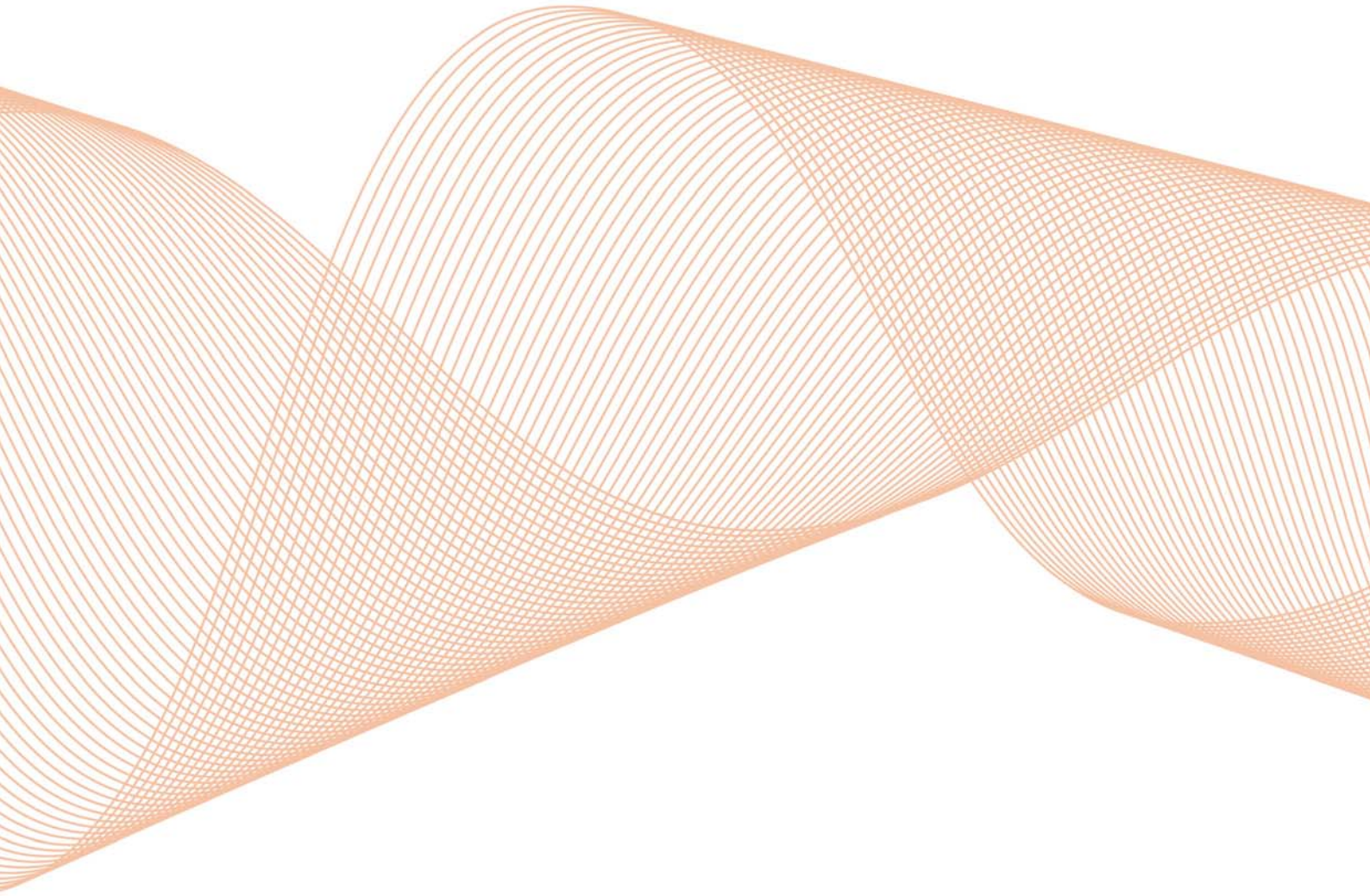
Appendix K – Network Investment Strategy

September 2011



Network Investment Strategy

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Document Control

Endorsement Approvals

	Name	Title	Signature
Endorsed by	Mark Wilshusen	Deployment Champion	Endorsed 22/12/2010 (see hardcopy file for signature)
Approved by	Mark de Laeter	GM Networks	Approved 22/12/2010 (see hardcopy file for signature)
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Record of Revisions

Revision number	Date	DM version	Revised by	Description
0	22/10/2010	9A	Mark Wilshusen	Original issue
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Documents Referenced In This Document

DM#	Title of Document
7508912	PowerPoint document containing diagrams used with this document
7125916	Visio document containing diagrams used with this document
Various	Refer to Appendix E for a full list of other documents referenced in this document

Other Documents That Reference This Document

DM#	Title of Document
Various	Refer to Appendix E for a full list of other documents referenced in this document

Stakeholders (people to be consulted when document is updated)

Position / Branch / Section
Western Power Board
Western Power Executive
All Branch Managers in the Networks Division
Project Director Access Arrangement

Notification List (people to be notified when document is updated)

Position / Branch / Section
Western Power's Extended Management Team
All Sponsor groups within the Networks Division

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Preface – why a network investment strategy?

Western Power owns and is responsible for the efficient development and management of the largest interconnected transmission and distribution electricity network in Western Australia.

Effective investment in capital intensive businesses is a cornerstone of corporate success. This is particularly true in a network business such as Western Power, where the interconnected nature of the network, combined with the high cost and often very long life of its constituent assets, present unique investment challenges.

In a physical sense, by its nature, the network is interconnected – not only in terms of its component elements, but also in terms of its connection to customers and their assets. This degree of interconnectivity requires consideration and understanding of the system as a whole, since action in one part of the network can impact on many other parts. Prudent and efficient investment in the network as a whole is a fundamental requirement for providing customers with a safe, reliable, affordable and sustainable electricity supply, supporting economic development of the state, and contributing to the quality of life for Western Australian communities.

There is also a strong time element to the interconnected nature of the network and associated investments due to the lifespan and cost of network assets. Investment decisions made today have implications for many years into the future and must take into account both short and long term outcomes.

The Western Power network has been developed over many years and has served Western Australia well in the past. However, it has been planned, designed and constructed to meet various needs, standards and customer expectations at various points in time. It is based on centralised generation centres that are remote from demand centres. Power flows are predominantly one-way through the distribution network and production is matched to demand, in a passive and non-interactive way.

Increasingly, the network is facing growing pressure from a number of current and future challenges, including:

- A large proportion of assets that will require replacement over the next ten to fifteen years as they approach the end of their useful life – with an associated increased risk of asset failures (impacting on network reliability, quality and safety),
- An ever increasing demand for electricity, with growth in peak demand growing faster than growth in energy consumption,
- Funding and deliverability constraints that will impact the timeframe over which gaps between the current and desired performance of the network can be closed,
- Higher expectations from customers on the reliability and quality of electricity supplies due to the increased economic dependence on electrical and electronic equipment that is increasingly sensitive to electricity reliability and quality (such as frequency or voltage fluctuations),
- Increasing pressure to provide a similar level of performance (such as security, reliability, quality, and capacity) to customers on the “edge of the grid” as to those in urban environments,
- The need to accommodate a growing amount of large and small scale renewable (intermittent) electricity generation connecting in an increasingly distributed way,

- Growing expectations for energy conservation and a more environmentally sustainable energy system from both communities and governments,
- The need to respond to climate change in terms of both new polices (such as the reduction of carbon emissions and expanded renewable energy targets) and impacts on infrastructure from higher temperatures, storm activities and a drier climate,
- The need to accommodate future technologies such as smart appliances, integrated energy storage and electric vehicles,
- Higher expectations from customers for flexibility and choice and the ability to participate in and control the way in which they consume and produce electricity,
- The need for increasing efficiency along the whole electricity value chain, including the way it is transported through the network, and
- A changing regulatory environment.

This document has been developed in recognition of the imperative for Western Power to have a robust and well documented Network Investment Strategy (NIS) that addresses the need to maintain and replace existing infrastructure while planning for new infrastructure to meet increased demand and changing expectations.

It provides both a framework and a strategy. It establishes new disciplines and represents a 'step change' in the way Western Power considers and articulates its investment decisions. Its application in the context of the current maturity of the organisation will generate tension in both decisions making (reconciling the new approach to the 'as is' state) and in dialogue. This is both expected and desired.

The NIS describes and guides how decisions are made to invest in traditional and, increasingly, non-traditional (non-network) solutions to address network issues, and how these support and give effect to Western Power's corporate vision to respond to current and future challenges. It also describes the key drivers for investment in the network and the associated high-level investment strategies.

It is both a tool to assist internal and external decision makers at the strategic and functional levels and a platform to facilitate dialogue.

It is designed to be explicit and transparent to facilitate understanding and provide confidence that Western Power's investment decisions are made prudently and commercially, with appropriate consideration of risk and return on investment.

The NIS will be a living, evolving document. Its value as a decision making tool will increase over time as it is tested both internally and externally through application to new scenarios that arise and investment decisions that need to be made. It is intended to be useful to all those involved with or interested in Western Power's network investment decision making. We encourage dialogue and value feedback about the information provided within this document.

Doug Aberle

Managing Director

Western Power

Navigating the document

This document is intended to be accessed by and useful to a wide audience for a variety of purposes, from the strategic to the tactical/functional. Internally, its audience is expected to range from the Board and Executive to individual planners. A similar range is expected in the external audience.

A conscious decision has been made to incorporate sufficient information at a level of detail adequate to satisfy the full spectrum of potential readers. However, it is important to recognise that the NIS complements and is supported by a range of other internal documents, processes and plans.

In recognition of the 'step-change' nature of this document and its introduction at 'this moment in time' some contextual information regarding Western Power, its network, key stakeholders and corporate vision is also provided in this first version of the NIS to aid the reader in positioning the NIS within the broader organisational context.

To accommodate the wide audience and their different needs, the document has been structured to allow readers to identify and access those sections of the document that are relevant or of interest to them. The 'road map' in Figure 1 is intended to facilitate navigation of the document.

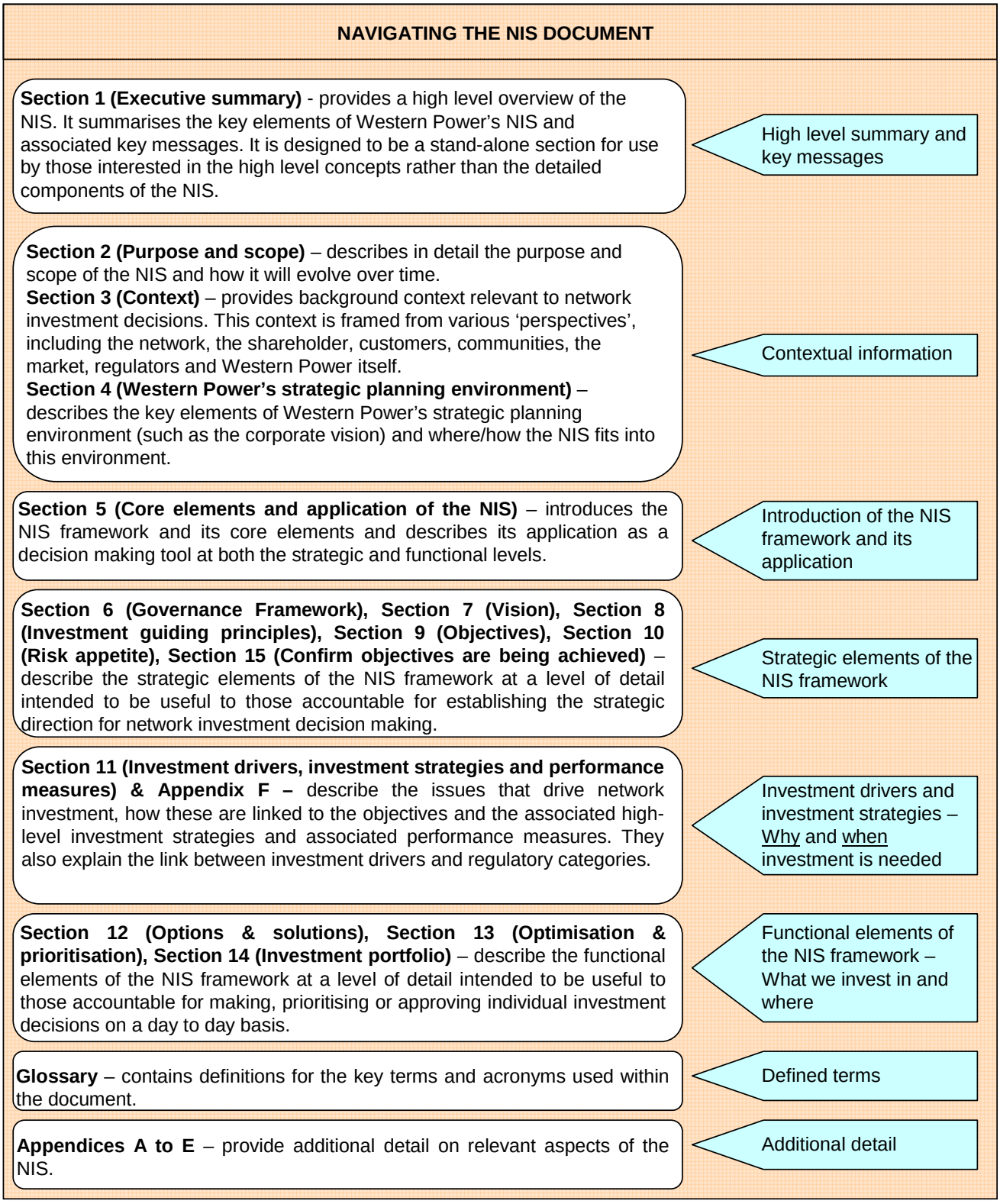


Figure 1: NIS document roadmap

1 Executive Summary

1.1 Introduction

This Executive Summary provides a high level overview of the key elements of Western Power's Network Investment Strategy. It is designed to be used as a stand alone section containing the key messages from within the document. It is intended to satisfy those predominantly interested in the high level/strategic aspects of the Network Investment Strategy (while allowing them to 'dive deeper' into the detail if required).

