Attachment 1: Asset management and governance

Regulatory proposal for the ACT electricity distribution network 2019–24
January 2018

evoenergy

Table of contents

List of figures

List of tables

List of appendixes

Appendix 1.15	ActewAGL 2017, Annual Planning Report
Appendix 1.16	Initiative AM13, Final Report Failure Mode Effects Analysis Pilot Project, May 2015
Appendix 1.17	Power Transformers, Bushings, and On-load Tap Changers FMEA, July 2016
Appendix 1.18	Network Augmentation Standard
Appendix 1.19	Distribution Network Planning and Expansion Policy
Appendix 1.20	Evoenergy Demand Side Engagement Strategy
Appendix 1.21	Work Health, Safety, Environment and Quality Policy, PO4601
Appendix 1.22	Risk Management and Legal Compliance policy, PO4930
Appendix 1.23	Policy, Financial Governance for the Energy Networks Division
Appendix 1.24	AECOM 2017, Review of Evoenergy's Asset Management Systems
Appendix 1.25	Procedure, Financial governance for the Energy Networks Division
Appendix 1.26	Procurement and Contract Management Policy, PO5001

Key points

Evoenergy is committed to maintaining and operating the electricity network in the Australian Capital Territory to meet regulatory obligations and customer requirements in the most prudent and efficient way.[1] Evoenergy is responding to changing demands for network planning by improving continuously its asset management.

Certification to ISO 55001, a globally recognised standard for asset management,[2] is a key achievement of Evoenergy's progress since 2014. Evoenergy has targeted activities to actively improve its decision-making processes, particularly for technical, financial and operational decisions. Current examples of Evoenergy's asset management and good electricity industry practice include:

- certification to ISO 55001 in asset management, and maintaining certifications for environmental management systems, quality management systems, and risk management standards;
- using a bottom-up approach to identify the activities required to maintain acceptable maximum levels of service risk for individual asset groups, and that offers the lowest whole-of-life cost and associated level of expenditure;
- optimising expenditure across asset categories and expenditure categories by using a top-down challenge to achieve the desired level of risk at least cost; and
- changes and upgrades to asset information systems, including increased levels of integration to support changing requirements and to drive efficiencies in business processes.

Evoenergy's Asset Management System (AMS) encompasses an integrated strategic approach to asset management, network development and network reliability.

Evoenergy's governance processes underpin asset management and ensures that standards of work are consistent, satisfy regulatory obligations and customer requirements, and that the resources needed are available. Key features include:

- classifying all projects over the project life-cycle according to the level of risk by using a tier rating to represent different levels of commercial and implementation risk;
- using a tiered governance approach to help ensure that the level of governance matches the complexity and business risk of the project; and
- improved decision-making by integrating risk assessment in program/project plans to determine the optimum way of managing resources, combined with strategic monitoring and review oversight.

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[1] National Electricity Rules, clause 5.2 details the obligations of Registered Participants.

[2] On 11 January 2018, the JAS-ANZ accredited certifier, Bureau Veritas, awarded Evoenergy with certification to ISO 55001:2014: Asset management, Management systems, Requirements (ISO 55001); Appendix 1.1 Evoenergy ISO 55001 Certification, Bureau Veritas, 11 January 2018.

This attachment provides examples and case studies on the methods, processes and systems supporting efficiency and prudence of expenditure consistent with the objectives of the National Electricity Rules (Rules).[3]

1.1 Introduction

Evoenergy considers that sound asset management and governance frameworks are essential for prudent investment in the distribution and transmission networks, and for achieving reliability standards and enabling efficient delivery of network services.[4]

The main purpose of this attachment is to highlight key factors relating to asset management and governance which demonstrate Evoenergy's efficient expenditure program in the 2019–24 regulatory period. To this end, Evoenergy provides examples and case studies of improvements to asset management and governance during the 2014–19 regulatory period, and which provide a record of accomplishment.

1.1.1 Scope

- **Section 1.2** of this attachment emphasises Evoenergy's commitment to **continuous improvement** of its asset management framework which includes Evoenergy's Asset Management System (AMS).
- **Section 1.3** explains the risk-based methodologies which Evoenergy applies in the development of the **asset replacement and renewal program**, including how using a top-down challenge provides for efficient and prudent expenditure.
- **Section 1.4** outlines the **network planning process** Evoenergy uses in developing the augmentation program. The top-down challenge that Evoenergy applies to the captial works progam incorporates demand management, and underpins sufficient security and reliability of supply at the lowest possible cost.
- **Section 1.5** explains how Evoenergy uses **asset information systems** to support all aspects of asset management and to facilitate its continuous improvement of the asset management function.
- **Section 1.6** focuses on key features of **asset management governance** and **financial governance** supporting prudent investment.

Evoenergy provides a comprehensive description of processes and systems in other parts of the submission and references those processes and systems in this attachment.

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[3] Rules, clause 6.5.6 and clause 6.5.7 detail the expenditure objectives and criteria for capex and opex.

[4] Evoenergy's service standard obligations arise mainly from the application of the *Utilities (Technical Regulation) Act 2014* (ACT). Transmission network reliability is measured in terms of the number of loss of supply events that occur in a year and the amount of unserved energy that results from such outages. Distribution network reliability is measured in terms of the frequency and duration of unplanned interruptions to customers. The network reliability measures and standards are adopted from the Electricity Distribution Supply Standards Code (2013) and the Electricity Transmission Supply Code (2016), and the referred Australian Standards therein which set out parameters for electricity supply through the ACT network.

1.2 Asset Management System overview

Evoenergy is responsible for the operation, maintenance, planning and augmentation of the transmission and distribution system within the ACT. Asset management is a core function of Evoenergy. This section describes Evoenergy's AMS, including the key processes, components and outputs. In this section, Evoenergy discusses its path for continuous improvement of asset management and certification to the ISO 55001 standard.

1.2.1 Asset Management System

Evoenergy's AMS describes the interlinked processes that support asset management objectives and decision-making throughout the asset life-cycle. The AMS underpins a structured and systematic approach to asset management which leads to the development and implementation of investment programs, demand management and network planning.

The interlinkages between corporate objectives and Evoenergy's asset management objectives underpin activities to implement the corporate mission, which is: *to offer customers the safe, reliable and sustainable energy solutions they want.*

Figure 1.1 shows how Evoenergy's AMS fits within the corporate context and within the external environment. It describes the alignment between organisational objectives and asset management, and highlights the important connection between asset management and influences on business decisions with respect to changing customer requirements, the economic environment, government policy, and regulatory frameworks.

Section 1.4.5 provides further discussion of the key issues and challenges facing Evoenergy in the external environment.

The line-of-sight alignment of the AMS with corporate objectives and external requirements is documented in the key Evoenergy asset management artefacts, namely:[5]

- Asset Management Policy;
- Asset Management Objectives;
- Asset Management Strategy; and
- Asset Specific Plans (ASPs).[6]

The asset management policy[7] sets the asset management direction which is consistent with business objectives. The asset management strategy explains how Evoenergy implements the asset management policy. The ASPs collectively form Evoenergy's Asset

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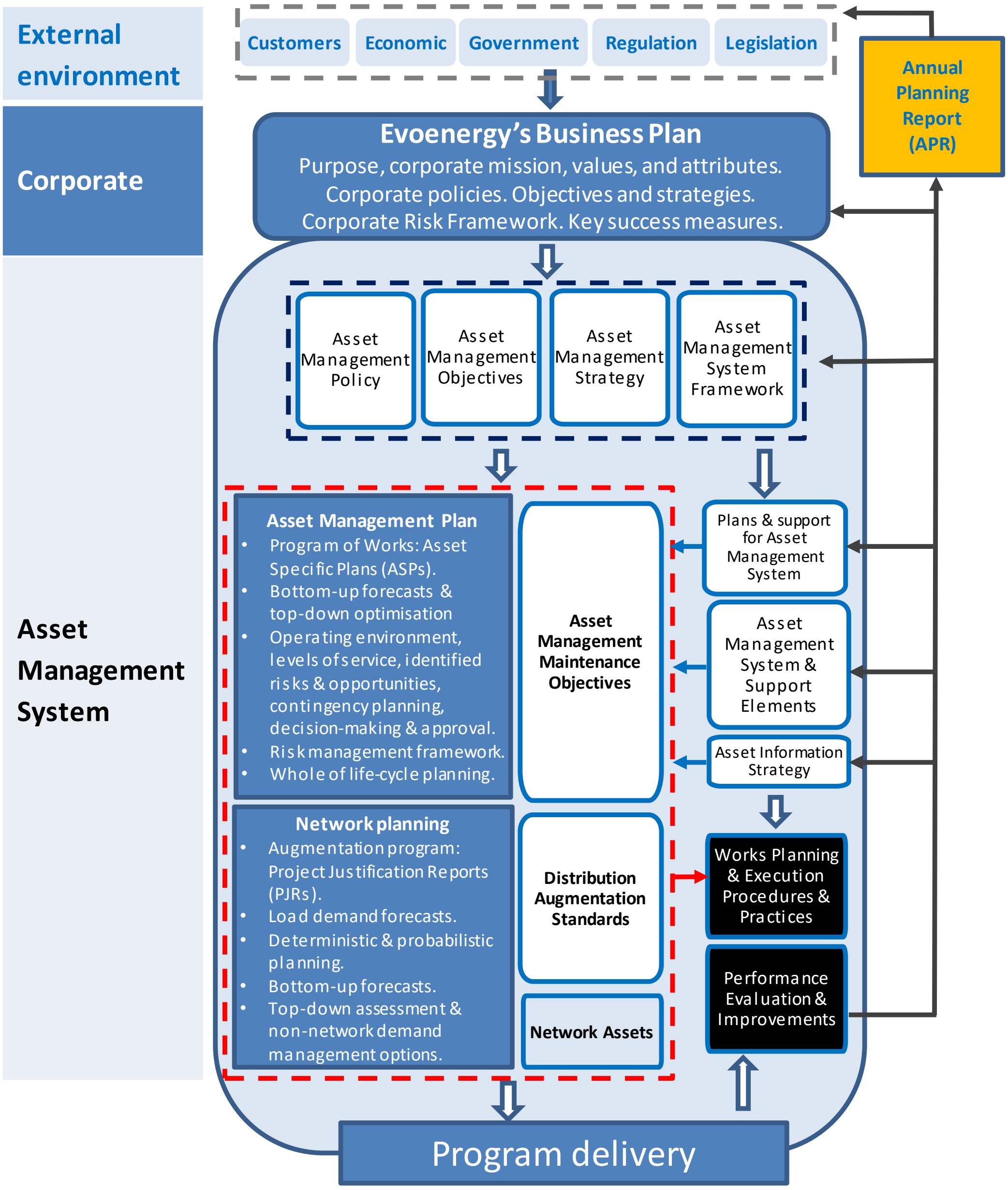
[5] Appendix 1.2 Asset Management Policy, PO1101; Appendix 1.3 Asset Management Objectives; Appendix 1.4 Asset Management Strategy. The key asset management documentation also includes: Appendix 1.5 Asset Management System Description; Appendix 1.6 Asset Management System Framework; Appendix 1.7 Asset Management System Configuration Management; Appendix 1.8 Asset Management Communications Plan; and Appendix 1.9 Asset Information System Description.

[6] Sections 1.3 and 1.3.1 provide further discussion regarding ASPs.

[7] Evoenergy's asset management policy provides its commitment to managing assets to comply with the international ISO 55001 standard and for continuous improvement, and provides the overarching framework for implementing its AMS.

