | | | ✓ | | ✓ |
| 5.2.2 POMAX Settlement Technology Refresh | | | | | ✓ |
| 5.2.3 Metering Data Management | | ✓ | | ✓ | |
| 5.2.4 Prudential Security | ✓ | | ✓ | | |
| 5.2.5 Clearing | ✓ | ✓ | ✓ | | |
| | | | | | |
| **5.3 Gas Services Information**Error! Reference source not found. | | | | | |
| 5.3.1 Rule Changes | ✓ | | | | |
| 5.3.2 Enhancements | ✓ | ✓ | | | |
| | | | | | |
| **5.4 Market Transparency** | | | ✓ | ✓ | |
| | | | | | |
| **5.5 Infrastructure – Market Systems** | | | | | |
| 5.5.1 Compliance Monitoring | ✓ | | ✓ | | |
| 5.5.2 Operational Support Software Tools | ✓ | ✓ | ✓ | | |
| 5.5.3 Market Operations Tools | ✓ | | ✓ | | |
| 5.5.4 Data Analysis, Forecasting and Modelling Tools | | | ✓ | | |
| 5.5.4 Evolution of Infrastructure | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | | | | |

| Roadmap Item | Roadmap Strategy | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **5.6 Corporate Support** | | | | | |
| 5.6.1 Public Website | | | | ✓ | ✓ |
| 5.6.2 Document Management System (DMS)**Error! Reference source not found.** | ✓ | ✓ | ✓ | | |
| 5.6.3 Corporate System Enhancements | ✓ | | | | |
| 5.6.4 End User Computing | ✓ | | | | |
| 5.6.5 Telephony | ✓ | | | | |