Reflecting its stand-alone nature, this section replicates many of the diagrams contained within the body of the document.

1.2 Purpose and scope

This document describes Western Power's Network Investment Strategy (NIS) and how it supports and gives effect to Western Power's corporate vision and objectives.

Western Power has developed this strategy document in recognition of the importance of the network and the associated investments that Western Power is required or chooses to make. It is driven by, and a consequence of the interconnected nature of the network, both in a physical sense and in the relationship between short and long term investment decisions.

The NIS articulates the long term vision for the network, the objectives associated with this vision and the nature of investments that need to be made to achieve these. The NIS contains Western Power's guiding principles for network investment decision making, based on both traditional and emerging non-traditional (non-network) solutions. It complements and is supported by a range of other internal processes, systems, policies and documents.

Externally, it provides a platform for communicating and encouraging dialogue on investment decision-making guiding principles and high-level investment strategies. It facilitates testing assumptions with the shareholder/funder, customers, regulators and other external stakeholders, and assists these stakeholders when making decisions in relation to Western Power's network investments.

Internally, the NIS is a tool to assist Western Power decision makers at both the strategic and functional level and to provide guidance when exercising discretion or balancing trade-offs.

It is designed to be explicit and transparent to facilitate understanding and provide confidence that Western Power's investment decisions are made prudently and commercially, with appropriate consideration of risk and return on investment.

1.2.1 Network and non-network solutions

The term 'non-network solutions' is widely used within the electricity network industry to describe alternatives to traditional 'poles and wires' type solutions to address network issues/constraints (with the most common examples being demand management and embedded generation). The economic regulatory environment under which Western Power operates requires a robust assessment of all viable alternatives to address network issues, including non-network solutions. Western Power recognises the imperative to develop and consider non-network solutions in the network investment decision making process. Throughout this document, any

reference to network solutions or network investment should be taken to include both traditional 'poles and wires' solutions and non-traditional/non-network solutions, and any associated investments - whether explicitly stated or not.

1.3 Investment context

Western Power is a Western Australian State Government owned statutory corporation. It is a combined transmission and distribution network service provider and owns and operates the network.

There are many external stakeholders who have significant influence over or interest in the network investment decisions made by Western Power and the outcomes these deliver. These stakeholders include the State Government (shareholder, funder and policy maker), customers, market participants, communities and regulators.

Western Power is required to make investments in its network within the context of the 'often competing' needs and expectations of the various stakeholders, balancing return on investment, cost, performance and risk.

Ensuring commercially sound, well justified and transparent network investments is crucial to Western Power for a number of reasons, including:

1. Delivering sustainable shareholder and customer value,
2. Achieving satisfactory determinations from the ERA on Access Arrangement revisions (pricing and revenue outcomes and appropriate returns on past investments), and compliance with licence conditions,
3. Gaining access to adequate funding from the shareholder to support investments,
4. Achieving corporate strategic objectives,
5. Supporting and enabling the decision-making of external stakeholders, and
6. Achieving a reputation as a competent, credible, customer focused, commercially sound and environmentally and socially responsible service provider.

Figure 2 depicts some of the links and relationships between key external stakeholders, Western Power and the investments it makes in the network.

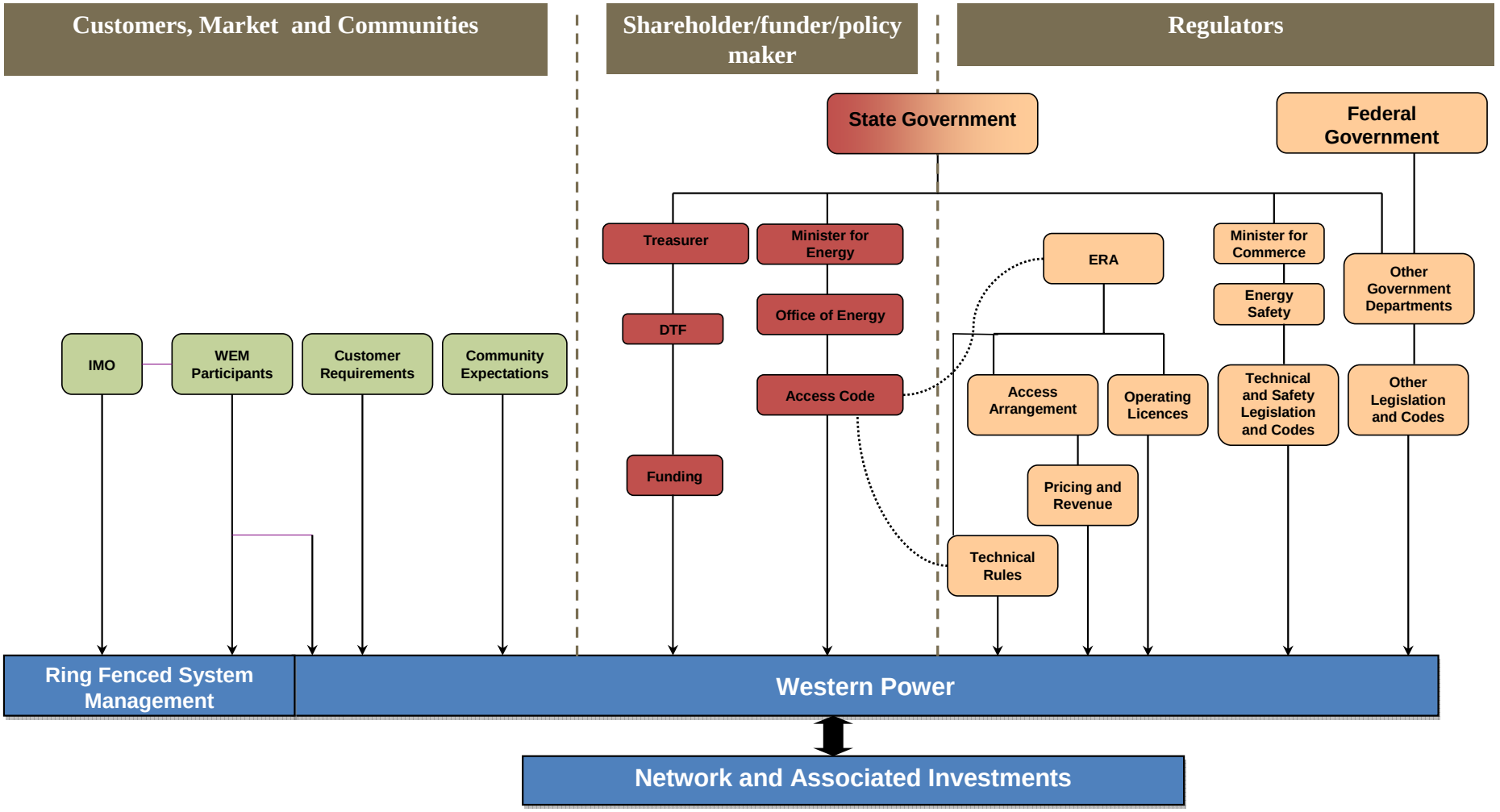


Figure 2: Relationships between key external stakeholders and network investment decisions

1.4 Strategic planning environment

The NIS fits within Western Power's broader strategic planning environment, the heart of which is the corporate vision (complemented by the corporate purpose and values).

Western Power's strategic direction is articulated in an overarching strategy known as *Transform the Core* (TTC). The TTC strategy has been developed to respond to the current strategic challenges faced by Western Power and is intended to operate over the three year period from 2010/11 to 2012/13. Its aim is to focus on excellence across the core operations to simplify and improve the responsiveness and commerciality of the business. However, it also incorporates a future positioning element.

Consistent with this, Western Power is developing five key support strategies, which collectively are intended to support the delivery of and give effect to Western Power's corporate vision. These are the: *Customer Strategy; Financial Strategy; Regulatory Strategy; Works Delivery Strategy;* and *Network Investment Strategy* (this NIS).

These five key support strategies are lead decision making tools. They are derived from and support delivery of the corporate vision. However, they are also an input to and inform the development of the corporate vision. These support strategies do not operate in isolation. They are integrally linked and strongly interdependent, with each informing and receiving input from the others.

Figure 3 shows Western Power's overall strategic planning environment and how *Transform the Core* and the five support strategies integrate with this.

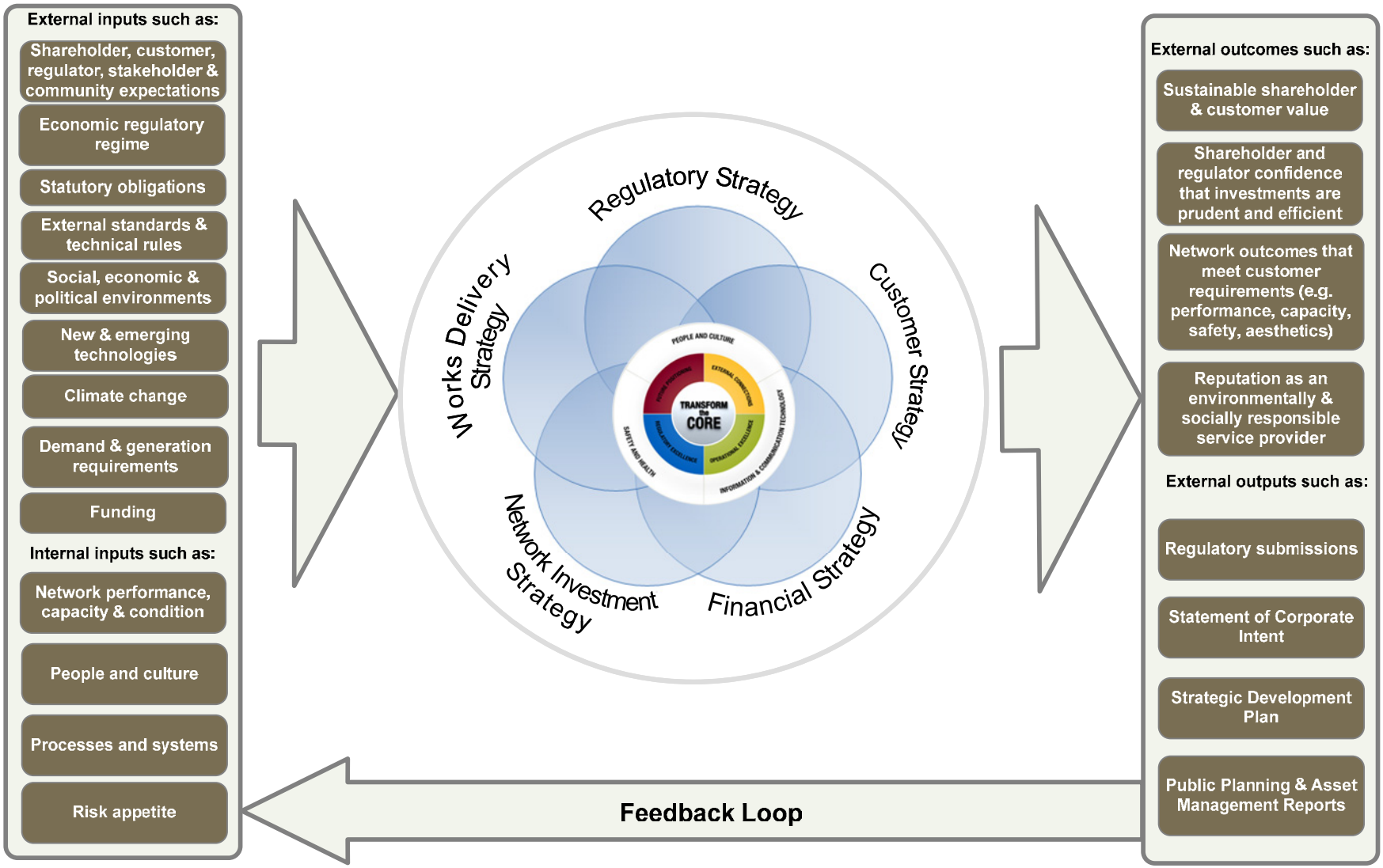


Figure 3: Western Power's strategic planning environment

1.5 Core elements and application of the NIS

Like the other key support strategies, the NIS is a lead decision making tool, linking the corporate vision to the network investment planning and decision-making process.

As a decision making tool, the NIS applies at both the strategic and functional levels and provides guidance to those within the business who operate at these different levels.

At the strategic level, it will guide the Board and Executive in establishing the strategic direction of network investments. This involves setting the network vision, objectives, guiding principles and risk attitude. At the functional level it will guide planning staff and leaders who are required to make, prioritise or approve individual investment decisions on a day to day basis as part of their role.

The framework for, and core elements of, Western Power's NIS are shown in Figure 4 and summarised in the remaining subsections of this Executive Summary.