Management Plan and make explicit reference to business outcomes. In addition, where appropriate, Evoenergy uses Project Justification Reports (PJRs)[8] to support planning for individual projects.

Figure 1.1 Evoenergy's Asset Management System framework



Evoenergy considers that the AMS addresses current and future asset performance and risks, and implements cost-effective programs that incorporate demand management options to address network needs.

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[8] Further context on planning for capital works is provided in section 1.4.

This attachment explains how Evoenergy's AMS facilitates efficient capital investment and maintenance and operating programs, and the application of its internal capabilities for planning and service delivery.

Attachment 5 Capital expenditure and Attachment 6 Operating expenditure detail Evoenergy's proposal for the expenditure program in the 2019–24 regulatory control period.

1.2.2 Asset management processes and outputs

Evoenergy's asset management processes are end-to-end processes spanning program/project initiation to delivery and final disposal. At the front end, these processes include initiation and development of programs/projects which cover network solutions, asset replacement, asset augmentation, customer-initiated works, and non-network expenditure. Evoenergy discusses further these programs in Attachment 5.

Evoenergy's AMS encompasses an integrated strategic approach to asset management, network development and network reliability. Thus the development of programs is coordinated in a manner which identifies and exploits synergies which may exist between network augmentation, asset replacement and customer connections. As much as practicable, the investment program reflects the whole-of-life approach to asset management and the use of risk-based methodology, including the valuation of risk.

The programs are documented in multilayer reports spanning a wide range of issues, from strategic to implementation. The planning documentation includes:

- Asset Specific Plans (ASPs) — sections 1.3 and 1.3.1;
- Annual Planning Report (APR) — section 1.4; and
- Project Justification Reports (PJRs) — section 1.4.

Attachment 5 (Capital expenditure) provides further context for these critical references in terms of capital expenditure (capex).

The following sections describe key features and improvements in relation to asset replacement, asset augmentation, customer initiated works, and asset information systems implemented during the 2014–19 regulatory period.

The explanation of these improvements includes how each contributes to the efficiency of the investment programs, and the development of demand management and capital works proposed for the 2019–24 regulatory control period.

1.2.3 Compliance with ISO 55001

Evoenergy uses up-to-date methods for maintaining and operating the electricity network in the Australian Capital Territory (ACT).[9] Evoenergy's compliance with ISO 55001 provides stakeholders with a high level of confidence that risks and costs associated with the management of assets are carefully considered and optimised. Evoenergy has adopted the ISO 55001 international standard to achieve effective asset management outcomes.

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[9] Appendix 1.2 Asset Management Policy, PO1101. Evoenergy's asset management policy sets the direction for the management of operational assets of the electricity distribution system in the ACT, and is a key component of the AMS.

During the 2014–19 regulatory period, Evoenergy achieved full alignment with ISO 55001 and subsequently compliance with the standard. In January 2018, following completion of the 2017 audit process, Bureau Veritas awarded Evoenergy with certification to the International Organization for Standardization (ISO) 55000 series of international standards for asset management.[10]

In addition to ISO 55001, Evoenergy's enabling systems for safety, environmental, quality and risk management comply with industry best practice. Evoenergy maintains certifications for *AS/NZS 4801 Occupational Health and Safety Management Systems*, *ISO 14001:2015 Environmental management systems*, *ISO 9001:2015 Quality Management Systems*, and *AS/NZS ISO 31000:2009 Risk Management Standard*.

Compliance with good industry practice confirms that Evoenergy's asset management practices achieve the highest of standards, and provides assurance to its stakeholders of the efficiency of its expenditure programs.

1.2.4 Continuous improvements in asset management

Continuous improvement is a requirement of the ISO 55001 standard and is embedded in Evoenergy's organisational culture. From 2014, Evoenergy conducted a series of audited assessments of its AMS to assess maturity of asset management towards certification to ISO 55001.[11]

In addition to the ISO 55001 audit assessments, Evoenergy has undertaken audits on individual projects to test the effectiveness of the AMS at the project level.[12] The recommendations of those audits identified practical methods for improving asset management, including:

- identifying issues and lessons in relation to specific projects between handover and delivery to operational and maintenance activities;
- providing an assessment of the effectiveness of the AMS; and
- identifying further improvements to the asset management framework.

In the next section Evoenergy explains the risk-based methodologies it applies in the development of its asset replacement and renewal program, including how using a top down challenge provides for efficient and prudent expenditure.

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[10] Appendix 1.1 Evoenergy ISO 55001 Certification, Bureau Veritas, 11 January 2018.

[11] Appendix 1.10, GHD 2017, Report for ActewAGL Distribution, Asset Management Maturity, April 2017, summarises the period assessments of continuous improvement of asset management, including:

- 2014, AMCL Maturity Assessment;
- 2015, Institute of Asset Management (IAM) Self-Assessment Tool;
- 2016, Asset Management Customer Value project (Water Services Association of Australia); and,
- 2017, IAM Self-Assessment Tool.

In addition, in November 2017, Bureau Veritas completed the Stage 1 and Stage 2 audits for Evoenergy's certification to ISO 55001; Appendix 1.11 Bureau Veritas 2017, Management System Certification: Audit Report for the Main Audit.

[12] Appendix 1.12 Sternberg Feeder project, Audit; Appendix 1.13 Bruce Substation project, Audit.

1.3 Development of the asset replacement and renewal program

This section discusses the main considerations leading to the development of the asset replacement program which responds to the needs of the network.[13] The asset replacement program covers the primary systems[14] and secondary systems[15], and is one of the key outputs supported by the AMS. Evoenergy develops the asset replacement program by analysing network needs for individual primary and secondary network asset classes.

Evoenergy documents the program in ASPs, which are developed mainly for the primary and secondary asset classes. The ASPs provide the business case for asset management strategy selection and specify the activities, resources, responsibilities and timescales for implementation for each specific asset class. Together the ASPs form Evoenergy's Asset Management Plan, which describes the management of operational assets of the electricity distribution system.[16]

Asset management options are assessed in the context of the current state of each asset class, including the condition, performance, risks, life-cycle costs, trends and external environment. A recommended asset strategy is presented with associated capex and operating expenditure (opex) forecasts, including a 10-year budget forecast, for consideration by management. Section 1.6 provides further explanation regarding governance arrangements, including management of program/project risks, and financial governance.

Detailed in this attachment are the systematic and coordinated activities and practices whereby Evoenergy manages each asset class in an optimal and sustainable manner for the purpose of achieving the organisational strategic plan. Attachment 5 (Capital expenditure), references the key ASPs when discussing the capex program.

In the preparation of its asset replacement program, Evoenergy adopts the Reliability Centred Maintenance[17] (RCM) philosophy and associated methodologies, such as Failure Modes and Effects Analysis (FMEA).[18] Analysis of network needs requires

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[13] The network's needs cover a range of requirements including customer requirements, changes in business environment and regulatory obligations (particularly with respect to network reliability and safety).

[14] Primary systems refer to the power equipment, including lines, cables, power transformers, switches, and other components which comprise the electricity network.

[15] The secondary systems include mainly electronic systems, such as asset protection, data acquisition, control and communication integral to the operation of the network (i.e. other than the parts of these systems included in the non-network program in accordance with the Regulatory Information Notice definitions).

[16] Individual assets classes are documented in 11 ASPs covering the major assets (seven Primary Assets and four Secondary Systems) and 22 ASPs for less significant asset classes.

[17] The governing factor of RCM analysis is the impact of a functional failure at the equipment level, and tasks are directed at a limited number of significant items - whose failure might have safety, environmental or economic consequences. These items are subjected to intensive study, first to classify them according to their failure consequences and later to determine whether there is some form of mitigation in the form of an optimised maintenance program to prevent these consequences.

[18] FMEA is a structure to identify specific ways that a product, service or process may fail in meeting customer expectations. FMEA provides a tool to improve process performance, reliability and safety, and to prevent an asset failure occurring.

assessment of asset health and asset criticality. As far as practicable, the asset health assessment is based on direct monitoring, inspections and testing of assets. Otherwise, the analysis of asset health uses a combination of asset age and operational experience as an approximation of asset health.[19]

Evoenergy applies RCM for the analysis of the failure consequences of each asset class to determine whether its failure will be evident to system operations or consumers. Using RCM allows Evoenergy to improve controls over inspection activities. Evoenergy assesses the attributes for each of the key distribution assets to validate the current maintenance and replacement regime, and to identify any necessary adjustments to the asset replacement program.

> The change in treatment of minipillars is an example of how Evoenergy has improved controls over inspection activities. Following analysis of costs and benefits, Evoenergy found continuing the inspection of minipillars was not justified in terms of faults requiring repairs or failure indicators as well as resourcing requirements. Evoenergy has categorised minipillars as a low-risk asset class following re-assessment of the criticality of these assets. Evoenergy has captured cost savings by abolishing the program for routine minipillar inspections based on risk assessment.

Asset criticality takes into account the operational function of the asset and consequences of failure. The criticality of the asset, together with the probability of failure and likelihood of consequence, allows for a quantification of the risk. A series of factors contributing to probability and consequence of failure for respective asset classes are identified, analysed and rated by a team of cross-functional subject matter experts.

Evoenergy uses the analysis of asset criticality to monetise the value of risk and to produce a risk priority number (RPN) (see Figure 1.2 in section 1.3.2). Further, asset managers determine the probability of failure for each asset class using the corporate risk assessment matrix. Evoenergy uses these inputs to forecast the value of the risk to the network in the RIVA Decision Support System (RIVA DSS)[20] asset information system. RIVA DSS enables dynamic adjustments to forecasts of the value of risks to the network as a result of changes in expenditure by asset class.

To ensure the selection of the least-cost solution, the analysis of asset needs is based on the whole-of-life approach. Particularly for major asset classes, the whole-of-life approach, which includes the cost of maintenance and asset replacements, ensures that capex (asset replacement) and opex (maintenance) trade-offs are considered. Evoenergy undertakes trade-off analysis of renewal/replacement of ageing assets, and potentially unreliable equipment. The analysis compares the ongoing maintenance, repair and fault costs (including loss of supply) with the capital cost of renewal/replacement. The analysis is supported by RIVA DSS, which allows for comparison of various scenarios and alternative solutions.[21]

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[19] Analysis of asset health draws on operational experience where available, as well as experience of other distributors and advice from manufacturers.

[20] PowerPlan, Inc acquired RIVA DSS in 2016.

[21] Section 1.5.4 provides further detail about how RIVA DSS supports long-range forecasts of asset investment needs.

The base option usually represents either a do-nothing or a reactive[22] option. Options considered are documented in the ASPs. The reduced-risk option (generally at a higher cost) and reduced-cost option (usually resulting in a higher risk) are usually considered within the set of alternative solutions.

The asset replacement programs are closely coordinated with the network augmentation investment programs. For example, a decision to invest in new assets, as opposed to maintain existing assets, may reduce lifecycle costs of maintenance of those assets and at the same time achieve improved reliability and/or increase of capacity.

One recent example demonstrates how Evoenergy combined the replacement of the underground cables on an 11 kV feeder with augmentation of capacity to meet a network need. After failure, Evoenergy replaced the existing cables with larger capacity cables. While the incremental cost of installing larger cables resulted in a moderate increase in costs, the project removed the need for costly augmentation of capacity in that location. The overall outcome of coordinating the replacement expenditure and augmentation expenditure programs for that feeder project has achieved overall cost savings.[23]

In addition, Evoenergy's analysis of network needs considers non-network solutions as alternative options to network solutions. Section 1.4.3 discusses how the analysis of non-network options achieves cost savings and deferment of capital investment. Coordinating the asset replacement and the network augmentation programs allows Evoenergy to identify and capture synergies between these programs and consequently effect cost savings. The savings result from the holistic approach of considering simultaneously replacement and augmentation requirements.