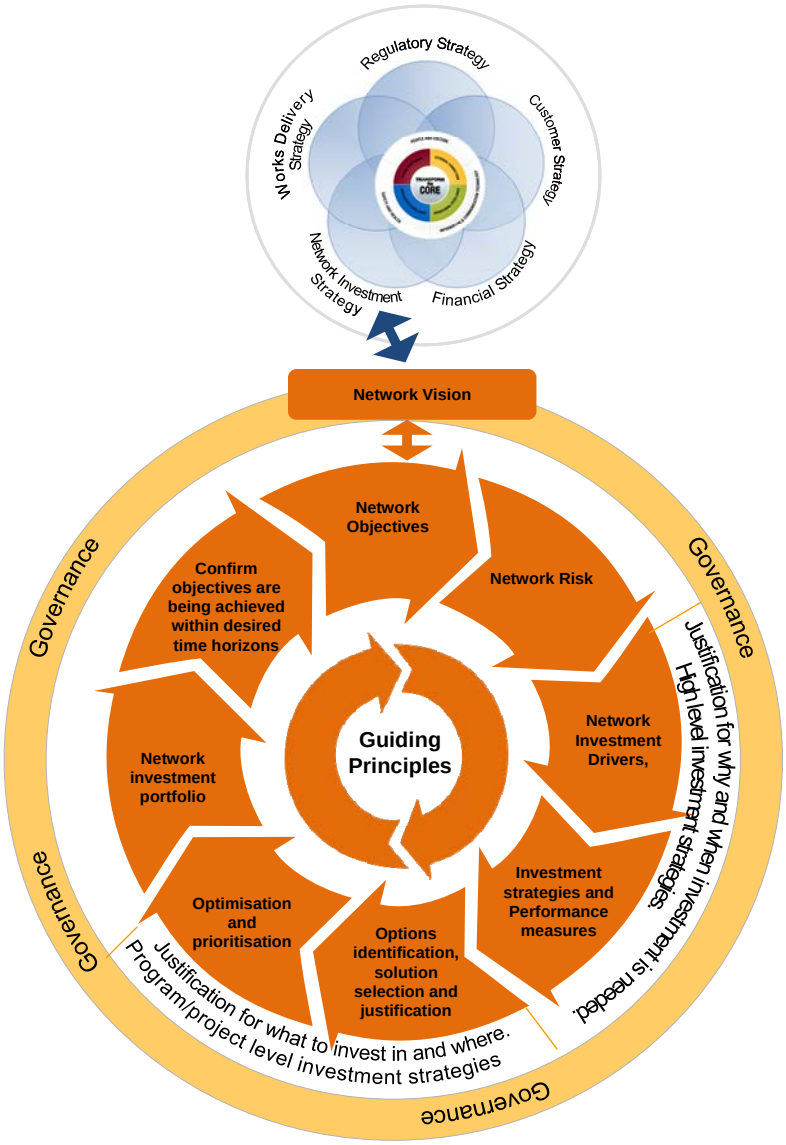


Figure 4: Core Elements of the Network Investment Strategy

1.6 Governance framework

Governance of network investments sits within the broader Corporate Governance Framework, which is described in DM# 3444604. Within the context of the NIS, governance establishes the processes, systems and controls to be applied to ensure that all investment decisions are made consistent with Western Power's NIS framework to deliver the desired network vision, objectives and risk outcomes. This includes clarity of roles and accountabilities, the provision of accurate and timely information to support decision making, clear process and criteria for decisions and opportunity to review and monitor the process and outcomes.

In application to the NIS framework, there are effectively two levels of governance, strategic and functional, as shown in Figure 5.

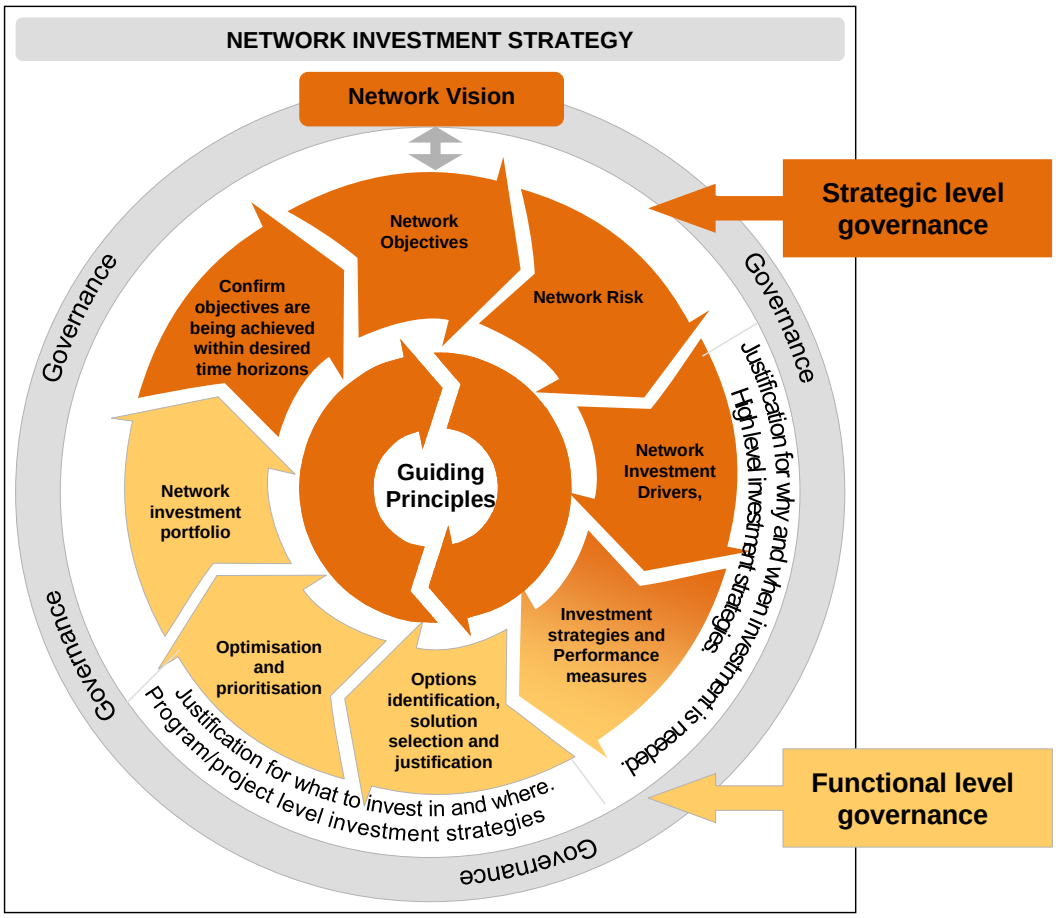


Figure 5: Strategic and functional levels of NIS governance

At the strategic level, the emphasis is on establishing and governing those elements of the NIS framework that guide the strategic direction of investments. This is predominantly the role of the Board and Executive. These elements are longer term, more thematic (bigger picture). While not static, they are more enduring and have longer periods between reviews, with a proactive rather than reactive focus.

At the functional level, the emphasis is on establishing and governing those elements of the framework where individual investments decisions are made. These elements are closely aligned with the day-to-day ('business as usual') activities. Accountabilities for these elements lie with individual General Managers and Branch

Managers based on their specific areas of accountability. These elements are dynamic and subject to more regular review and approval.

At the functional level, the overall investment governance framework is described in Western Power's Works Program Governance Manual (DM# 5200741). This framework sets out the steps required to identify, develop, design and deliver network investment projects or programs and is characterized by a six phase/six gate process as shown in Figure 6. As indicated, the NIS focuses on the first three phases of the investment lifecycle, that is, the Initiation, Scoping and Planning phases, which result in approved business cases.

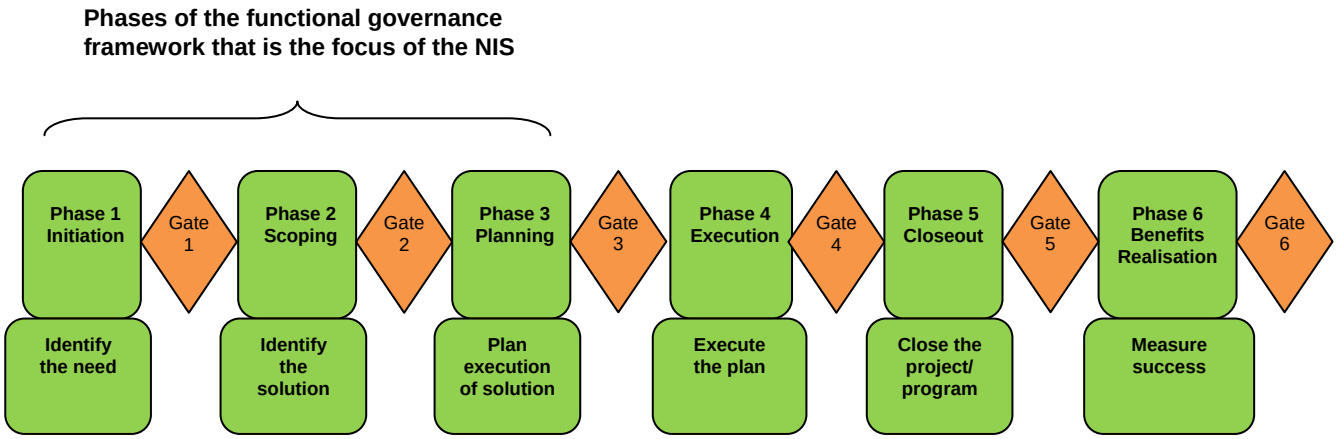


Figure 6: NIS governance process at the functional level

1.7 Network vision

Conceptually, the NIS lifecycle begins with the formulation of a network vision. In the same way that the corporate vision describes the desired future state for the business, the network vision describes the desired future state for the network. This includes how electricity is supplied to customers, which may be via the network or via non-network solutions (such as stand alone power supplies).

At the highest level, Western Power's network vision is shown in Figure 7. However, this vision is crystallised and translated into functional decision making through an associated set of network investment guiding principles and network objectives, which are described in subsequent sections.

Network Vision

An intelligent, connective and safe network that delivers sustainable shareholder and customer value, is compliant with statutory obligations, and enables the delivery of energy solutions that are customer oriented, environmentally responsible and socially acceptable.

Figure 7: Western Power's network vision

The vision is intended to provide a 'beacon', and stretch thinking. It is based in the reality of 'what is' but articulates what 'can be'. It articulates the future performance, functions and outcomes to be delivered through or enabled by the network, reflecting its interconnected nature and strategic importance in terms of providing options to and enabling outcomes valued by customers, the shareholder and other key stakeholders.

1.8 Network investment guiding principles

Network investment guiding principles are intended to provide a frame of reference for investment decision makers, where trade-offs between cost, risk and performance are required. There is a strong link between these investment guiding principles and Western Power's values.

The consistent application of these principles will ensure transparent, commercially sound, economically efficient and sustainable investments in network and non-network solutions. It will also provide increased assurance of regulatory compliance in the areas of safety, environmental management and economic regulation (for example, where investments are required to satisfy prudency and efficiency tests in the Access Code).

These principles will also assist in dialogue with the shareholder, customers and other stakeholders.

Western Power's network investment guiding principles are shown in Figure 8.

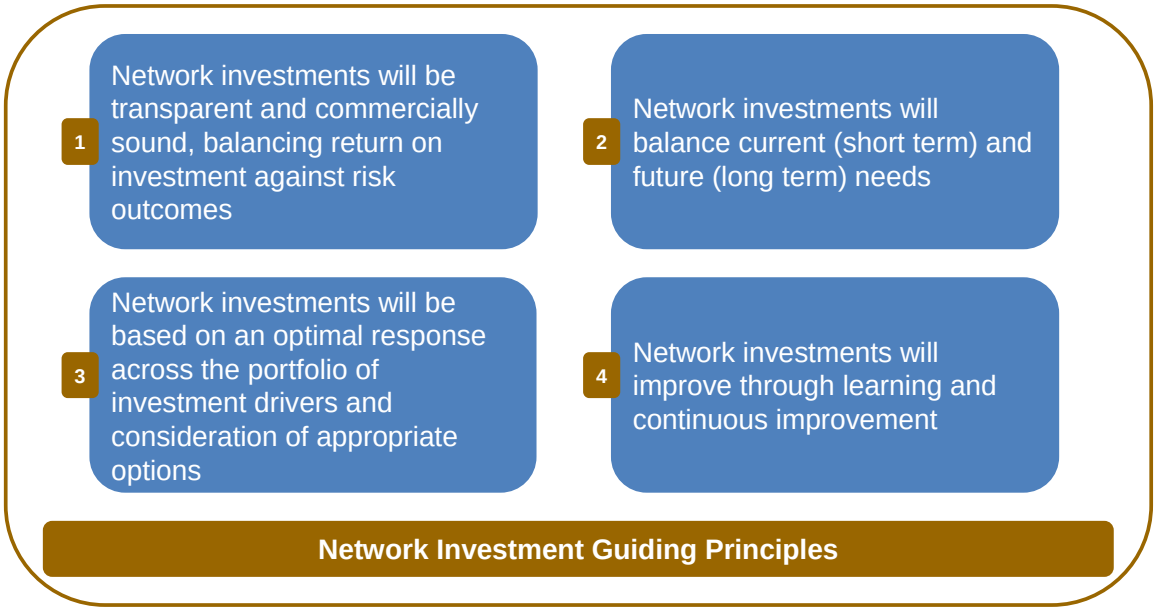


Figure 8: Network investment guiding principles

1.9 Network objectives

Network objectives translate the network vision into more tangible outcomes. Each network objectives is described in terms of the outcomes Western Power seeks to deliver to its various stakeholders via the network, and the goals Western Power has established to determine if the objective is being achieved.