During the 2014–19 regulatory period, Evoenergy significantly expanded use of risk-based methodologies to asset replacement decisions. The application of risk-based methodologies to asset replacement is discussed in the sections below.

1.3.1 Risk-based methodologies in asset renewal and replacement

The development of the asset replacement program uses three different, though integrated risk-based methodologies. The risk assessment methodologies are used in:

- ASPs to assess and estimate the monetary value of the risk (sections 1.3 and 1.3.1)
- the application of the RCM and FMEA methodologies (section 1.3.2)
- the top down challenge to optimise the allocation of resources (section 1.3.3).

Risk assessment is used in the development of the bottom-up plans for individual asset classes. The risk assessment is applied more rigorously to the major asset classes because of the availability of data on historical performance. The assessment includes quantification of risk. The replacement and renewal programs proposed for the individual assets classes are documented in 11 ASPs covering the major assets (seven Primary Assets, and four Secondary Systems) and 22 ASPs for less significant asset classes.[24]

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[22] Assets are repaired or replaced after failure (no or minimum maintenance).

[23] Appendix 1.12 Sternberg Feeder project, Audit.

[24] ASPs for available major asset classes are provided as appendices to Attachment 5 – (Capital expenditure).

The risk trend and cost of individual options are projected into the future to inform selection of the preferred solution. The capital cost and values of risk is quantified for each scenario to select the least-cost approach. Risk is assessed on the basis of the probability of failure and cost of failure. The values for the probability and consequence of failure are calculated using historical performance data for the asset class. Evoenergy considers that the method employed does not overstate the risk and recognises that not every failure results in the worst case consequence every time.[25]

The bottom-up approach requires asset managers to identify the activities required to maintain acceptable levels of risk across individual asset groups and the associated level of expenditure. Typically, Evoenergy evaluates the following options for the management of assets:

- Option 0 – Reactive strategy: any maintenance or asset replacement is purely reactive and is undertaken when the asset is no longer suitable for service. This option delivers a drastic reduction in both opex and capex spending, although simultaneously severely sacrificing risk exposure;
- Option 1 – Existing strategy: includes planned maintenance, planned opportunistic replacement, and reactive replacement to manage assets at their lowest lifecycle cost. This strategy looks to optimise opex and capex costs and manage the risk presented through considered opex and capex trade-offs;
- Option 2 – Reduce cost strategy: employs a decreased frequency of condition-based monitoring and planned maintenance to reduce the life-cycle cost, however at the expense of an increasing risk exposure; and
- Option 3 – Reduce risk strategy: incorporates additional targeted replacement of assets and dedicated condition monitoring. This option considers opportunities to reduce risk from the existing strategy and assesses the impact on the asset class budget.

Qualitative assessments of the risks and consequences inherent in each option are undertaken using standard methodology and risk assessment tables.[26] Evoenergy evaluates the options using a risk-condition based approach in accordance with the asset management strategy to determine the optimal strategy. Options for the asset specific strategies are evaluated against the relative cost, risk, and benefits. The assessment considers the risk profile of each asset class and trade-offs between capex and opex to deliver the asset management objectives.

Evoenergy forecasts measures of the probability and consequence of failure to generate risk profiles for each option and to estimate the risk exposure for assets. The options are assessed in terms of the resulting opex, capex and risk exposure costs over a 10-year forecast period. Evoenergy generates option specific financial assessments as outputs from the RIVA DSS system which are then factored into the options assessment process. The preferred strategy meets the asset class objectives, is technically feasible, controls risk at an acceptable level and has the least net present cost for customers and the community over the long term.

[25] The cost-of-failure model includes an incident conversion rate which is the probability of a consequence eventuating when a failure occurs. For example, the probability of an ensuing bushfire when a pole fails is less than 1.

[26] Appendix 1.14 ActewAGL Risk Management Framework, Energy Networks Risk Assessment Tables.

Evoenergy adjusts all expenditure forecasts for the time value of money to correctly account for the impact of cash flow and timing. Attachment 5 – (Capital expenditure) provides further context for how Evoenergy applies risk-based methodologies in asset renewal and replacement.

The ASPs determine how Evoenergy prioritises expenditure activities for each asset class and build on analyses from the RCM and FMEA methodologies to determine the least-cost approach to delivering projects. The next section discusses how Evoenergy applies RCM and FMEA to inform asset management decisions.

1.3.2 Reliability Centred Maintenance and Failure Modes and Effects Analysis

Using RCM and FMEA methodologies allows Evoenergy to make more informed investment decisions. The work programs detailed in the ASPs are developed using the RCM philosophy, which takes into account asset, age, health and criticality.

RCM considers the critical importance of the detection and identification of potential failures in maintenance planning for the critical assets. RCM also includes assessment of risk and valuation of risk in monetary terms. Using RCM involves the consideration of various scenarios, including least cost, base case do-nothing, and reduced-risk scenarios. These scenarios are analysed for individual assets using information systems[27] and for costing the works program.

Maintenance tasks are directed at assets where failure might have most significant safety, environmental or economic consequences. Evoenergy classifies assets as:[28]

- significant items—where failure may have serious safety, environmental, financial or operational consequences;
- non-significant items—where failure has no impact on operating capability; and
- items with hidden function—where failure will not be evident and might therefore go undetected.

Applying the principles of RCM involves considering the criticality of assets based on a systematic analysis of cost, risk and performance across the entire asset base. The net result of the decision process is a scheduled maintenance program that is based at every stage on the known reliability characteristics of the equipment in the operating context in which it is used.

Since 2014/15, Evoenergy has undertaken further integration of RCM principles for the maintenance program. For example, Evoenergy uses RCM to establish priorities to manage risks, and to minimise costs. The functional failure at the equipment level combined with probability of failure now drives decisions for maintenance tasks for all assets. The key improvements to asset management resulting from the application of the risk-based methodologies include:

- optimised maintenance interventions for all assets is established on a fully quantified cost/risk basis/criticality;

[27] Section 1.5.4 provides further detail about how RIVA DSS supports long-range forecasts of asset investment needs.

[28] Appendix 1.15 ActewAGL 2017, Annual Planning Report, p. 69.

- optimised maintenance interventions for medium and low-criticality assets is established on a defined and cost/risk basis; and
- managing, rectifying and recording faults is based on FMEA as part of the maintenance optimisation process. [29]

Evoenergy uses the FMEA methodology for significant asset classes, and applies these methods to ASPs using desktop analysis. FMEA assists with the development of preventive maintenance and replacement programs. Evoenergy uses FMEA to analyse common or recurring faults with specific types of assets, which are identified through historical records of the performance of assets. While time-intensive, Evoenergy now applies FMEA as an extension of the RCM method to prioritise:

- the criticality and urgency of tasks;
- the dynamic nature of condition-based work; and
- work bundling opportunities and resource constraints.

Using FMEA has enhanced the control of maintenance activities, and supported more effective condition assessment methods to determine the criticality of assets. Evoenergy uses FMEA to prevent similar faults or failures occurring in the future, improving reliability and reducing maintenance costs.

For example, the application of FMEA has enabled efficiency improvements to the pole replacement program. Distribution poles are critical assets, with asset failures presenting significant risk to customers and the community, primarily in network reliability and bushfires in high bushfire risk areas. On average, 1,307 customers are affected by an outage from a high voltage (HV) pole failure. Distribution pole assets have a high cost of failure and, to manage environmental, safety and network reliability risks, are required to be replaced before complete failure.

A review of the pole condemnation criteria and use of ultrasound testing methods for monitoring condition has reduced the rate of pole replacement.[30] As a result of applying FMEA, Evoenergy has obtained greater confidence in the validity of condition assessments for poles.

Another example of how applying FMEA has improved maintenance outcomes involves using an algorithm to rate feeder health for the cable replacement program.[31] Underground HV cables are critical for power delivery through the connection of equipment or directly to the customer's point of connection. If an underground cable, termination or joint fails, the connected equipment or customer will also lose connection to the electricity distribution network.

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[29] FMEA is a proactive process for evaluating assets for possible ways in which failures can occur. Evoenergy uses FMEA for all critical assets, including transformers, switchgear and cables, in conjunction with supporting IT systems to enable asset risk modelling. Examples of how FMEA has been developed and implemented at Evoenergy include: Appendix 1.16 Initiative AM13, Final Report Failure Mode Effects Analysis Pilot Project, May 2015; and Appendix 1.17 Power Transformers, Bushings, and On-load Tap Changers FMEA, July 2016.

[30] Appendix 5.16 ASP Poles.

[31] Since the 1980s, all new sub-division development in the ACT is reticulated with underground distribution network. See Appendix 5.15 ASP Underground HV Cables.

Evoenergy's risk-based approach has improved efficiency through prioritising the criticality and urgency of the treatment of underground HV cables. In addition, at-risk feeders are subject to engineering tests to determine actual health and risk, and replaced once certain thresholds are met. The main benefit of this strategy is that healthy feeders are left in service for longer and at-risk feeders are replaced sooner, irrespective of the theoretical design service life.

FMEA involves a risk assessment approach based on the frequency of incidents and their severity to determine common modes of failure. A series of factors contributing to probability and consequence of failure for respective asset classes are identified, analysed and rated by a team of cross-functional subject matter experts. Evoenergy uses this analysis as one of the inputs to the overall risk cost calculations for generating the bottom-up forecasts for the asset renewal/replacement and maintenance program. FMEA allows Evoenergy to optimise maintenance requirements.

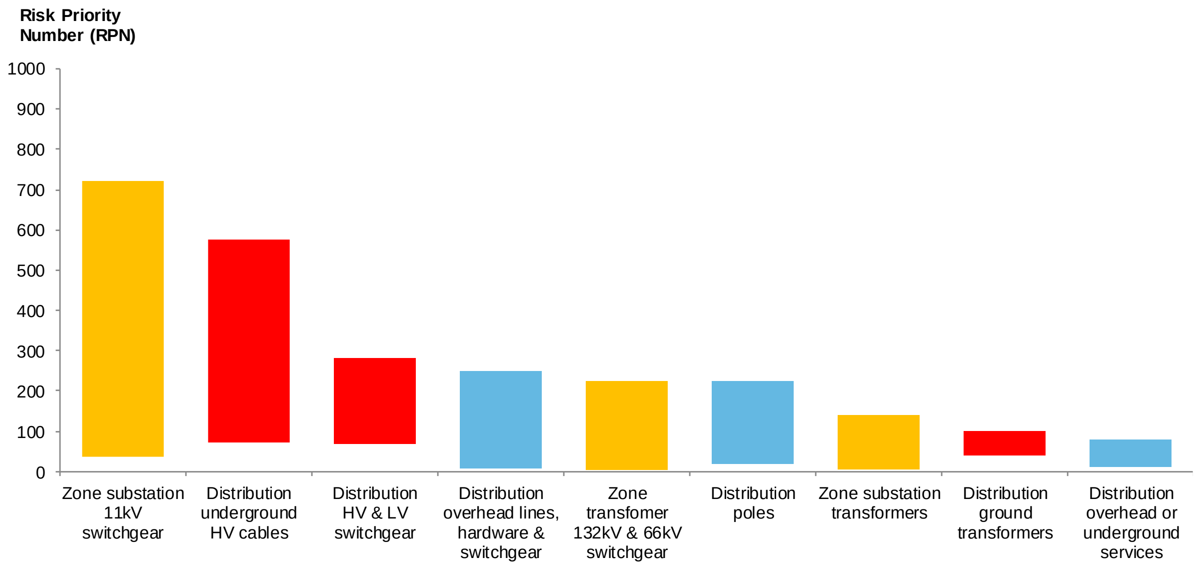
Evoenergy uses the risk-based assessment process to drive inspection frequency, insurance valuations and environmental mitigation strategies, and also to rank competing events and activities. Evoenergy prioritises inspection of assets prioritised according to the exposure that the organisation would experience if the asset failed.