Western Power's network objectives are shown in Figure 9.

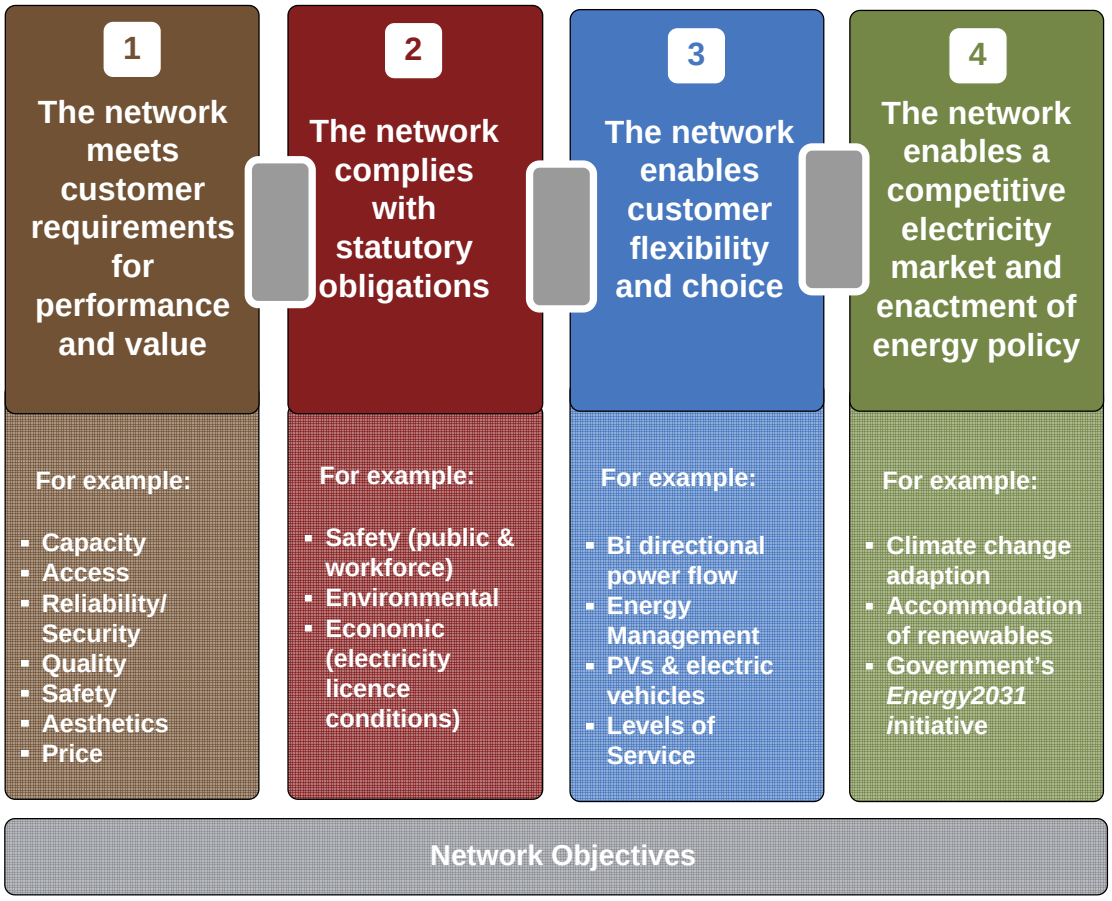


Figure 9: Network objectives

1.10 Network risk

Western Power's Risk Management Framework (DM# 3861477) defines risk as "the effect of uncertainty on objectives". Network risks are the subset of Western Power's risks that give rise to uncertainty in the achievement of the network objectives.

Network risks arise through Western Power's ownership of the network and the provision of covered services, including the application of statutory obligations. Uncertainty arises from issues such as load growth, the aging of assets, changing legislative and performance obligations, and changing customer and market requirements. Therefore risks will increase over time if left untreated.

At the strategic level, network risk is pervasive in the consideration of network objectives, definition of network risk tolerance, and the identification of network investment drivers. At the functional level, network risk is also considered when selecting and justifying solution options and as part of optimisation and prioritisation of network investments.

Western Power is progressing a project that will enhance the asset risk management framework to develop a Network Risk Management Framework (NRMF). The NRMF will implement Western Power's Risk Management Policy in the management of network risks. Network risks will be identified, analysed, evaluated, and treated in accordance with the NRMF.

Figure 10 is a conceptual diagram showing the potential future state of Western Power's risk management environment, with particular focus on describing the type of risks that each risk framework covers, including the NRMF.

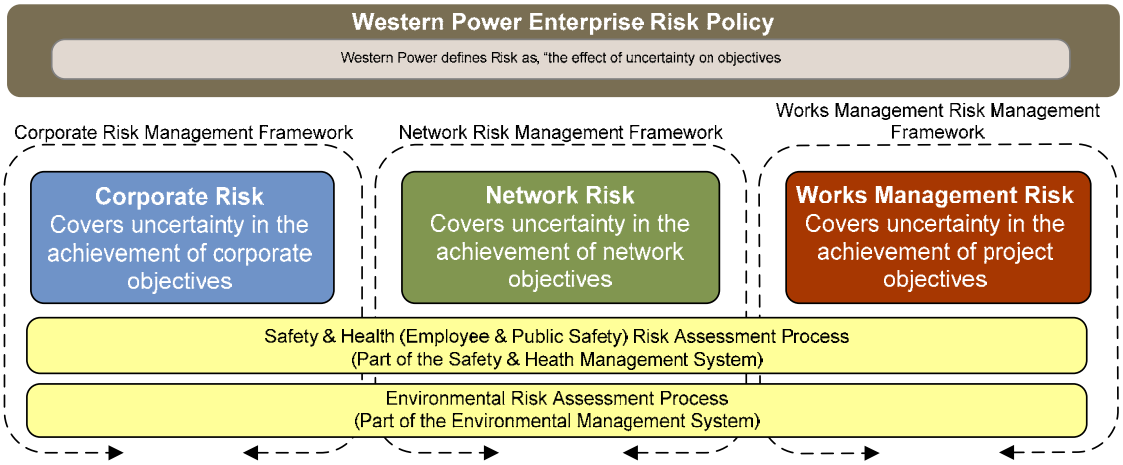


Figure 10: Conceptual future state of Western Power risk management environment with focus on describing the type of risks that each risk framework covers.

1.11 Network investment drivers, investment strategies and performance measures

Network investment drivers are events, issues or factors that change the state of, or circumstances faced by, the network and apply 'pressure' to the network in terms of its ability to deliver desired network objectives. They can trigger an investment response if they result in a gap between actual or predicted state and desired future state relative to network objectives.

Western Power has defined a suite of nine network investment drivers, which are shown in Figure 11.

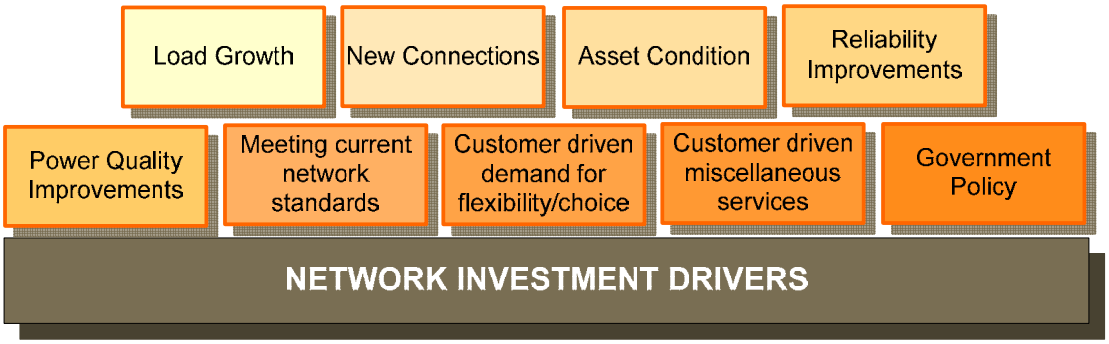


Figure 11: Suit of network investment drivers

This document also describes the high level investment strategies that have been established in response to each of these drivers. These strategies generally reflect the current state of the network and a realistic pathway over time towards the achievement of network objectives.

A number of key dimensions are also articulated for each investment strategy. These key dimensions are shown in Figure 12. Collectively, these dimensions provide justification for why and when investment is needed on the basis of the strategies and in response to the associated network investment driver.

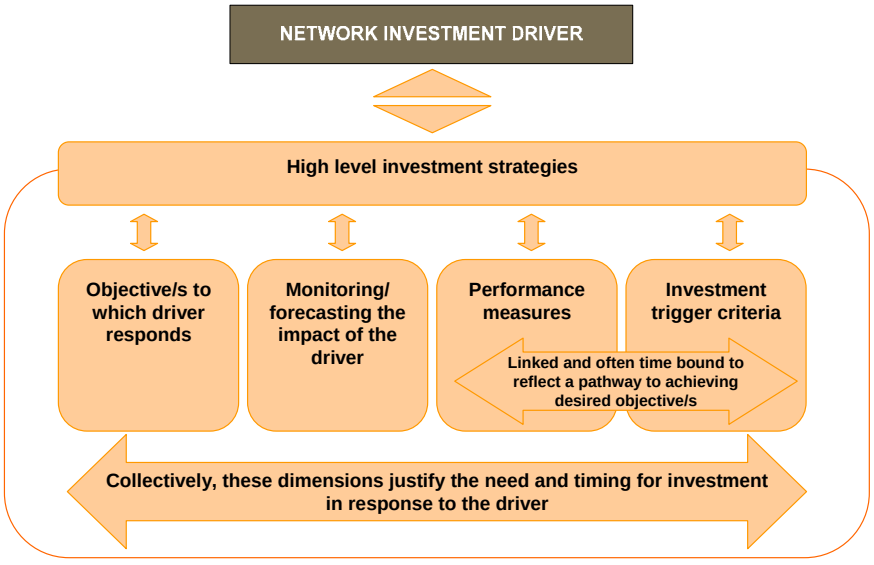


Figure 12: Dimensions of investment strategies associated with investment drivers

A critical element in justifying investment in response to an investment driver is a robust and defensible set of performance measures and associated criteria (levels of performance) that trigger the need for an investment response (trigger criteria).

Western Power has established two guiding principles in defining and establishing performance measures and associated trigger criteria, which are that:

1. They are underpinned by an authoritative external frame of reference, and
2. They are robust in terms of providing justification for a need to invest. This means that they are either unchallengeable, (i.e. not subject to interpretation), or represent a sound and defensible interpretation.

1.11.1 Objectives to which driver responds

There is a direct link between network objectives and network investment drivers. Each network objective must have at least one corresponding network investment driver and each network investment driver must respond to one or more network objectives. Figure 13 shows the main network objective/s to which each network investment driver responds.

This diagram also reinforces the concept that investments made in response to one driver will usually contribute to more than a single objective.

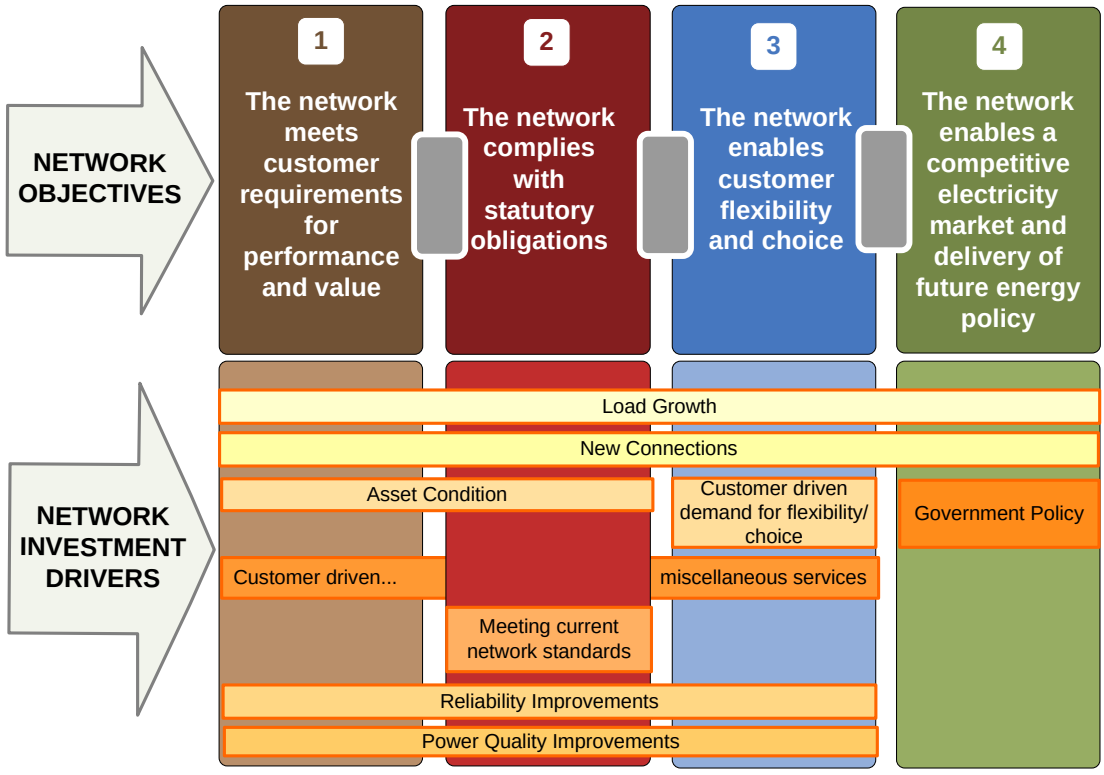


Figure 13: Link between network objectives and investment drivers

1.12 Options and solutions

Once a network issue (risk or opportunity) has been identified (i.e. triggered in response to a network investment driver) and clearly defined, the next step in the process is to determine the most appropriate solution. The process of identifying, evaluating, selecting and justifying the most appropriate option must be undertaken

in a transparent, systematic, consistent and thorough way. In so doing, the reasons behind the eventual selection of an option are auditable and defensible and enable the business to learn and adjust.

Western Power's process for option selection and justification is summarised in Figure 14. This process fits within Phase 2 (scoping) of the overall six phase/six gate process shown earlier in Figure 6.

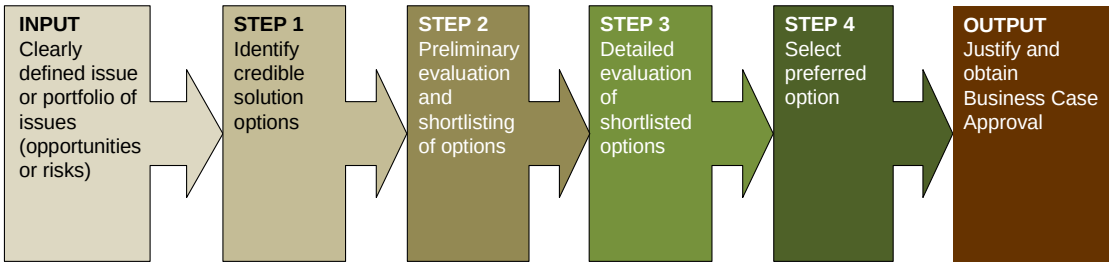


Figure 14: Option selection and justification process

1.13 Optimisation and prioritisation

Optimisation is intended to deliver maximum benefits from the investments made (best 'bang for buck') and often occurs within the context of competing needs.

Prioritisation is closely linked to optimisation, but is generally undertaken in response to constraints imposed on investment opportunities. Prioritisation is intended to ensure the delivery of those projects that deliver maximum value or achieve the greatest reduction in risk across the suite of possible investment options, as shown in Figure 15.

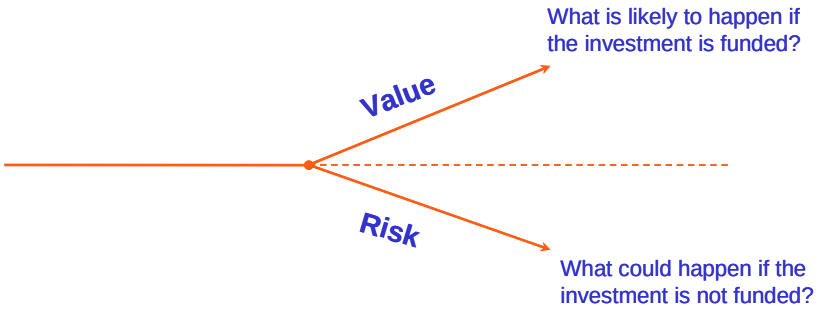


Figure 15: The risk/value equation

1.14 Network investment portfolio

The network investment portfolio reflects how planning activities are translated into physical outcomes. It contains a 25 year view of all existing, proposed and potential capital and operating projects and programs identified to address known or forecast network issues. These projects and programs exist with varying levels of confidence, definition and approval and will be at various stages of development, from fully approved and in progress to a simple forecast needs statement.

It facilitates the development of a number of different views of current and future work and associated level of investment for a variety of business purposes. This includes macro and micro budgets, funding and regulatory submissions and programs of work. Figure 16 depicts some of the key views that are assembled from the network investment portfolio.

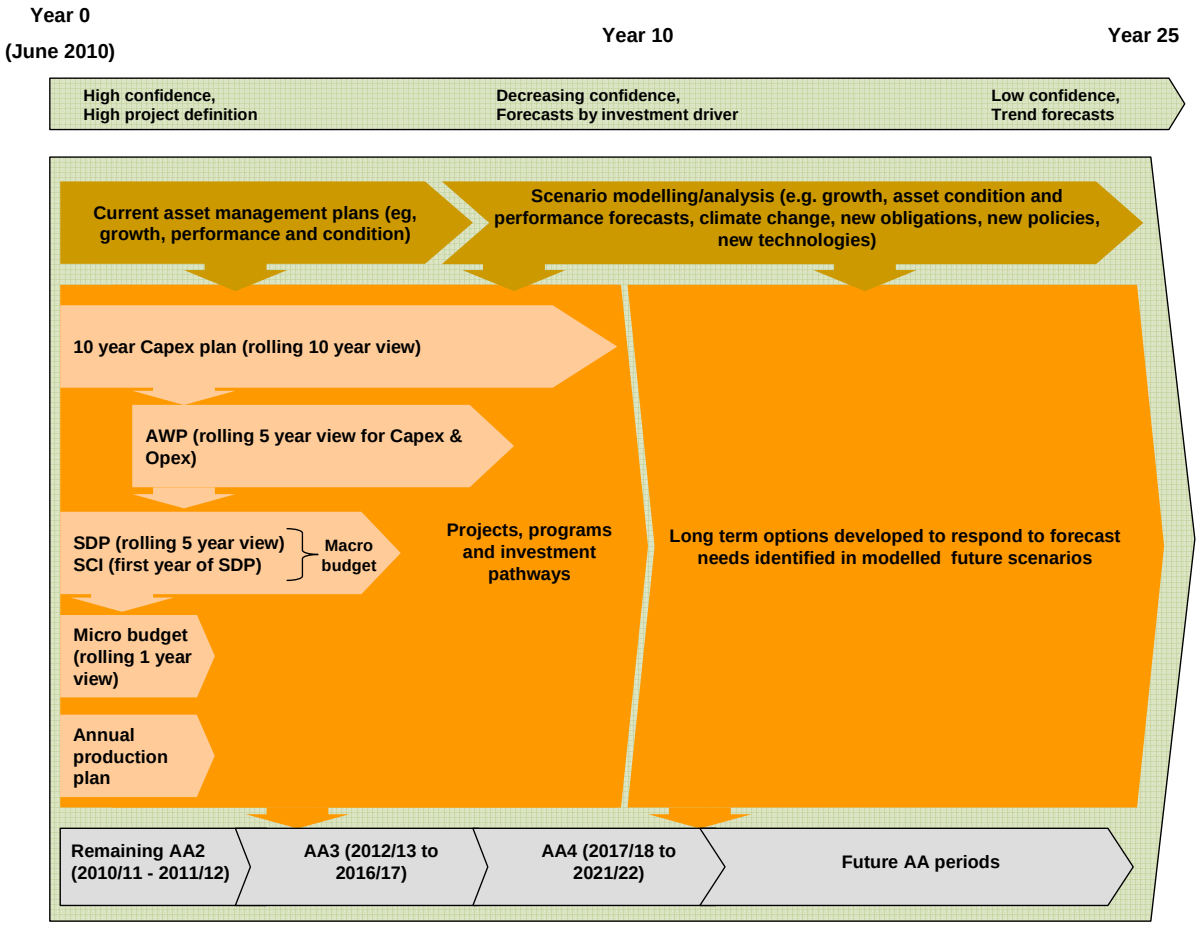


Figure 16: Network investment portfolio and key views

1.15 Confirmation that objectives are being achieved

Reviewing progress against network objectives is a key element of the feedback loop into the strategic planning and investment process. It is achieved by monitoring a set of performance metrics at various levels within the business. At the highest level, progress is monitored against a suite of corporate Key Performance Indicators (KPIs) contained in the Statement of Corporate Intent (SCI).

Accountability for compiling, monitoring and reporting against relevant performance measures is done in accordance with the NIS Governance framework.

2 Purpose and scope

2.1 Purpose

The purpose of this document is to describe Western Power's Network Investment Strategy (NIS) and how it supports and gives effect to Western Power's corporate vision and objectives.

It exists as a separate strategy in recognition of the importance of the network and the associated investments that Western Power is required or chooses to make. It is driven by, and a consequence of the interconnected nature of the network, both in a physical sense and in the relationship between short and long term investment decisions.

The NIS articulates the long term vision for the network and the objectives associated with this vision. It establishes a roadmap to achieve the vision and objectives and provides a framework for making associated investment decisions in the short, medium and longer term.

It also describes the key drivers for investment in the network and the high-level strategies associated with each driver.

The NIS contains Western Power's guiding principles for network investment decision making, based on both traditional and emerging non-traditional (non-network) solutions. It complements and is supported by a range of other internal processes, systems, policies, documents and plans.

2.1.1 Internal use

Internally, the NIS is a tool to assist Western Power decision makers at both the strategic and functional level and to provide guidance when exercising discretion or balancing trade-offs. It provides:

- A framework to articulate how network investment is linked to achieving Western Power's corporate vision and objectives,
- A point of reference to guide and prioritise network investment decisions and ensure that these decisions are aligned with achieving the corporate vision and are consistent with other organisational values, policies, strategies and objectives,
- A platform that will enable Western Power to develop robust business cases which demonstrate that its network investments appropriately satisfy regulatory requirements, including the 'Regulatory Test' and the 'New Facilities Investment Test' (NFIT), thus minimising the potential for the Economic Regulation Authority (ERA) to exclude past and future capital expenditure from the Regulated Asset Base (RAB),
- A guide for the development of detailed year-to-year work plans/programs,
- Support for regulatory and funding submissions by providing robust, transparent and defensible links between expenditure proposals and expenditure drivers (such as compliance obligations),
- The architecture for the various internal processes, systems, policies and documents that support investment decisions and a vehicle to establish and embed common language and terminology, and

- A platform for identifying and prioritising research and development opportunities (innovations) for network and non-network solutions.

2.1.2 External use

Externally, it provides a platform for communicating and encouraging dialogue on investment decision-making guiding principles and high-level investment strategies. It facilitates testing assumptions with the shareholder/funder, customers, regulators and other external stakeholders, and assists these stakeholders when making decisions in relation to Western Power's network investments.

It is designed to be explicit and transparent to facilitate understanding and provide confidence that Western Power's investment decisions are made commercially (prudent and economically efficient) and consistent with the regulatory framework.

2.2 Scope

The NIS deals with all **covered services** provided by Western Power and considers investments associated with both traditional 'poles and wires' network solutions and non-traditional (non-network) solutions such as demand management and embedded generation. It focuses on the 'front-end' of the investment planning lifecycle and operates at both the strategic and functional level.

The NIS provides an overview of the high-level network strategies that drive network investment. However, it does not directly deal with individual projects and programs that are derived from these. This level of detail is provided in a range of other documentation.

Covered services essentially refer to the regulated part of Western Power's business associated with the network. The Electricity Networks Access Code 2004 (WA) defines a covered service as "a service in relation to the transportation of electricity provided by means of a covered network".

The NIS does not deal with unregulated services or activities, nor does it deal with the ring-fenced System Management aspect of the business. System Management is a segregated business unit within Western Power, established under the Wholesale Electricity Market (WEM) Rules.

Additional details on the categories of services provided by Western Power are provided in Appendix A - Categories of service.

2.2.1 Network and non-network solutions

The term 'non-network solutions' is widely used within the electricity network industry to describe alternatives to traditional 'poles and wires' type solutions to address network issues/constraints (with the most common examples being demand management and embedded generation). The economic regulatory environment under which Western Power operates requires a robust assessment of all viable alternatives to address network issues, including non-network solutions. Western Power recognises the imperative to develop and consider non-network solutions in the network investment decision making process. Throughout this document, any reference to network solutions or network investment should be taken to include both traditional 'poles and wires' solutions and non-traditional/non-network solutions, and any associated investments - whether explicitly stated or not.

2.2.2 In scope investments

The investment categories that are within the scope of the NIS include:

- Network primary infrastructure investments (such as overhead lines, underground cables, switchgear and transformers),
- Network related Information and Communication Technology (ICT) investments (e.g. metering, protection, SCADA and communication equipment),
- Network related land, easement and building investments (such as substation sites or buildings and line or cable easements),
- Investments in alternatives to traditional network solutions (such as network control services, distributed energy resources and energy management solutions) and associated ICT investments, and
- Network and non-network related research and development/innovation investments.

2.2.3 Out of scope investments

The investment categories that are outside the scope of the NIS include:

- Plant, vehicles and tools,
- Human resources,
- Land, buildings and associated fixtures not related to the network (such as depots, offices and warehouses),
- System operation and management activities and ICT to support operation of the WEM,
- ICT not directly related to network or non-network investments (such as corporate IT systems), and
- Investments to support work not related to covered services.

2.3 Evolution of the NIS

This first version of the NIS articulates the current state. It predominantly captures, consolidates and aligns Western Power's current network investment strategy, which previously had elements contained in a variety of different internal documents. It seeks to make explicit many of the elements of the network investment strategy that were previously implicit or unclear (and therefore difficult to access and test).