Asset managers evaluate common modes of failure for each asset class based on the historical performance of assets. Asset managers evaluate the severity, occurrence and detection of the assessed effects of each failure mode to generate an RPN for each asset.[32] The RPN is obtained in the FMEA procedure by assigning a numerical value from 1 to 10 to each of the severity, occurrence and detection indexes. The RPN for an asset is the product of the values assigned to these indices.

Figure 1.2 illustrates the FMEA assessment of RPN for selected assets. Evoenergy prioritises assets with a higher RPN under the asset renewal/replacement and maintenance program.

[32] The RPN is obtained in the FMEA procedure by assigning a numerical value to each failure mode using severity, occurrence and detection indexes.

Figure 1.2 **RPN range for failure modes for selected asset classes**



Attachment 5 (Capital expenditure), explains further how Evoenergy undertakes planning for the asset renewal/replacement and maintenance program.

The next section discusses how Evoenergy applies a top down challenge to the asset specific strategies, which provides for efficient and prudent expenditure of the asset renewal/replacement and maintenance program.

1.3.3 Top-down optimisation

As a further measure to ensure that the expenditure program is prudent and efficient, Evoenergy has overlayed a top-down assessment onto its bottom-up, asset-specific planning approach. The top-down approach considers how expenditure can be minimised while maintaining the level of network risk within the desired risk envelope. Specifically, in the 2019–24 regulatory control period, Evoenergy adopts a top-down challenge to consider how expenditure can be optimised across asset categories and expenditure categories to achieve the desired level of risk at least cost.

Evoenergy commissioned top-down modelling of network risks and replacement expenditure for the 2019–24 regulatory period to provide a challenge to the bottom-up results that are forecast using RIVA DSS.[33] Section 1.5.4 provides further detail about how RIVA DSS supports long-range forecasts of asset investment needs. Improvements in Evoenergy's planning approach achieved the following benefits:

- the top-down assessment provides a validation that the bottom-up expenditure forecasts reflect prudent and efficient costs;
- risks to the community and workforce, and the quality of supply to customers are minimised using the top-down and bottom-up approach to risk assessment;[34]

[33] Appendix 5.2 Cutler Merz - Evoenergy Consideration of Risk.

[34] Evoenergy's provision of distribution network services inherently involves risk. These risks include:

- risks to the community and workforce:
  - electrical safety risks

- the top-down risk assessment enables Evoenergy to control expenditure at the aggregate level and to mitigate risk, whereby the same risk outcome is targeted by multiple activities.

Evoenergy has applied these risk management principles to achieve an appropriate balance between supply adequacy, security, reliability and safety at the lowest cost to its customers.

The top-down modelling undertaken by CutlerMerz revealed opportunities to reduce expenditure to levels below the bottom-up estimates while maintaining overall network risk profile.[35] For the 2019–24 regulatory period, Evoenergy considers the results of both the top-down and bottom-up expenditure and determines a final expenditure envelope.

For example, Evoenergy identified approximately $32.2 million over 5-years of replacement expenditure that could be deducted with at least the same risk outcome as the original bottom-up forecast.[36] Using the top-down challenge enables Evoenergy to constrain increases in proposed replacement costs. Overall, opportunities to reduce expenditure to levels below that produced by the bottom-up modelling mean expenditure on asset replacement is at around the same level as Evoenergy's expenditure allowance in the 2014–19 regulatory period.

Attachment 5 (Capital expenditure), explains further how Evoenergy responded to the top-down challenge and minimised costs for the asset renewal/replacement program while maintaining the desired level of risk.

Asset renewal/replacement decisions are made in conjunction with the augmentation program to capture any potential synergies that impact system performance. The next section explains Evoenergy's network planning process for the development of its augmentation program and activities in the ACT, and how key elements of network planning relate to the asset management strategy.

1.4 Network planning

Evoenergy applies its network planning process in developing the augmentation program. The primary objective of network planning is to ensure sufficient security and reliability of supply at the lowest possible cost. Evoenergy analyses network performance and capacity against projected demand and future network needs. The analysis takes into account the security of supply requirements, which are documented in Evoenergy's network augmentation standard, and is consistent with its network planning and expansion policy.[37]

  - workplace safety risks
  - bushfire and other environmental risks
- risks to customers' quality of supply including:
  - power quality
  - reliability.

[35] Appendix 5.2 Cutler Merz - Evoenergy Consideration of Risk.

[36] Appendix 5.2 Cutler Merz - Evoenergy Consideration of Risk, p. 15.

[37] Appendix 1.18 Network Augmentation Standard document. Appendix 1.19 Distribution Network Planning and Expansion Policy

Evoenergy's planning standards are set to ensure sufficient level of supply security for key components of the distribution and transmission network, including sub-transmission lines, substations and distribution lines. The planning process employs a variety of methods, including load-flow modelling through the Advanced Distribution Management System (ADMS).[38] Through this process, Evoenergy is able to identify existing and emerging constraints.

Evoenergy documents the outcomes of the network planning process in its Annual Planning Report (APR).[39] The APR describes the network planning process and the corresponding outcomes which form the network augmentation program. The APR summarises projects proposed for implementation over the next five years, including the projects which may be subject to assessment through the Regulatory Investment Test for Distribution.[40] The APR reflects the aggregate augmentation program further detailed in the strategic planning reports, area plans and individual PJRs.

Evoenergy's PJRs provide justification for augmentation projects. These proposals for augmenting supply address specific network constraints within the strategic context. The analysis in the PJRs addresses growth of electricity demand and capacity requirements, and evaluates credible options to address network needs.

The option analysis considers rigorously alternative solutions to address supply requirements including the do-nothing option and non-network option as appropriate. Non-network solutions include demand management options which are considered as part of each proposal. As an example, a proposed demand management solution is provided in section 1.4.3.

Each proposal is subjected to a rigorous process of forecasting, analysis of asset capability and options analysis (including non-network solutions). The PJRs take into account a range of requirements including supply security, reliability, safety, and environmental and power quality requirements. Section 1.4.1 discusses how Evoenergy prepares annual demand forecasts as a key input to network planning.

In addition, Evoenergy also assesses customer-initiated works that impact on network extension and network augmentation requirements. For example, new estate developments and connection of major customers are taken into account when preparing the network augmentation plans or PJRs.[41]

Further, Evoenergy undertakes non-demand driven augmentation to address supply security, resolve power quality issues not directly linked to demand driven works. For example, changes to information technology and secondary systems, such as improved supervisory control and data acquisition or additional switching flexibility, are required to address environmental, safety and compliance issues or to enhance functionality of network assets.

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[38] The ADMS is linked to the Supervisory Control and Data Acquisition system and obtains and analyses data such as the status of the network, current flows and voltage levels throughout the network in real time. Section 1.5.1 provides further detail regarding functionality of the ADMS.

[39] A summary of proposed supply projects over the next five years is publicly available in Evoenergy's APR which is prepared in accordance with clauses 5.12.2 and 5.13.2 of the Rules; Appendix 1.15 ActewAGL 2017, Annual Planning Report.

[40] Where the cost of the most costly credible option exceeds $5 million, the project is subject to the Regulatory Investment Test for Distribution in accordance with the Rules (clause 5.17).

[41] Appendix 5.8 Customer Initiated Works report.

Evoenergy's proposed upgrades to these systems to address challenges arising from the emergence of distributed energy resources (DER) in the electricity market are discussed further in attachment 5 – (Capital expenditure).

The augmentation program is also closely coordinated with asset replacement program to ensure that any synergies in asset augmentation and replacement are captured in the investment decisions.

The next section describes improvements in the methodology for calculating the ten-year forecast of maximum summer and winter load demands for each zone substation, bulk supply point and whole of system. These forecasts are used to identify potential future constraints in the network.

1.4.1 Demand forecasting improvements

Evoenergy's annual planning process involves a comprehensive analysis of all indicators and trends to forecast the future load on the network, and is followed by a detailed analysis of network performance and capability.

Load demand forecasting is one of the main inputs to network planning. Evoenergy's network planning approach takes into account the combination of demand forecasts, asset ratings, and asset failure rates to identify the severity of constraints and the required timing of solutions.

The demand forecast is the key input for informing capacity requirements for the augmentation program and network planning. These forecasts are used to identify emerging network limitations, and identify network risks, that need to be addressed by either network or non-network solutions. Evoenergy uses forecasts as an input to the timing and scope of capex and for scheduling and establishing demand reduction strategies as well as risk management planning.

Load forecasts are used to identify parts of the network that may become overloaded due to load growth and require augmentation and to identify other parts of the network where spare capacity may be available.

Evoenergy prepares and updates a rolling 10-year load forecast, identifying expected summer and winter maximum demands for the whole network, each zone substation and each 11 kV feeder. The forecast maximum demand for summer and winter loads for each zone substation and bulk supply point, and the forecast for whole-of-system demand inform network planning requirements. For example, demand forecasts are the main input that determines the augmentation program for zone substations.

Load demand forecasts are dependent on a number of factors such as climatic conditions, population growth, uptake of embedded generation, emerging technologies and economic factors such as level of economic activity or electricity tariffs.

During the 2014–19 regulatory control period, Evoenergy implemented a number of methodology improvements which provide a more accurate demand forecast and robust network augmentation program. Evoenergy has undertaken considerable work to improve the rigour of the demand forecasting methodology in support of planning and expenditure decisions. The accuracy of the forecasting model Evoenergy uses has been verified by comparing ex-ante and ex-post forecasts.

Evoenergy has adopted the Australian Energy Market Operator's maximum demand forecast methodology which uses the Monash Electricity Forecasting Model. Further details of Evoenergy's forecasting methodology and results are provided in Attachment 3 (Energy, customer numbers and peak demand forecasts). A number of improvements have been implemented through collaboration with Jacobs.[42] For example, important improvements include:

- specifying additional variables to account for the impact of retail pricing and energy efficiency on energy usage;
- recognition of battery storage, and rooftop solar photovoltaic (PV) generation;
- an adjustment for electric vehicles (EV); and
- use of more sophisticated methods to replace multiple linear regressions.

The improved forecasting method has informed investment decision which has resulted in deferral of capacity augmentation at the sub-transmission level. For example, the improved forecasting method underpinned decisions to defer the proposed augmentation of the capacity at the Belconnen Zone Substation from the 2019–21 period to 2025/26. Evoenergy is confident that the forecasting methods used reflect the future capacity requirements of the network with an increased accuracy.

Attachment 3 provides a more detailed explanation of demand analysis for Evoenergy's network, including the forecasting method and approach.

The next section explains the risk-based methodologies Evoenergy applies for the planning and expansion of the distribution network. For example, Evoenergy uses both deterministic and probabilistic planning approaches to develop the augmentation program and demand management alternatives.

1.4.2 Risk-based approach in network planning

Risk management principles assist Evoenergy in achieving an appropriate balance between supply adequacy, security, reliability and safety at the lowest cost to customers. Evoenergy applies several risk management methodologies in network planning.

As a starting point, deterministic criteria[43] are used to identify parts of the network where demand may exceed supply capacity. These supply security criteria allow for a limited backup capacity for the critical parts of the network. The backup capacity enables Evoenergy to avoid interruption of supply in case of a credibly network event such as a failure of major equipment. The reduced network capacity after the contingency event is commonly referred as the N-1 capacity.[44] In recent years, Evoenergy significantly reduced reliance on deterministic planning criteria. For example, if part of the network experiences a deficiency of capacity, Evoenergy supports the deterministic methodology by using risk-based and probabilistic methods.

Evoenergy's planning approach to addressing network constraints or load growth issues, is to use probabilistic analysis techniques coupled with fully exploring non-network solutions, such as demand-side management, before investing in network

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[42] Appendix 3.1 Energy, customer numbers and peak demand forecasts; and Appendix 3.2 Peak demand forecast for period: 2018 – 2027.

[43] Planning requirements are generally set as 'deterministic' requirements, where rules or standards require investment to meet N (or N-0), N-1 and N-2 contingency criteria, where 'N' is a single infrastructure element such as a transformer, transmission line or cable. These criteria define the level of reliability and security to which a network is designed. These requirements are intended to ensure that the network can withstand periods of plant outage without leading to load shedding. Appendix 1.15 ActewAGL 2017, Annual Planning Report, p. 26.

[44] Appendix 1.18 Network Augmentation Standard.

augmentation.[45] This approach takes into account the combination of demand forecasts, asset ratings and asset failure rates to identify the severity of constraints and the required timing of solutions.

Evoenergy uses probabilistic risk assessment in conjunction with deterministic planning. Specifically, when the demand is projected to exceed capacity, asset managers analyse the time for which the capacity is likely to be exceeded. Subsequently, 'energy at risk' is estimated based on the probability of supply interruption and other related parameters. This approach reflects the value of network reliability to customers. Evoenergy undertakes this assessment on a case-by-case basis by reference to the load curves. Evoenergy uses the risk assessment in addition to deterministic methods to inform investment decisions.

Furthermore, in an effort to minimise investment in the major network assets, Evoenergy uses emergency capacity[46] of power transformers as the reference for the zone substation loading limits. This emergency capacity is typically 40 per cent to 50 per cent higher than the capacity based on continuous transformer rating.

In the event of a network fault, Evoenergy plans for immediate significant load transfers between zone substations to reduce the load from emergency levels to ensure sustainable and continuous loading limits. Savings in capacity investment offset the increased operational risk associated with load transfers. Using this approach allows Evoenergy to defer significant expenditure on major capacity augmentation projects.

Attachment 5 (Capital expenditure) provides further context on how the planning methodologies support expenditure decision making at Evoenergy.

The next section discusses how Evoenergy uses a risk-based, top-down challenge and assesses non-network options for demand-side management in determining the proposed augmentation program.

1.4.3 Top-down assessment and non-network demand management options

The top-down assessment of program expenditure includes the application of the CutlerMerz Augex Uncertainty Risk Appraisal (AURA) model, which applies comparable methods to assess both non-network demand management and network options.[47] The model recognises that the demand forecasts, on which augmentation programs are based, correspond to the probability of exceedance. The AURA model provides a tool for considering demand-side options alongside network solutions based on probabilistic demand forecasts.

Evoenergy recognises that under the deterministic planning approach the timing of network augmentation is determined on the basis of peak demand exceeding the planning criteria. The probabilistic planning approach is an extension of the deterministic planning approach in the sense that it provides a method of assessing the economic value of network reliability to customers. A probabilistic planning framework therefore may offer a different range of opportunities for demand management.

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[45] Appendix 1.19 Distribution Network Planning and Expansion Policy

[46] Evoenergy is using the two-hour emergency rating of zone substation power transformers.

[47] Appendix 5.4 Cutler Merz - AURA Model Methodology.

Using probabilistic planning provides scope for non-network demand management alternatives to reduce load by introducing the economic value of supply for customers. Evoenergy's applies the top-down analysis to prioritise competing projects rather than assuming that network investment occurs in discrete units, with known levels of reliability. In this way, the top-down analysis assesses the outcomes of actual expenditure to inform proposed investment and to ensure the most prudent and efficient outcome for ACT customers.

For example, Evoenergy anticipates that deferring a major investment in the Strathnairn Zone Substation project in the 2019–24 period may be achieved by implementing a demand management solution in combination with a minor augmentation of capacity.[48] The preferred solution includes installation of a new feeder and incentive payments to customers to install batteries to allow the deferral of a major investment in a new zone substation. The proposed capex program for 2019–24 regulatory period reflects that cost saving. The proposed solution is discussed further in Attachment 5 (Capital expenditure) and Attachment 6 (Operating expenditure).

The AURA model produces a net present value (NPV) analysis for network planning of augmentation expenditure, while incorporating benefits of the deferral value and options value of non-network solutions. The deferral value relates to deferral of capital investment. The options value recognises the inherent uncertainty of demand forecasts, and recognises an option to adjust the response as the demand changes.

The NPV analysis considers all options prior to decision-making to initiate any major capital augmentation project. The AURA model uses a dynamic build response to peak demand changes over time and selects the most cost-effective option for network planning given uncertain peak demand forecasts. The model calculates a build profile for different combinations of network and non-network options to maintain supply reliability following a breach of a firm rating.

Evoenergy has made a concerted effort to minimise investment in the network without compromising service levels. Using probabilistic planning has helped Evoenergy reduce costs from deferral of proposed capex for the 2019–24 regulatory period. In addition to the reduction of $32.2 million in replacement expenditure discussed in Section 1.3.3, Evoenergy identifies $13.4 million in augmentation expenditure that could be deducted from the bottom-up forecast in order to achieve the same risk outcome. Overall, the top-down challenge facilitates a reduction in total expenditure of $45.6 million, which represents a 33 per cent reduction compared to the initial bottom-up approaches.

Attachment 5 (Capital expenditure) provides additional context about the application of the top-down challenge across all of Evoenergy's asset categories and expenditure categories considered material to network risk.

In the next section, Evoenergy highlights how its network planning process considers demand management solutions in addressing network constraints or load growth issues. In addition, Evoenergy describes how existing trails for demand management and its demand-side engagement strategy are facilitating greater understanding of the potential for demand management to contribute further to system performance.

[48] Appendix 6.3 Strathnairn demand management opex/capex trade off step change.

1.4.4 Demand management

Evoenergy's analysis of the credible option for addressing network needs includes the mandatory assessment of non-network options as a preferred solution. In considering alternative options, Evoenergy identifies demand management options[49] and assesses their potential to solve network limitations and constraints for broad based and more specific local situations. By undertaking demand management, Evoenergy seeks to influence the patterns of energy consumption including the amount and rate of energy use, the timing of energy use, and the source and location of energy supply.

Evoenergy's assessment of demand management options includes, but is not limited to, demand response programs, peak shaving generation, embedded generation, energy storage at customer level, or energy storage at a network level. Evoenergy's demand management response is based on its peak demand strategy and demand-side engagement strategy required under the Rules.

During the 2014–19 regulatory period, Evoenergy endeavoured to expand the suit of demand management solutions which could be used as an alternative to the orthodox supply-side solutions.

Table 1.1 highlights some of the demand management solutions trialled by Evoenergy.

Table 1.1 Evoenergy's trials of demand management techniques

Demand management action	Description of activity
SMS curtailment requests	In 2017, Evoenergy undertook a two-month investigative project to determine the acceptance and effectiveness of sending direct messages to customers via SMS to request short-term load curtailment over designated times. Around 6 per cent of the study population responded to the SMS requests demonstrating moderate acceptance of the curtailment request. The results indicated that customers had curtailed load in some way in response to the request, although the magnitude of the curtailment actions could not be quantified.
Virtual Power Plant	In November 2017, Evoenergy successfully trialled what it believes to be the largest coordinated deployment of residential battery storage for network support in the world to date. Although the trial was of a modest size, it demonstrated the potential for much larger deployment in the future to significantly change the way the network operates and potentially avoid or defer significant network augmentation.
Demand Reduction Contracts	Evoenergy is trialling contracts for demand reduction with a number of major customers. Under these contracts, customers will be incentivised to curtail their demand from the network at times of network constraint. If correctly implemented and operated, these contracts have the potential to reduce overall network costs through deferral of augmentations, and to increase network utilisation.

[49] Demand management in the context of an electricity distribution network is deliberate action taken to reduce demand from the grid, rather than increasing supply capacity to meet increased demand; Appendix 1.14 ActewAGL 2017, Annual Planning Report, p. 97.

Evoenergy explores demand management opportunities in consultation with stakeholders. Evoenergy is developing further demand management activities through information sessions with market participants and by negotiating contracts with major commercial customers for curtailment of load during periods of network constraint.

Evoenergy's demand-side engagement strategy aims to create a cooperative and proactive relationship with customers and proponents of non-network solutions and involve them with its network planning and expansion. For example, key themes raised by consumers during the development of Evoenergy's 2019–24 electricity network regulatory proposal include:

- technology has the potential to be an important enabler for the electricity network and should play a role in the future of Evoenergy in providing innovative solutions and cost-effective outcomes;
- the cost/reliability trade-off approach with respect to opex currently adopted by Evoenergy is supported by customers;
- maintaining security of supply is important, particularly during the adoption of new technology; and
- most customers are prepared to modify their electricity consumption in response to price signals.

Attachment 2 (Consmer engagement) provides further context regarding customer engagement on demand management.

Under its engagement strategy, Evoenergy consults with registered parties to identify potential opportunities for demand management which are consistent with customer requirements.[50] Evoenergy operates an engagement program through our Demand Management Register of Interested Parties (DM-RIP), aimed at gathering new ideas for demand management from the community.

The objectives of Evoenergy's demand-side engagement strategy are:

- to embrace demand-side management and provide opportunities for customers and non-network service proponents to participate in resolving network and customer supply limitations;
- to develop and apply a transparent demand-side management process for network planning and development;
- to identify demand-side management options for individual and broad-based demand management situations;
- to provide proponents of non-network solutions with simple and effective mechanisms for obtaining information on network development proposals; and
- to develop demand management tools and industry alliances to readily facilitate non-network options.

Section 1.4.3 highlights a key improvement in Evoenergy's network planning involving the consideration of non-network options in the NPV analysis for augmentation. The option analysis considers rigorously alternative solutions to address supply requirements

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[50] Appendix 1.20 Evoenergy Demand Side Engagement Strategy. Publishing a demand side engagement document is required under clause 5.13.1(e) of the Rules. Information requirements for the strategy are described in Schedule 5.9 of the Rules.

including the do-nothing option and non-network option as appropriate. Evoenergy proposes demand solutions in the program for the 2019–24 regulatory control period.[51]

In that context, Evoenergy welcomes additional incentives introduced by the Australian Energy Regulator (AER). The AER published a demand management incentive scheme to provide an additional incentive for demand-side projects that have the potential to reduce long-term network costs.[52] Additional funding under the new demand management innovation allowance mechanism is likely to support further research and development into non-network solutions.[53] Attachment 10 (Incentive schemes) provides Evoenergy's preliminary position on the AER's new demand management incentives.