This version of the NIS is intended to be functional for the present but also provide a platform to identify opportunities for (and then capture) future improvements or refinements. Western Power is currently making significant investment in strategic improvement initiatives across many core areas of the business. One of these initiatives focuses specifically on improving the network planning and investment process. Where appropriate throughout the document, reference is made to the desired future state that this improvement initiative is intending to deliver. Figure 17 depicts Western Power's network planning and investment strategic architecture and indicates which elements of this are covered in the NIS. This strategic architecture provides the roadmap for the improvement initiative.

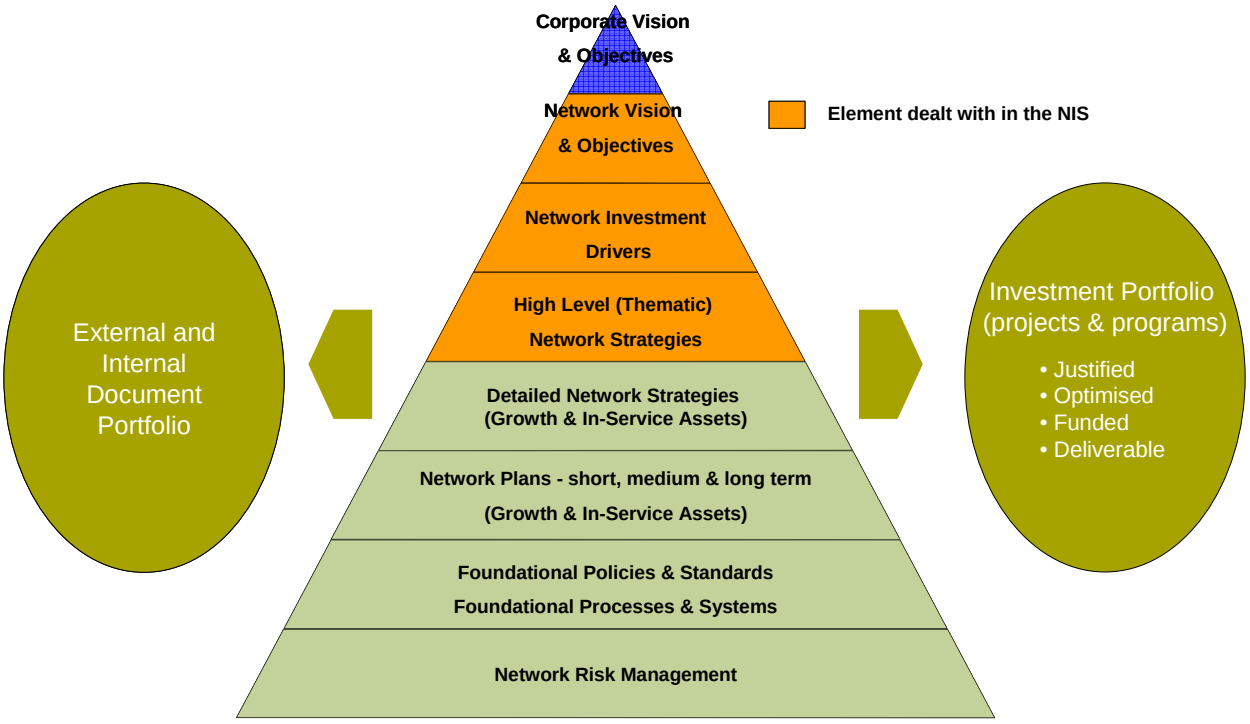


Figure 17: Strategic architecture for network planning and investment

Going forward, Western Power intends to work closely with external stakeholders to ensure Western Power's network investment strategy is more outward looking and shareholder, customer and stakeholder centric. The approach for this external engagement will be to develop and analyse a range of scenarios, establish the most likely view of what the future might hold and determine the most appropriate response.

It is envisaged that the value of the NIS as a decision making tool will increase over time as it is tested both internally and externally through application to new scenarios that arise and investment decisions that need to be made.

2.3.1 Custodianship and review of the NIS document

Custodianship of the NIS document resides with the Network Investment Branch within the Networks Division. This document will be formally reviewed and updated at least annually. However, more frequent revisions may occur if appropriate. This is particularly likely to be the case in the early life of the document, as significant effort is occurring to improve key elements of Western Power's network investment strategic architecture and it is important for such improvements to be captured as they are implemented.

3 Context

3.1 Introduction

This section is intended to outline the physical nature of Western Power's network and to provide insight into the environment in which network investment decisions are made. This insight is framed from the perspective of Western Power's various stakeholders and the interest and influence they have in network investment decisions made by Western Power.

3.2 Western Power's Network

Western Power is a Western Australian State Government owned statutory corporation. It is a combined transmission and distribution network service provider and owns and operates the network. This is the largest interconnected network in the state, connecting to around 900,000 customers and covering an area of approximately 322,000 km^2 as shown in Figure 18.

Western Power, plans, designs, constructs, maintains and operates the network to transmit electricity from generators (such as power stations) to consumers on behalf of electricity retailers.

It has both a transmission network and a distribution network comprising overhead wires and poles, underground cables, substations and associated equipment such as switchgear and transformers, as well as secondary assets for metering, protection, communication and automation/control functions.

The transmission network operates at voltages of 330 kV, 220 kV, 132 kV and 66 kV. The distribution network consists of:

- A high voltage (HV) distribution system operating at voltages of 33kV, 22kV, 11kV and 6.6kV, and
- A low voltage (LV) distribution system operating at voltages of 415V and 240V.

Electricity is received from electricity generators and typically fed into the transmission network, although increasingly, generators are connecting into the HV or LV distribution networks. Substations transform the power into suitable voltages for consumption by consumers, who can be connected to the network at any voltage level. Large commercial or industrial consumers are able to take supply at up to 330kV, while typical domestic consumers take supply at 415V or 240V. Western Power's network is represented diagrammatically in Figure 19.

Figure 18: Extent of Western Power's South West Interconnected System

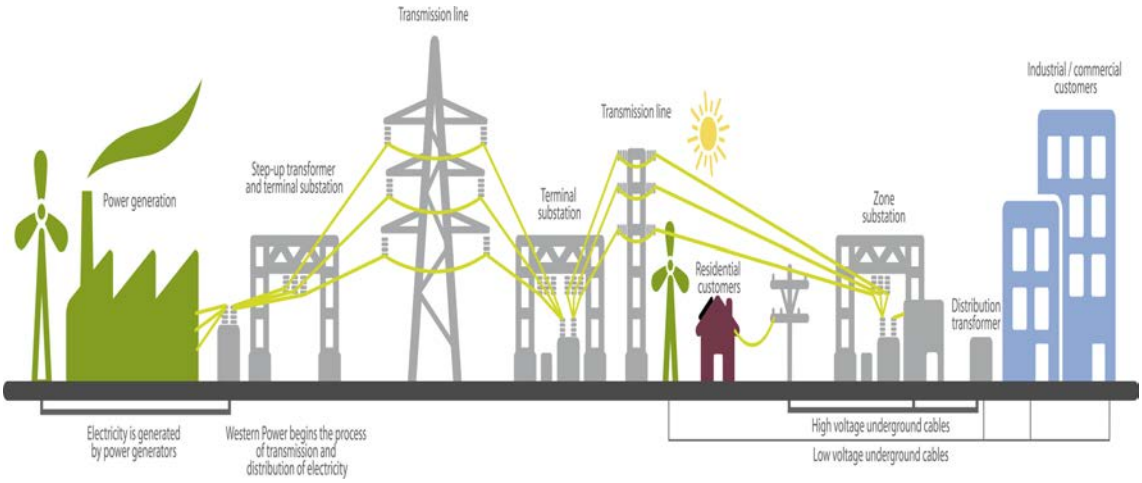


Figure 19: Characteristics of Western Power South West Interconnected System

3.3 External stakeholders

There are many external stakeholders who have significant influence over or interest in the network investment decisions made by Western Power and the outcomes these deliver. These stakeholders include the State Government (shareholder, funder and policy maker), customers, market participants, communities and regulators as described below.

3.4 Customer, market, and communities perspective

Western Power's role is to efficiently provide customers with a safe, reliable, and quality electricity supply and associated energy solutions. This role contributes to economic development within the state and the quality of life for the people of Western Australia.

The network facilitates the Wholesale Electricity Market (WEM). The WEM is administered by the Independent Market Operator (IMO) and allows the trade of electricity between generators and retailers. These market participants require network access to facilitate the trade of electricity.

Customers and communities expect Western Power to make investment decisions that deliver sustainable outcomes which meet their requirements across a range of dimensions including safety, security, access, reliability, quality, flexibility/choice, amenity (such as aesthetic or environmental outcomes) and price.

3.5 State Government perspective

The State Government effectively has four roles in its relationship with Western Power: shareholder, funder, policy maker, and regulator. It exercises these roles through the delegation of different functions to different Government offices and agencies.

As a state-owned Government Trading Enterprise (GTE), Western Power is ultimately accountable for its business performance to the State Government via the Minister for Energy.

The Western Australian Treasury Corporation (WATC) is the Government organisation that acts as the state's central borrowing authority and is the lender of capital to Western Power (managed through the State Budget process).

The Department of Treasury and Finance (DTF) plays a central role in managing State Government public sector finance (including Western Power) and in providing associated expert analysis and advice. The DTF focuses on Western Power's ability to use government funding in an efficient way to maximise shareholder return. It also sets the borrowing limits for Western Power.

As Western Power's sole shareholder, the State Government seeks to be satisfied that investments made by Western Power are a prudent and efficient use of public funds, deliver a satisfactory rate of return, support policy decisions and achieve an acceptable level of risk.

The State Government's role in regulation is discussed in the next subsection.

3.6 Regulatory perspective

Western Power's core business is conducted under economic regulation by the ERA. It is the ERA's role to ensure that Western Power (as a natural monopoly) undertakes prudent and efficient investment to deliver services to customers that they value.

The ERA regulates Western Power via its licences to operate as an electricity transmission and distribution network service provider and in accordance with the Access Code. The Access Code requires that Western Power operates under a formal Access Arrangement, which is periodically revised by Western Power and approved by the ERA for regulatory periods of several years (currently three and soon to be five years).

The Access Arrangement establishes service standards and incentive mechanisms and determines allowable annual revenues and prices - based on numerous parameters, including capital and operating expenditure forecasts and an assessment of the prudency and efficiency of past capital investment.

Western Power is also subject to technical and safety regulation by EnergySafety, as well as a range of other legislation and codes under the jurisdiction of various federal and state regulatory authorities (such as the Department of Environment and Conservation). Such regulators expect Western Power to make investment decisions to achieve compliance (or an acceptable pathway to compliance) with applicable statutory obligations.

3.7 Western Power perspective

Western Power is required to make investments in its network within the context of the 'often competing' needs and expectations of the various stakeholders, balancing cost, performance, risk and achievement of other strategic objectives. Such investments are usually in response to statutory compliance obligations and/or current and future challenges or opportunities.

Ensuring commercially sound, well justified and transparent network investments is crucial to Western Power for a number of reasons, including:

1. Delivering sustainable shareholder and customer value,
2. Achieving satisfactory determinations from the ERA on Access Arrangement revisions (pricing and revenue outcomes and appropriate returns on past investments), and compliance with licence conditions,
3. Gaining access to adequate funding from the shareholder to support investments,
4. Achieving other corporate strategic objectives,
5. Supporting and enabling the decision-making of external stakeholders, and
6. Achieving a reputation as a competent, credible, customer focused, commercially sound and environmentally and socially responsible service provider.

Figure 20 depicts some of the links and relationships between key external stakeholders, Western Power and the investments it makes in the network.