The next section summarises how Evoenergy responds to new and emerging operational challenges with particular reference to the increasing take-up of DER technologies.

1.4.5 Transitioning to a new energy utility model with DER

Evoenergy is mindful of the likely and significant impacts of DER technologies on operational practices and asset management. Major advances in technology are transforming the traditional energy utility model. Historically, distribution and transmission networks transported energy generated from a centralised supply to retail customers. The industry landscape is predicted to change rapidly in the next few decades to more decentralised electricity generation and supply.[54]

In addition, the policy and regulatory focus has shifted from a traditional 'electricity network service provider' model to a 'distribution system operator' (DSO) model where the distributor is encouraged to accommodate disruptive technologies and application of non-network and other innovative investments. This means an increasing focus on operating the distribution network more efficiently and the need to better understand emerging DER and consumption trends. The transition to a new energy utility model also represents new opportunities to delay, reduce or even remove the need for substantial network expenditure.

In the ACT, the mandatory requirements for DER in some developments of new residential suburbs are indicative of trends in changing customer requirements. For example, development requirements for Denman Prospect Estate and Ginninderry Estate developments include having PV systems installed on all new detached dwellings.

Denman Prospect Smart Network Trial

Denman Prospect is a new residential suburb currently under development in the Molonglo Valley to the west of Canberra City.[55]

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[51] Appendix 6.3 Strathnairn demand management opex/capex trade off step change.

[52] AER 2017, Draft demand management incentive scheme, August 2017; AER 2017, Explanatory Statement, Draft demand management incentive scheme, August 2017.

[53] AER 2017, Draft demand management innovation allowance mechanism, August 2017; AER 2017, Explanatory statement, Draft demand management innovation allowance mechanism, August 2017.

[54] CSIRO and Energy Networks Australia, *Electricity Network Transformation Roadmap: Final Report*, April 2017 (source: www.energynetworks.com.au/roadmap).

[55] Stage 1 will comprise 400 dwellings, each of which will be equipped with mandatory minimum 3 kW rooftop solar PV generation panels, and Evoenergy anticipates that some will also feature battery storage systems; Capital Estate Developments 2017, Denman Prospect, Building and Siting Guidelines,

The developer of Denman Prospect proposes to make detached dwellings energy efficient by requiring the mandatory installation of minimum 3 kW rooftop solar PV generation per dwelling. This will reduce energy demand but will require significant uptake of energy storage to have a major impact on the overall maximum demand of the network. Denman Prospect will be the first residential estate in the ACT, and one of the first in Australia, with 100% PV penetration.

Ginninderry Estate

Evoenergy is undertaking an energy pilot project in a new, large residential estate under development in the West Belconnen area. The pilot project aims to assess the real-time implications from an electricity-only estate with a high penetration of rooftop PV generation systems. The first stage of the development will require rooftop PV systems, demand management systems and solar or heat pump hot water heating systems, with all dwellings to be fitted with smart meters. Evoenergy will use the ADMS to monitor the performance of the network, in particular, the impact on power quality.

Over time, Evoenergy is also expecting other developments such as EV, the ACT Government's new electric light rail system (Capital Metro), smart meters and drones to impact future network planning requirements. It is likely that the nature and expected pace of technological change will pose a number of challenges and opportunities for Evoenergy. In preparation for these changes, Evoenergy is responding by undertaking a number of activities including the following examples:

- the development of technical guidelines and business processes to facilitate the connection of embedded generators, which are published on Evoenergy's website;
- trialling the installation of electric vehicle (EV) charging stations in the ACT (as part of this trial, Evoenergy is investigation roaming, load levelling, bi-direction chargers, open smart charging protocol, expansion of the EV charging network and electric busses);
- investigating the viability of micro-grids within its network with proponents of such schemes;
- trialling a virtual power plant across the network area;
- developing the ADMS to provide real-time information allowing for network switching decisions and the realisation of self-healing network principles;
- investigating the installation of additional smart devices such as voltage regulators, on-line tap changing transformers, dynamic volt-amp reactive compensators, auto-reclosers and sectionalisers on its distribution network to improve quality, security and reliability of supply; and

p.8 (source: https://denmanprospect.com.au/wp-content/uploads/2017/05/20170111-CED-DP-Building-Guidelines_WEB.pdf).

- engaging in a trial using drones to perform pole top, pole equipment, transmission tower and vegetation inspections.

DER such as battery storage, EVs, fuel switching and embedded generation are fast approaching commercial viability and challenging the traditional electricity operating model of centralised power production and distribution. In the long run, the electrification of transport and adoption of EVs is expected to raise further issues and opportunities for operating and maintaining the network. The challenge for Evoenergy is to predict the impact of these emerging technologies on its operations and adapt efficiently and effectively to this new future.

Attachment 5 (Capital expenditure) explains further how Evoenergy is responding to the issues and challenges raised by DER technologies that are expected to impact on the electricity distribution industry.

The technical challenges from DER arise from the large demands that these emerging technologies place on the management of energy flows in Evoenergy's network. At present, Evoenergy's network is designed to allow for voltage drop from one-way power flows to customers.

Evoenergy is already aware of power quality issues arising from DER through its monitoring program and customer notification. For example, a major consequence of an increasing penetration of DER is more severe and/or numerous voltage fluctuations within short time periods which require more sophisticated technical solutions to modulate, such as dynamic control systems. DER will require changes to system components, system configuration and control systems to ensure the network is maintained in accordance with regulatory requirements.

To meet this challenge, Evoenergy has embarked on the Distributed Energy Exchange (deX) project that will be help enable evaluation, understanding and experimentation of possible solutions to DER and implementation of a DSO transformation.

Distributed energy exchange (deX) – Stages 1 and 2

Evoenergy is working with stakeholders to develop tailored solutions and to address operational challenges associated with changing network and customer requirements. The prototype deX develops and tests the principles and functions required for a future large-scale, open-access, reliable and secure DER exchange.

The deX prototype aims to link DER with network operators to demonstrate how a digital platform market can coordinate DER to maximise their value to participants and to the electricity system. The Canberra pilot will use deX to demonstrate how market-integrated batteries and other DER devices might address grid constraints around net solar exports on high PV penetration feeders. It will be focused on the Denman Prospect Stage 1 subdivision where the developer has mandated 100% PV arrays for detached dwellings.[56]

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[56] Capital Estate Developments 2017, Denman Prospect: Building and Siting Guidelines. Retrieved from <https://denmanprospect.com.au/wp-content/uploads/2017/05/20170111-CED-DP-Building-Guidelines_WEB.pdf>.

deX Stage 2 will provide a proof o concept to validate the technical and financial viability of the DSO model. It aims to continue the development of deX and use in a real-life situation—the Denman Prospect development.

The purpose of Evoenergy's strategic planning is to provide an approach that leverages DER technologies to meet customer requirements by ensuring that network functionality meets customer needs at a competitive price. The extent to which customers will generate and store energy, both for their own use and export to the network, is expected to have a major impact on the topology and dynamic control of the distribution network. These factors will influence future transmission and distribution infrastructure development and operation.

Determining the future needs of the network protects Evoenergy's assets, and ensures that resources are available to operate and maintain the network in the long-term interests of consumers. Evoenergy's approach is grounded in a real and implementable asset strategy and maintains a customer-centric focus. Planning for the future needs of the network supports the strategic direction for asset management. Evoenergy's strategic priorities and opportunities are driving change management across the organisation.

Attachment 5 (Capital expenditure) provides further discussion about the expected impacts of DER technologies on network planning ,and changes to its operational practices, as well as the opportunities to delay, reduce or even remove the need for network expenditure.

The next section discusses how Evoenergy uses asset information systems to support prudent investment and efficient delivery of network services.

1.5 Asset information systems

Evoenergy uses asset information systems to support all aspects of asset management including the collection and analysis of data. These systems facilitate Evoenergy's continuous improvement of the asset management function. Continuous improvements to the asset information systems enable Evoenergy to respond to changes in needs or to drive efficiencies in business processes.

During the current regulatory period, Evoenergy put into production several operational applications which are key to the asset management function. This investment went beyond the original plan for the 2014–19 regulatory period, but was considered essential for effective asset management and continuous improvement.[57]

Evoenergy has implemented changes to the core information technology applications (asset information systems) to streamline data flows, digitise the field works management system and enable data visibility, including the:

- integration of ADMS with meter data and the billing system (Velocity) which enables the mapping of customers to up-to-date network supply points which has improved the accuracy of customer notifications of planned outages;

[57] Appendix 5.36 Evoenergy ICT Proposal provides context for the expenditure program for asset information systems.

- integration of the geographical information system ArcFM with Velocity which enables the automatic syncing of meter installations, increasing the speed by which the network information is updated while decreasing manual effort;
- ensuring that ADMS has up-to-date information on customer connection points;
- implementation of works management mobility which enables work crews to execute key works management activities in the field, including the closure of work orders, leading to improved timeliness, availability and accuracy of data; and
- development of a customer portal which enables end users to register and log into a portal to view consumption data and provide feedback.

Table 1.2 lists the key systems supporting asset management at Evoenergy.

Table 1.2 Evoenergy's key asset information systems

Asset information system	Function
Schneider Electric ADMS	Advanced Distribution Management System
ESRI GIS	Geospatial asset attributes and network connectivity
Schneider Electric ArcFM/Designer	Asset modelling
Azteca Cityworks	Works management system
Riva Decision Support	Asset analysis and program of works

The following sections provide a high-level overview of each application and key asset management related improvement initiatives.

1.5.1 Advanced Distribution Management System

Evoenergy recently implemented Schneider Electric's Advanced Distribution Management System (ADMS).

The ADMS includes three core integrated components; the Distribution Management System, the Outage Management System and the Supervisory Control and Data Acquisition System. The integration of these three capabilities as one solution enables operators, dispatchers, analysts, planners and managers to work from the same visual representation of network information. Increased integration of network planning and network control functions into one application has improved efficiencies for the operation of the network.

The enhancements to the ADMS system through the inclusion of Evoenergy's low voltage (LV) network was conducted by using ArcFM/GIS data and provides the control room visibility of the entire ACT electrical network to the edge of the network boundary.

An additional improvement made to the ADMS was the implementation of integration between ADMS and Velocity. This interface has enabled mapping of customer outage calls to network supply points. In addition, Evoenergy has extended the ADMS to be accessible via mobile iPad devices. This has enabled Electrical Operators to utilise the same information as the control room by viewing the same real-time network maps.

1.5.2 GIS/ArcFM/ Designer

Evoenergy uses the GIS/ArcFM/Designer applications to geospatially map network assets, document and maintain electrical network, and draft network designs directly in the GIS.

For example, the implementation of the Feeder Identification Tool automates the identification of feeders that are added in the ArcFM Default database, and which subsequently need to be re-exported into the ADMS. The automation of this process increases accuracy of asset data.

A further enhancement to these systems is the implementation of an integration between Designer and Cityworks. The improved interface has enabled the loading of designs from ArcFM Designer through to the Works Management System, Cityworks, and increased the efficiency of the design process.

1.5.3 Cityworks

Evoenergy's works management system, Cityworks, is based on GIS maps enabling the system to be geospatially centric. The use of GIS maps assists with network visibility by enabling the same network map data to be accessible across the organisation. Regular improvements to Cityworks enables enhancements to occur in the overall works management process. Examples of key improvement initiatives that Evoenergy has completed for Cityworks are the implementation of:

- the Oracle FIMS interface which enables visibility from within Cityworks of actual cost of works, the use of which has improved cost management of activities;
- the Data Defect Form which replaced an email process for identifying data defects with asset information and facilitates consistency of reporting and greater tracking capacity, allowing individuals to see defects previously identified on an asset; and
- Cityworks mobility which enables asset data to be captured more accurately and in a more timely manner.

1.5.4 RIVA Decision Support System

RIVA DSS is a statistical asset-modelling platform that supports long-range forecasts of asset investment needs. It leverages the asset register contained within the GIS/ArcFM as well as asset condition data contained within Cityworks through off-the-shelf integrations. Using this information, RIVA DSS can generate live forecasts, which are synchronised to the operational asset inventory, and generate associated inspections and work orders. In particular, RIVA DSS provides the following functions.

- Uses historical records to calculate the costs and risks over the life of the assets, and determines life-cycle maintenance, refurbishment and replacement activities according to strategies developed through the FMEA process (Section 1.3.2).[58]
- Enables bottom-up risk modelling, including refining probability of failure and degradation curves, and probability and cost of failure (economic, environmental, health and safety, operational and reputational).
- Records information on condition assessments and the health of assets. Based on the condition, potential failure modes are identified, along with the probability of each failure mode occurring.
- Calculates asset risk as the product of the likelihood of failure and the cost of failure. This risk profile forms the input to the asset management strategy and for determining the annual Program of Work.

Since 2014–15, Evoenergy has forecast program costs using RIVA DSS forecasts, following extensive testing and refining of the asset data. RIVA DSS undergoes regular updates and upgrades aligned to the vendor's system roadmap. This enables Evoenergy to leverage continual improvements built into the application.

In this way, RIVA DSS supports the development of individual ASPs and forecasts of service level, risk, cost and other performance measures over the forecast period and asset life-cycle. Section 1.3 provides further context on how RIVA DSS contributes to the construction of business cases for the works program.

Evoenergy's asset management activities are informed by and support organisational objectives and whole of organisation strategies and plans via a holistic governance structure. In section 1.6, Evoenergy explains the frameworks and elements of its governance most relevant to the effective delivery of electricity distribution services in the 2019–24 regulatory period.

1.6 Governance

Evoenergy's sound corporate governance supports effective delivery of services and compliance with legal and regulatory obligations. In particular, the governance arrangements enable Evoenergy to operate the electricity distribution business, including financial controls, in compliance with ring-fencing obligations.[59] Evoenergy operates within the broader corporate structure of the ActewAGL joint venture partnership, which includes regulated electricity and gas distribution network services.[60] The organisational structure supports effective asset management practices, especially by creating a streamlined decision-making process and clear lines of responsibility.

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[58] RIVA DSS outputs the annual Program of Works which determines the testing and maintenance of all network assets.

[59] The AER Ring-fencing Guideline updated on 17 October 2017 stipulates that DNSPs must use independent and separate branding for electricity distribution network services by 1 January 2018. The ActewAGL Distribution JV Partnerships became compliant by implementing a new brand, Evoenergy, for the provision of regulated electricity distribution network services.

[60] Evoenergy is governed by a single joint venture partnerships board (ActewAGL Joint Venture Board). The Board consists of three members appointed jointly by the SPI (Australia) Assets Pty Ltd and AGL-owned partners, and three members appointed by the Icon Water-owned partners.

Evoenergy's corporate frameworks operate in an integrated manner to ensure that the business is operated in the interests of owners, and that resources are allocated and managed to maximise productivity and value, and to minimise risks. These frameworks include, but are not limited to the following aspects.

- Management assurance and risk:[61] provides a structured and consistent approach to assessing the design and operating effectiveness across management frameworks.
- Safety management:[62] provides the overarching boundary for Evoenergy to provide safe, reliable, sustainable, quality-assured energy products and services to its customers and the community.
- Legal compliance:[63] details the steps to achieve and maintain ongoing compliance with Evoenergy's legal and regulatory obligations and to facilitate an environment of ongoing continual learning and improvement.
- Asset management:[64] provides for effective and economic management of Evoenergy's transmission and distribution assets, in a manner that considers the whole of life of the assets, and the whole of the system.
- Financial management:[65] forms the foundation for financial governance and the commercial risk framework and provides certainty, consistency and simplicity in delivering a risk-based approach to financial planning, budgeting, approval, management and forecasting.

The governance framework for the electricity distribution business involves management review of all elements of the integrated management system, which satisfies the requirements of ISO 31000, ISO 9001, ISO 14001, AS 4801, OHSAS 18001 and ISO 55001. This compliance evaluation ensures the high-level performance of assets and that assets are fit for use.

The following sections focus on these elements which are most relevant to the effective delivery of the electricity distribution services and Evoenergy's proposal for the 2019–24 regulatory period. In particular, Evoenergy explains its asset management governance, and financial governance, and highlights how risk management is integrated with financial and asset decisions.

1.6.1 Asset management governance

Evoenergy's asset management governance supports asset management implementation, cost minimisation, and risk management. The maturity of Evoenergy's asset management aligns with the best practice requirements of the ISO 55001 series of standards. Recent reviews by independent consultants have confirmed Evoenergy's compliance with ISO 55001.[66]

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[61] The Safety, Audit, and Risk Committee oversights and controls the appropriateness of Evoenergy's operating internal controls by monitoring their adequacy, integrity and effectiveness.

[62] Appendix 1.21 Work Health, Safety, Environment and Quality Policy, PO4601.

[63] Appendix 1.22 Risk Management and Legal Compliance policy, PO4930.

[64] Appendix 1.2 Asset Management Policy, PO1101. Section 1.2.1 provides further context in relation to Evoenergy's asset management system.

[65] Appendix 1.23 Policy, Financial Governance for the Energy Networks Division.

[66] Bureau Veritas awarded Evoenergy with certification to ISO 55001. AECOM recommended that Evoenergy has the full set of asset management documentation required to comply with ISO55001.

Evoenergy's asset management processes cover the complete spectrum of its activities, from initiation to delivery of assets, including project initiation, work planning, approvals, work delivery, projects closure and reviews. Independent engineering consultant AECOM reviewed Evoenergy's governance against the ASX Corporate Governance Principles[67] and concluded that:[68]

> Evoenergy has the full set of asset management documentation required to comply with ISO55001:2014 that provide Policy, Strategy and Objective statements, all of which refer to corporate / business objectives and therefore demonstrate the intent to maintain line of sight.
>
> The Asset Specific Plans (Evoenergy's name for strategic asset management plans) make explicit reference to business outcomes such as service reliability, safety and environmental impact (among others), and it is clear that the maintenance activity developed in these Plans is derived from an analysis of business outcomes (which also include the need to identify and implement cost-effective strategies).
>
> We therefore conclude that satisfactory line of sight exists.

The Evoenergy Asset Management Committee (AMC) provides oversight to the ongoing alignment of asset management with the strategic direction of the organisation. The AMC fulfils a high-level function and meets periodically (e.g. quarterly meetings) for efficiency reasons and for consistency with business needs.

The AMC supports investment decisions and governance through strategic monitoring and review to ensure that the asset management strategy objectives are being achieved. The AMC reviews and reports on:

- alignment between Evoenergy's strategic plans and asset management objectives;
- alignment of the AMS approach to managing risks/opportunities to corporate requirements;
- the extent to which asset management policies and objectives are established and compatible with Evoenergy's strategic direction;
- the extent to which the AMS is integrated into Evoenergy's business processes;
- availability of resources required for the AMS;
- communicating the importance of effective asset management;
- how effectively the AMS achieves its intended outcomes;
- staff support in maximising the effectiveness of the AMS; and
- continuous improvement.

Appendix 1.1 Evoenergy ISO 55001 Certification, Bureau Veritas, 11 January 2018; Appendix 1.11 Bureau Veritas 2017, Management System Certification Audit Report; Appendix 1.24 AECOM 2017, Review of Evoenergy's Asset Management Systems.

[67] ASX Corporate Governance Council 2014, Corporate Governance Principles and Recommendations, 3rd Edition (source: www.asx.com.au/documents/asx-compliance/cgc-principles-and-recommendations-3rd-edn.pdf).

[68] Appendix 1.24 AECOM 2017, Review of Evoenergy's Asset Management Systems, p. 5.

The role of the AMC includes ensuring business stakeholders are aware of asset management performance indicators that have a long-term impact on the performance of the distribution network business.

As part of its oversight role, AMC initiates or recommends improvements to the AMS.

1.6.2 Clear allocation of responsibilities

While the AMC provides high-level strategic oversight, responsibilities for asset management are delineated according to a defined corporate structure which is organised to deliver the strategic objectives of the organisation. In this structure, the main asset management responsibilities for all aspects of the electricity distribution network are allocated across four branches. Table 1.3 summarises the high-level responsibilities of the respective branches.

Table 1.3 Corporate structure for the provision of electricity distribution network services

Branch	Activities	Principal responsibility
Asset Strategy Branch	• asset management policy development • asset management system design and development • asset strategy • asset standards • network planning • asset commissioning and acceptance • regulatory compliance • development and maintenance of asset information systems	Asset ownership responsibilities, and development of the program relating to the network augmentation, demand management, and operational technology systems
Asset and Network Performance Branch	• maintenance and management of the primary power assets • maintenance and management of the secondary systems • operation of the network, including system control function • management of the program of work and major projects	Development of the asset maintenance and replacement program
Customer Connections Branch	• customer connection offers and management • network augmentation & customer connection design and work packaging • use-of-network billing • feed-in-tariff administration • meter data validation and management • contact centre operations	Development of the customer initiated works program, and NEM compliance (Local Network Service Provider, Meter Data Provider, Meter Provider (Type B))

Works Delivery Branch	• inspection and maintenance of network assets • reactive and emergency repairs • construction and replacement of network assets and customer connections • network switching	All field activities relating to construction, inspection and maintenance

The above summary demonstrates clear allocation of key asset management responsibilities to line management. However, to ensure a seamless approach to project and program implementation, Evoenergy's processes require cross-branch involvement in project and program management. This involves integration across boundaries between organisational functions and asset disciplines, and where relevant, between infrastructure managers and contracting organisations. Further, documenting and sharing information about processes and procedures across all business areas ensures the way Evoenergy manages assets is communicated effectively.

Evoenergy manages its projects and programs in accordance with tier classifications that reflect financial, delivery and other business risk. Section 1.6.3 describes how Evoenergy tailors the project management intensity according to the level of risk.

1.6.3 Projects are managed according to risk

Since 2014, Evoenergy has progressively incorporated risk assessment in business cases to tailor the project management requirements according to the level of risk, with all projects categorised as either tier 1, tier 2 or tier 3. Tiering determines how the projects are approved and managed. A tier rating is a requirement when setting up a project and is applied prior to project approval.[69] Evoenergy defines the tier allocation systematically according to an approved methodology.[70]

Generally, Evoenergy employs Prince 2 methodology for project management, and applies the methodology in accordance with the tiering system. The methodology is scalable and allows for a tailored project management approach according to project size or complexity. Broadly, projects with a higher risk are monitored closely through project boards, in accordance with stricter Prince2 project management principles. The line managers manage routine and lower risk projects, as part of broader programs.

Typically, tier 1 projects are strategic or high value projects which require a higher level of management oversight. For example, project boards undertake review of the delivery of significant projects. Tier 1 projects are attributed closer scrutiny and monitoring. Specifically, as highlighted in section 1.2.4, Evoenergy has undertaken audits on individual and significant projects to test the effectiveness of project delivery within the AMS framework at the project level.[71] Tier 3 projects cover simple or more routine

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[69] The Project Tier Classification Matrix is detailed in Appendix 1.25 Procedure, Financial governance for the Energy Networks Division.