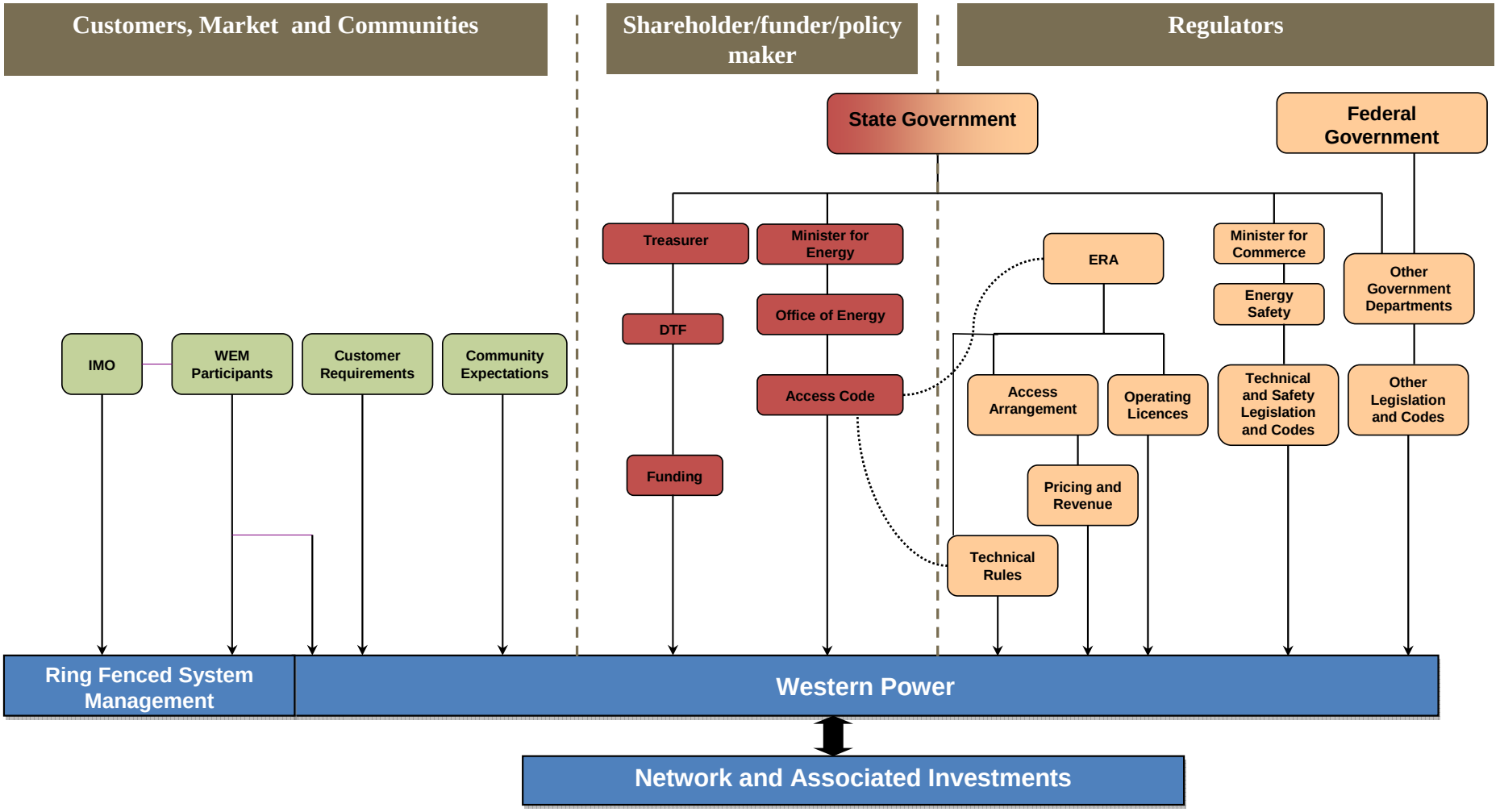


Figure 20: Relationships between key external stakeholders and network investment decisions

4 Western Power's strategic planning environment

4.1 Introduction

The purpose of this section is to describe Western Power's broader strategic planning environment, and how the NIS fits within this environment. It is intended to provide an insight into the issues that the NIS responds to and how it gives effect to Western Power's corporate vision.

4.1.1 Vision, purpose and values

The heart of Western Power's strategic planning environment is the corporate vision. The corporate vision describes the desired future state for the overall business and directs the whole-of-business response to challenges and opportunities. The corporate vision is complemented by the corporate purpose and associated values.

Western Power's **vision** is that:

By 2020 to be recognised as a world class commercial enterprise, providing sustainable energy transfer/connections and related services. We will:

- Have a quality network that meets the needs of customers and stakeholders,
- Have multiple service offerings delivering diverse income streams,
- Be sought out for our expertise in energy,
- Be recognised for our engagement with communities and for superior customer service,
- Be the dominant provider of smartgrid services across WA,
- Be a leader in energy efficiency and supporting renewables,
- Return superior shareholder value, and
- Be recognised for our engaged, committed and highly skilled staff as the source of competitive advantage.

Western Power's **purpose** is: Connecting people with energy. This is founded on the following elements:

- Connections – internal and external connections between our people, our customers and the community, as well as the physical connections to infrastructure and technology,
- People – customers and communities of WA, and
- Energy – recognising that the primary focus is to deliver electricity,

Western Power's **values** are:

- Put safety first,
- Respect the customer,
- Work together,
- Make a positive difference,
- Earn trust, and

- Act like it's our own business.

4.1.2 "Transform the Core"

Western Power's strategic direction is articulated in an overarching strategy known as *Transform the Core*. This strategy has been developed to respond to the current strategic challenges faced by Western Power and is intended to operate over the three year period from 2010/11 to 2012/13. Its aim is to focus on excellence across the core operations to simplify and improve the responsiveness and commerciality of the business. However, it also incorporates a future positioning element.

From 2013/14, Western Power's strategic direction will continue to leverage future opportunities as Western Power responds more fully to the needs of the shareholder, customers, regulators and other stakeholders.

Transform the Core has four primary areas of focus: External Connections; Regulatory Excellence; Operational Excellence; and Future Growth, plus three enabling strategies: Safety and Health; People and Culture; and Information and Communication Technology, as represented in Figure 21.

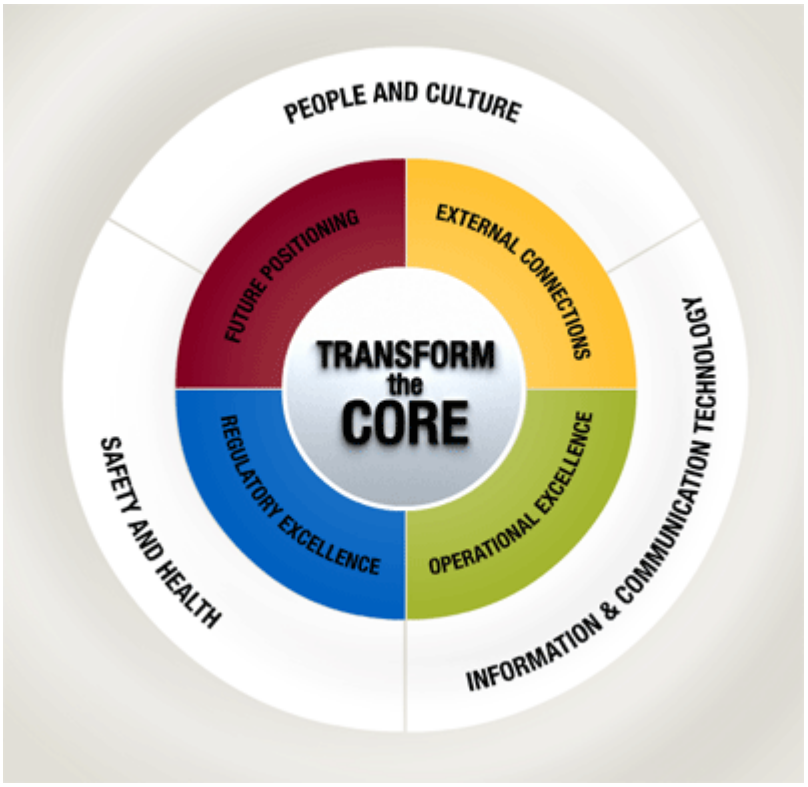


Figure 21: Western Power's *Transform the Core* strategy

4.1.3 Key support strategies

Consistent with the *Transform the Core* strategy, Western Power is developing five key strategies intended to support the delivery of, and collectively give effect to, Western Power's corporate vision. These are the: Customer Strategy; Financial Strategy; Regulatory Strategy; Works Delivery Strategy; and Network Investment Strategy (this NIS).

These five key support strategies are lead decision making tools. They are derived from, and support delivery of the corporate vision. However, they are also an input to and inform the development of the corporate vision.

These support strategies do not operate in isolation. They are integrally and dynamically linked and strongly interdependent. Each informs and receives input from the others.

The other four key support strategies are described briefly below:

1. **Customer Strategy** – articulates Western Power's strategy for engaging with and meeting the needs of the various customer segments across all facets of the business.
2. **Financial Strategy** – articulates the medium to long term financial direction for Western Power. It is intended to support regulatory decisions and investment opportunities with knowledge about price impacts, stakeholder requirements, shareholder funding and Western Power's financial position.
3. **Regulatory Strategy** – articulates Western Power's strategy for operating within an economic regulatory regime. The intent of the Regulatory Strategy is to deliver good regulatory outcomes for Western Power, and through this, good outcomes for its customers, shareholder and other stakeholders. The Regulatory Strategy is intended to integrate the features of the regulatory framework and regulatory contract into the decision making processes of Western Power.
4. **Works Delivery Strategy** - articulates Western Power's strategy for delivering Western Power's investment portfolio. This includes the strategies for resourcing (internal and external resources), procurement, fleet/plant, and work and resource planning/scheduling.

While the five key support strategies currently exist to various degrees, they are not all articulated in individual, consolidated documents. In three cases (this Network Investment Strategy, the Customer Strategy and the Financial Strategy), the consolidated strategy documents have or are being developed as part of the *Transform the Core* strategy. In other cases, the strategies will initially be consolidated within the AA3 submission and then built into 'stand alone' consolidated documents at some point in the future.

Figure 22 shows Western Power's overall strategic planning environment and how *Transform the Core* and the five support strategies integrate with this.

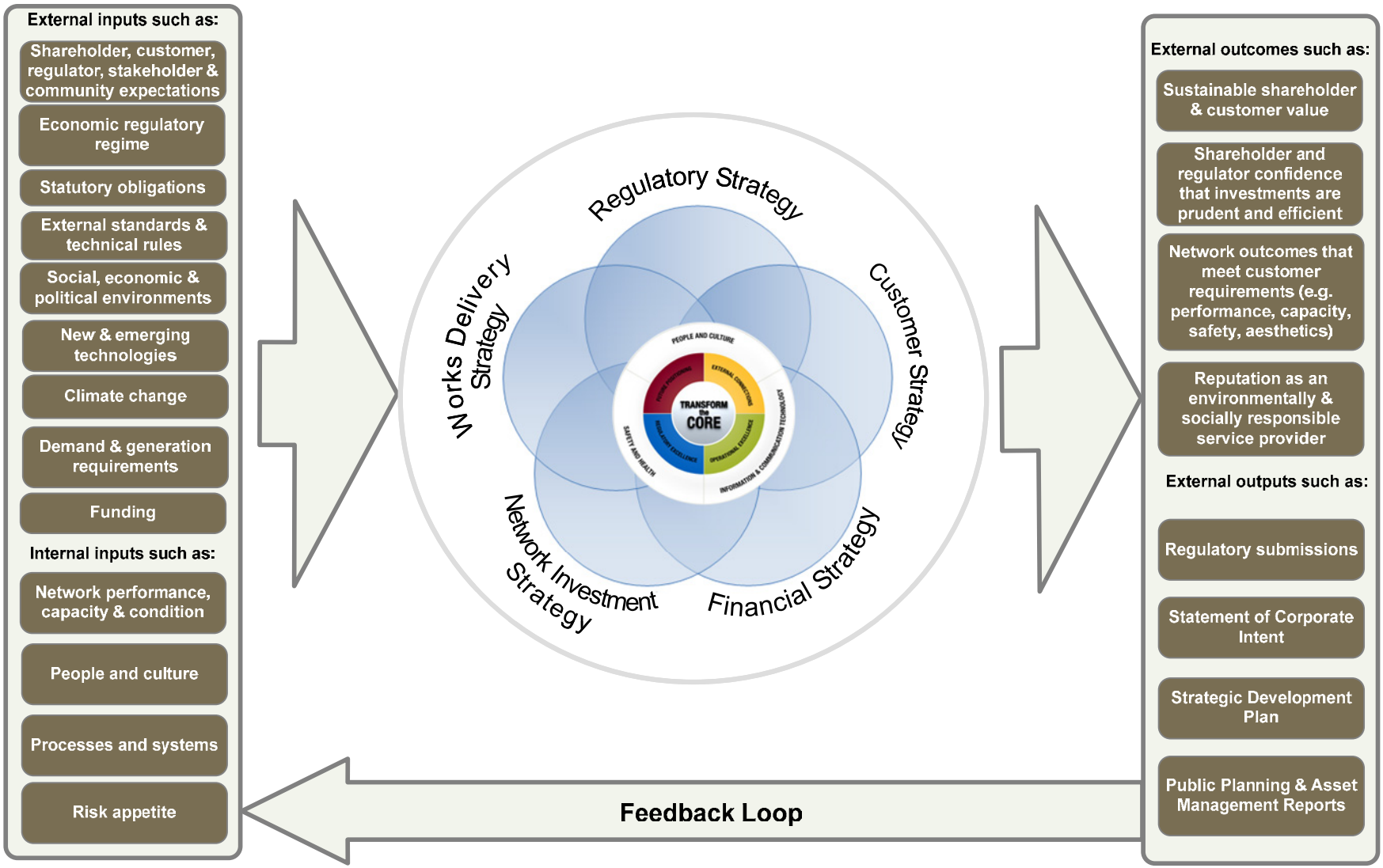


Figure 22: Western Power's strategic planning environment

5 Core elements and application of the NIS

5.1 Introduction

The purpose of this section is to introduce Western Power's Network Investment Strategy, its core elements and its application as a decision making tool within and external to Western Power.

5.2 Overview

Like the other key support strategies, the NIS is a lead decision making tool, linking the corporate vision to the network investment planning and decision making process.

As a decision making tool, the NIS applies at both the strategic and functional levels and provides guidance to those within the business who operate at these different levels.

At the strategic level, it guides the Board and Executive in establishing the strategic direction of network investments. This involves setting the network vision, objectives, guiding principles and risk appetite.

At the functional level it guides planning staff and leaders who are required to make, prioritise or approve individual investment decisions on a day to day basis as part of their role.

The framework for Western Power's NIS is shown in Figure 23. The current state for each the core elements of this framework is described in detail in subsequent sections. For those elements where opportunities for improvement exist (e.g. in processes, systems, documentation or strategy), the desired future state is also described, along with the intended pathway to achieve this.