[70] A tier is assigned to a project based on a combination of the total cost of the project and a number of commercial, work type and technical attributes. In this system, the project management intensity of tier 1 projects reflect a high level of risk compared to a tier 3 classification that Evoenergy applies to simpler and more routine projects. Appendix 1.23 Policy, Financial governance for the Energy Networks Division.

[71] Appendix 1.12 Sternberg Feeder project, Audit; Appendix 1.13 Bruce Substation project, Audit.

projects (e.g. standard customer connections) managed as part of the normal line management functions.

Evoenergy uses tiering to facilitate appropriate governance arrangements according to the different levels of commercial and implementation risks. Evoenergy considers that this approach strikes an appropriate balance between risk management and efficiency. Specifically, projects that are assessed as carrying higher risk can be monitored more closely. At the same time, the level of project management intensity is commensurate with the scale of projects and does not compromise the delivery of routine projects. Therefore, Evoenergy considers that using a tier risk-based approach supports efficient project delivery.

In section 1.6.4, Evoenergy discusses how financial governance supports the management of project risk. In particular, Evoenergy's financial governance framework ensures that project tiering correctly reflects the risks associated with projects in a prudent and succinct manner.

1.6.4 Financial governance

Evoenergy's Commercial Risk Framework[72] underpins sound financial management within the business. The Commercial Risk Framework provides an overall structure for managing financial processes related to forecasting, budgeting, approvals for the expenditure program. Together these processes reflect a fully integrated planning process, and align with the implementation of the expenditure program. Further, the financial governance policy and procedure set overall parameters for managing primary business risk, and formulating objectives and requirements for:

- financial planning and forecasting;
- budgeting ; and
- project and program approvals.

The Commercial Risk Framework provides an overarching layer of guidance and direction, and combined with the financial delegations framework acts to limit the exposure to risk for network planning and delivery of the works program. The financial planning processes and associated activities of Evoenergy's financial governance are discussed in the sections below.

1.6.4.1 Financial planning and forecasting

The Commercial Risk Framework provides a risk-based approach towards the commercial management of expenditures (both capital and non-capital). Evoenergy aligns its financial planning and budget forecasting processes for the network with corporate financial planning. Financial plans and forecasts for business planning are largely based on the asset programs developed by asset managers. The formulation of the expenditure forecasts within the financial planning process strategically align business plans and strategies with program/project delivery.

Evoenergy priorities expenditure on programs/projects based on 10-year forecasts, which are developed in accordance with business requirements. These requirements

[72] Evoenergy's Commercial Risk Framework is articulated in: Appendix 1.23 Policy, Financial governance for the Energy Networks Division; Appendix 1.25 Procedure, Financial governance for the Energy Networks Division. Evoenergy clearly identifies commercial risks for forecasting, budgets, and projects using a risk register and applies robust controls to mitigate and manage these risks.

include operational needs, customer needs and compliance with regulatory obligations. For example, less critical project expenditures are deferred within the 10-year forecast period.

Evoenergy gives careful consideration to the timing of expenditures with respect to the overall business drivers, cash flow effects and availability of resources. In particular, business planning processes incorporate the delivery of customer initiated works. Evoenergy undertakes financial planning in compliance with the *Utilities Act 2000*, Consumer Protection Code, requirements of both the technical regulator and the pricing regulator, as well as industrial, public safety, and environmental legislation.

1.6.4.2 **Budgeting**

Evoenergy implements its budgets, plans, programs and project-level estimates using a consistent approach that reflects actual costs. Evoenergy prepares financial forecasts (10-year forecasts) annually for formulating the annual budget for expenditure on projects/programs. The annual review of the expenditure program occurs in conjunction with updating the 10-year forecast. The review process defines the forthcoming budget over the following one to two years of the 10-year forecast period.

Financial estimates of the expenditure requirements for business planning determine the budget in the forthcoming financial year. Annual budgets for capital and operating expenditure are updated to reflect business needs, and expenditures are prioritised in accordance with business requirements. In each year, the forward budget reflects the timing of expenditure for program/project delivery.

Evoenergy manages business planning by effectively deploying both financial and non-financial resources to achieve whole-of-business targets. The Commercial Manager oversights and reviews resource balancing, such that all available resources are effectively deployed and that budgets do not exceed available resources to execute the program of works. If a circumstance arises where there is a need for material unbudgeted expenditure, and this cannot be accommodated by offsets in Evoenergy's budget, the Chief Financial Officer must be advised and it may be necessary to request the ActewAGL Joint Venture Board's (the JV Board) for an increase of funds with an adjustment to the financial budget forecasts.

Evoenergy records all expenditure in the core finance system, Oracle. The Oracle system has financial delegations built-in to the purchasing and project modules to ensure the release of payments are authorised in accordance with the JV Board's financial delegations. These governance and reporting requirements ensure appropriate controls are in place and provide assurance for consistency of budget management.

The next section explains the formal approval requirements for managing program/project expenditure.

1.6.4.3 **Financial approval requirements**

Evoenergy develops projects through technical assessment and manages the projects/program within a financial framework. Evoenergy evaluates engineering requirements and risks in conjunction with financial risk and expenditure requirements before implementing solutions to address network needs.

The financial approval process jointly considers the needs of the technical program and financial management. Approved projects are subject to ongoing review to evaluate decision-making for prudent expenditure.

Expenditure is approved at a program expenditure level, with additional governance and reporting to ensure appropriate controls for incurring costs. The requirements for project/program approval apply to:

- financial forecasts (10-year forecasts) which are based on the proposed programs, and are prepared and approved annually;
- budgets for capital and operating expenditure which are prepared and approved annually; and
- individual projects and programs (included in the budget) which are approved individually on a case-by-case basis.

Evoenergy's delegations schedule defines the levels of financial authority for releasing funds for expenditure on program/projects. Approval must be sought from the appropriate level of delegated authority with project approval consisting of the following elements:

- financial authorisation (budget recognition and alignment);
- technical network approval; and
- financial approval.

For strategic projects, expenditure proposals are prepared by asset managers and coordinated through section managers before being advanced through the general manager for consideration by the executive. Broad adjustments as directed by the executive are communicated back to asset managers for further refinement of expenditure proposals. The process is repeated until an acceptable solution is reached.

The expenditure proposal is rigorously assessed at each stage to ensure compliance with regulatory requirements, expenditure is justified through a 'needs' assessment, and options analyses are thorough and accurate. This process validates that expenditures are efficient and necessary for Evoenergy to achieve its strategic objectives. The JV Board approves program expenditure and is responsible for the release of funds based on business cases with a significant capital value.

The next section discusses how Evoenergy incorporates a risk-based approach in managing procurement of goods and services.

1.6.5 Procurement of goods and services

Procurement of goods and services allows Evoenergy to make the best use of resources consistent with the size and complexity of the ACT network. Evoenergy applies corporate policies in respect of contract management and procurement that ensure contract arrangements reflect arms-length terms, and all goods and services provided meet specified performance requirements and minimise the total acquisition cost.

Evoenergy uses tendering to ensure that it receives and considers competitive offers through an open approach to the market. Evoenergy uses evaluation criteria to assess whether the procurement of goods and services is consistent with value-for-money principles. A value-for-money judgement balances the relative importance of the criterion against the costs and risks involved.[73]

[73] Evoenergy's Procurement and Contract Management Policy document outlines the principles of acquiring goods and/or services; Appendix 1.26 Procurement and Contract Management Policy, PO5001.

Certain components of the work program to maintain and develop the network are outsourced to achieve cost efficiencies. For example, the design and construction work for major projects, such as a new zone substation, is outsourced. The key rationale is that major projects can require specialised solutions and it is more cost-effective to outsource the works.

Evoenergy applies financial thresholds to procurement and incorporates market testing in determining value for money. Financial delegations apply to procurements to ensure that the commercial risks are managed appropriately. This approach applies increasing threshold values for managing commercial risks of contracting for external goods and services.

Further, Evoenergy is committed to ensuring a high standard of probity in all phases of the procurement process, from initial advertising, through to final decision-making and de-briefing of applicants. Evoenergy's probity principles set out the standards of ethical behaviour which must be adhered to by all parties at all times and at all levels during the proposal process. The probity plan provides a strategy and process to protect the integrity of the procurement.[74]

Evoenergy prepares technical specifications for the procurement of major primary assets which include requirements for an assessment of whole-of-life costs, including electrical losses.[75] The method of assessing these costs is included in the specification and is taken into account when selecting the successful tenderer, including:

- a business case identifies the need in the context of the organisation's objectives;
- consideration of a range of possible options in meeting the objective, such as asset transfer, re-utilisation, lease or purchase;
- identification and quantification of costs, benefits and potential risks for options including life-support costs and disposal issues; and
- justification for the recommended course of action.

The level of detail required in the business case will depend on the complexity and cost of the initiative. The key consideration for procurement is to ensure access to the required inputs for current and future asset management capabilities. The resourcing strategy ensures:

- asset management is optimised and sustainable in terms of whole-of-life, whole system cost over the long term; and
- the required level of service is met in the most cost-effective way through efficient use and maintenance of existing assets and prudent investment in new assets.

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[74] The probity plan and protocols supplement other obligations applying to employees, including:
- *Work Health and Safety Act 2011 (ACT)*;
- *Crimes Act 1914*;
- *Privacy Act 1988*;
- *Territory Records Act 2002*; and
- the ActewAGL Distribution Code of Conduct.

[75] The effects and costs of distribution losses are included in the system planning analysis and investment strategy as inputs to determining any augmentation required to the system capacity to maintain the supply-demand balance. Appendix 1.15 ActewAGL 2017, Annual Planning Report, p.39.

1.6.6 Risk management and accountability

Evoenergy's Risk Management and Legal Compliance policy[76] and procedures align to the International Standards Organization's *ISO 31000:2009 Risk management – principles and guidelines.*

Risk management spans the full range of business activities from strategic planning to field activities. A number of examples applicable to asset management are provided above. The treatment of risk is commensurate with the level of risk. This strategic approach to risk reflects pre-determined tolerance levels and appetite for risk.

The JV Board determines the tolerance for risk of the organisation. The JV Board, through the Safety, Audit, and Risk Committee,[77] oversights controls for managing risk and risk mitigation in relation to key business risks. For other types of specific risks, the responsibility and risk ownership is allocated to line management in accordance with functional responsibilities.

For example, the responsibility for electricity network operation and asset management is allocated predominantly at the branch level, with each branch responsible for elements of the operation and management of the electricity distribution network. Table 1.3 summarises the high-level responsibilities of the respective branches.

During the current regulatory period, Evoenergy has progressively increased integration of a risk-based approach with asset management. In most cases, risk management is integrated with various processes and functions within the business. The sections above provide examples how risk management is used in:

- development of asset strategies;
- development of asset plans;
- top-down reviews of the proposed program to allocate financial controls;
- project and program management.

Evoenergy considers that its risk management measures strike an appropriate balance between the need to manage risks without compromising the efficiency of operations. In the application of risk management measures, Evoenergy is aware of the need to use risk management in a way which adds value to business outcomes and is commensurate with the scale of its projects.

[76] Appendix 1.22 Risk Management and Legal Compliance Policy, PO4930.

[77] The Committee's charter sets out its role in overseeing the appropriateness of the organisation's operating internal controls by monitoring their adequacy, integrity and effectiveness.