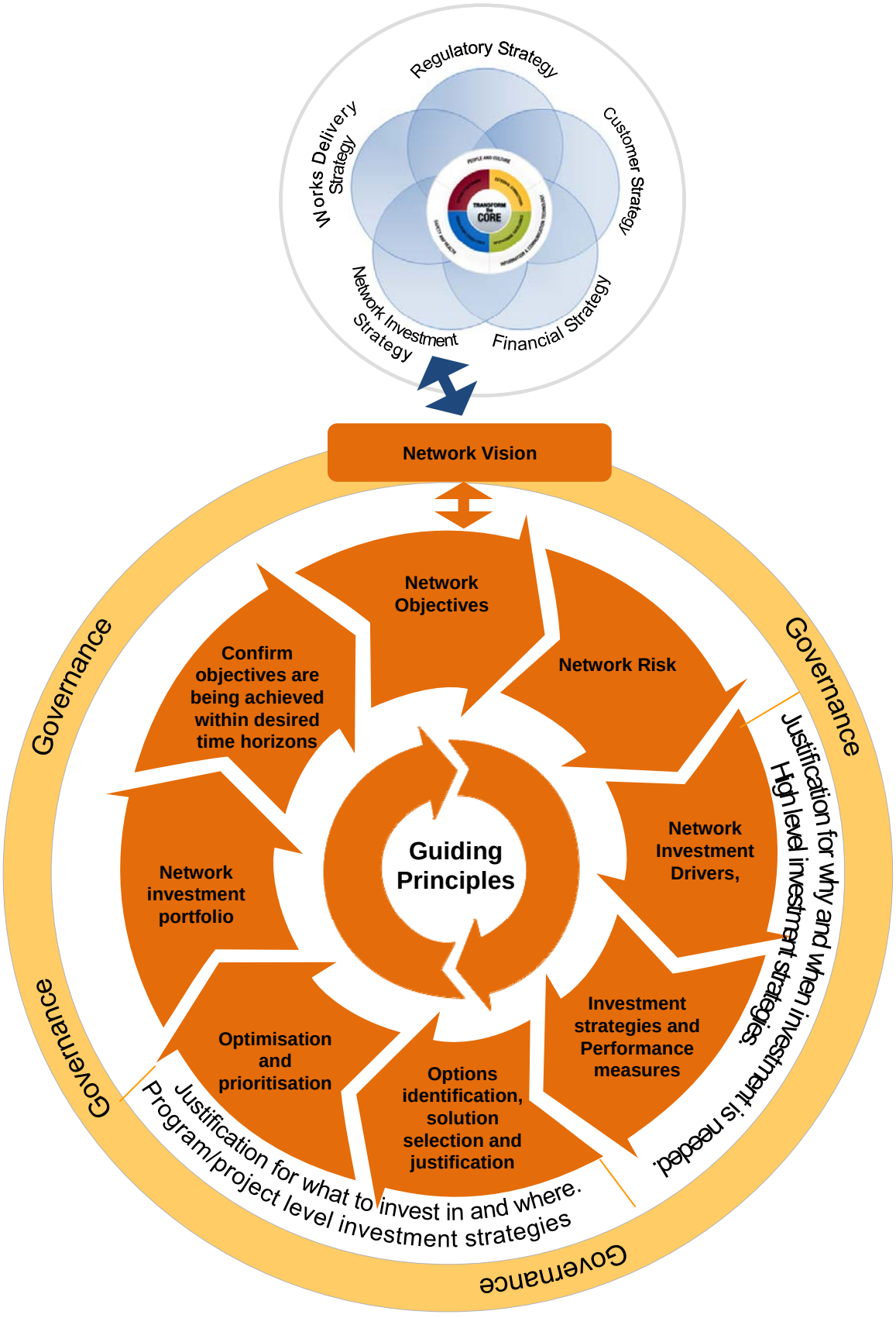
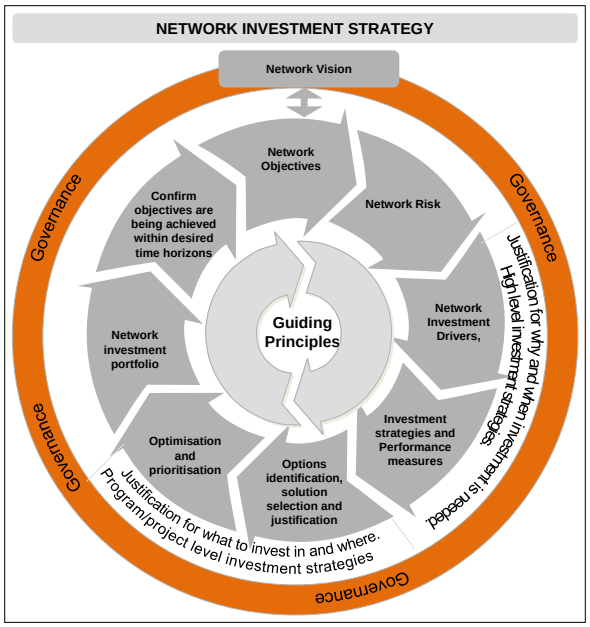


Figure 23: Core Elements of the Network Investment Strategy

6 Governance framework



6.1 Introduction

The purpose of this section is to describe the governance framework associated with the NIS. Governance establishes the processes, systems and controls to be applied to ensure that all investment decisions are made consistent with the NIS framework. This includes clarity of roles and accountabilities, accurate/timely information and clear processes/criteria to support decision making, and the opportunity to review and monitor the process and outcomes.

6.2 Overview

Governance of network investments sits within the broader Corporate Governance Framework, which is described in DM# 3444604.

Effective and transparent governance over network investments:

1. Provides guidance to key decision maker on roles, accountabilities and authorities,
2. Ensures transparent, consistent and holistic decision making, aligned to key aspects of the NIS framework, and
3. Promotes confidence with and provides assurance to the shareholder and key external stakeholders of Western Power's ability to make good investment decisions.

In application to the NIS framework, there are effectively two levels of governance, strategic and functional, as shown in Figure 24.

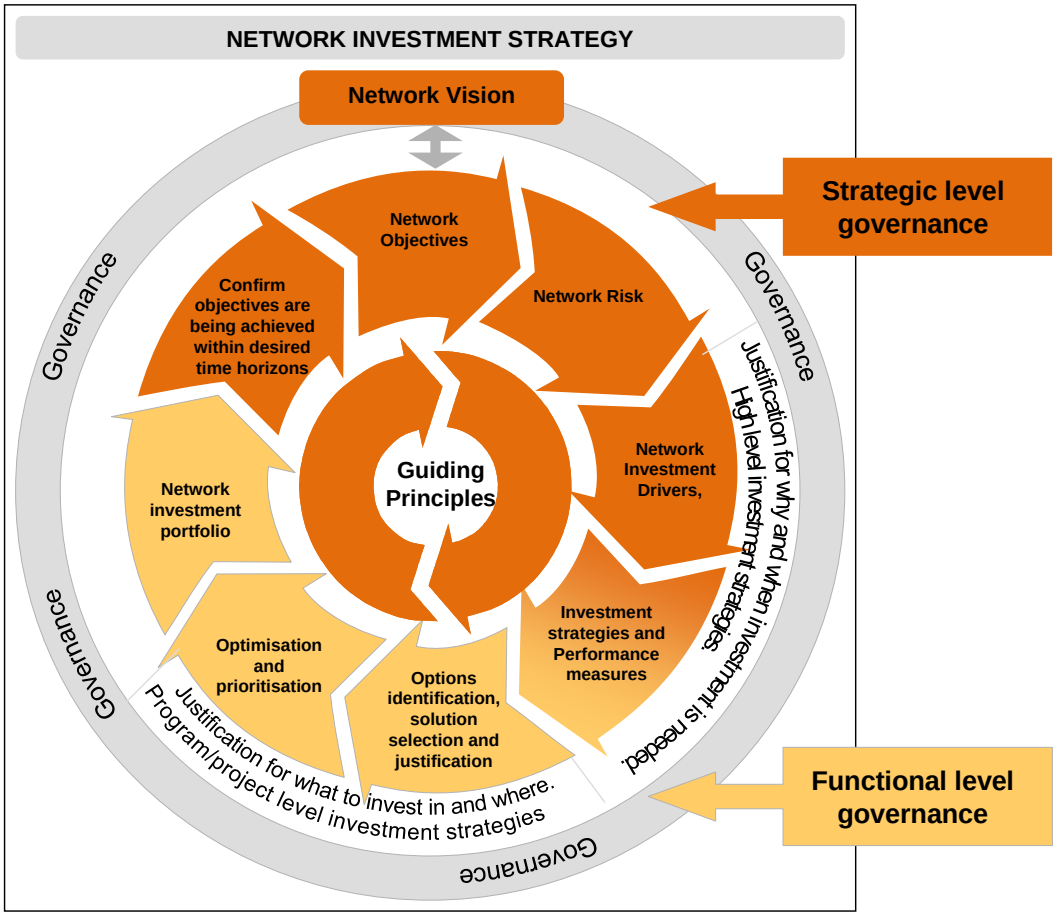


Figure 24: Strategic and functional levels of NIS governance

At the strategic level, the emphasis is on establishing and governing those elements that guide the strategic direction of investments. While not static, these elements are more enduring and have longer periods between reviews.

At the functional level, the emphasis is on establishing and governing those elements where individual investment decisions are made. These elements are dynamic and subject to more regular review and approval.

An overview of the two levels of governance of the NIS framework is provided in the remainder of this section.

6.3 Strategic level governance

The elements that fit within the area of strategic governance (shown in red in Figure 24, such as the network vision and objectives) are the longer term, more thematic (bigger picture) elements. They are stable for longer periods, with a proactive rather than reactive focus.

These elements are developed by Western Power's Executive in response to the corporate vision set by the Board, and are subject to the approval of the Board. They need to be reviewed and recalibrated on a regular basis in response to evolving or future challenges or changes to the corporate vision and objectives. Typically these elements would be reviewed for currency on an annual basis, with a major review/recalibration done every three years or when a significant change in the business environment occurs.

Engagement between the Executive and the Board on establishing, approving and reviewing these elements is currently done as part of the overall annual corporate planning process. In addition, significant engagement occurs between the Executive and the Board on the strategic elements as part of the annual Approved Works Plan (AWP) submission process and also as part of the Access Arrangement revision process.

6.4 Functional level governance

The remaining elements (shown in orange in Figure 24, such as options identification and optimisation) fit within the area of functional governance, as they are closely aligned with the day-to-day ('business as usual') activities. Accountabilities for these elements lie with individual General Managers and Branch Managers based on their specific areas of accountability.

At this level, the overall investment governance framework is described in Western Power's Works Program Governance Manual (DM# 5200741), custodianship of which resides with the Network Investment Branch. This framework sets out the steps required to identify, develop, design and deliver network investment projects or programs.

The framework outlined in the Works Program Governance Manual is characterised by a six phase/six gate process as shown in Figure 25. As indicated, the NIS focuses on the first three phases of the investment lifecycle, that is, the Initiation, Scoping and Planning phases, which result in approved business cases.

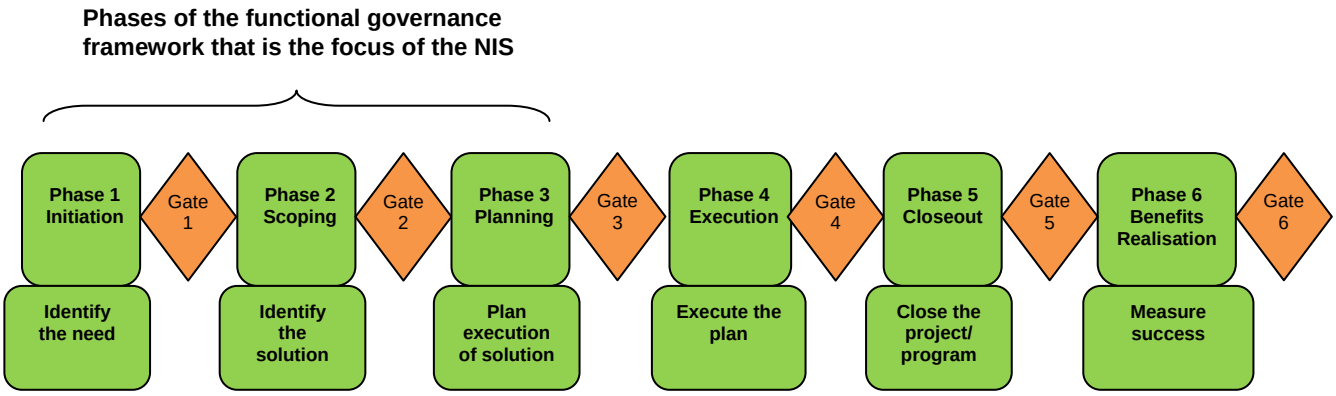


Figure 25: NIS governance process at the functional level

This six phase/six gate process is managed within the context of the Annual Planning Cycle. This defines and guides the different planning activities that take place over the calendar year and ensures that the whole business is working to a common timeframe for the key planning activities. It also provides clear linkage between the building blocks of investment decisions and financial requirements and describes the different inputs and outputs involved.

Details of the Annual Planning Cycle are provided in the Annual Planning Cycle Interpretation Guide (DM# 7389850). The linear and pipeline views of the annual planning calendar are shown in Figure 26 and Figure 27 respectively. These depict the phases of individual investment decisions within the gated process.

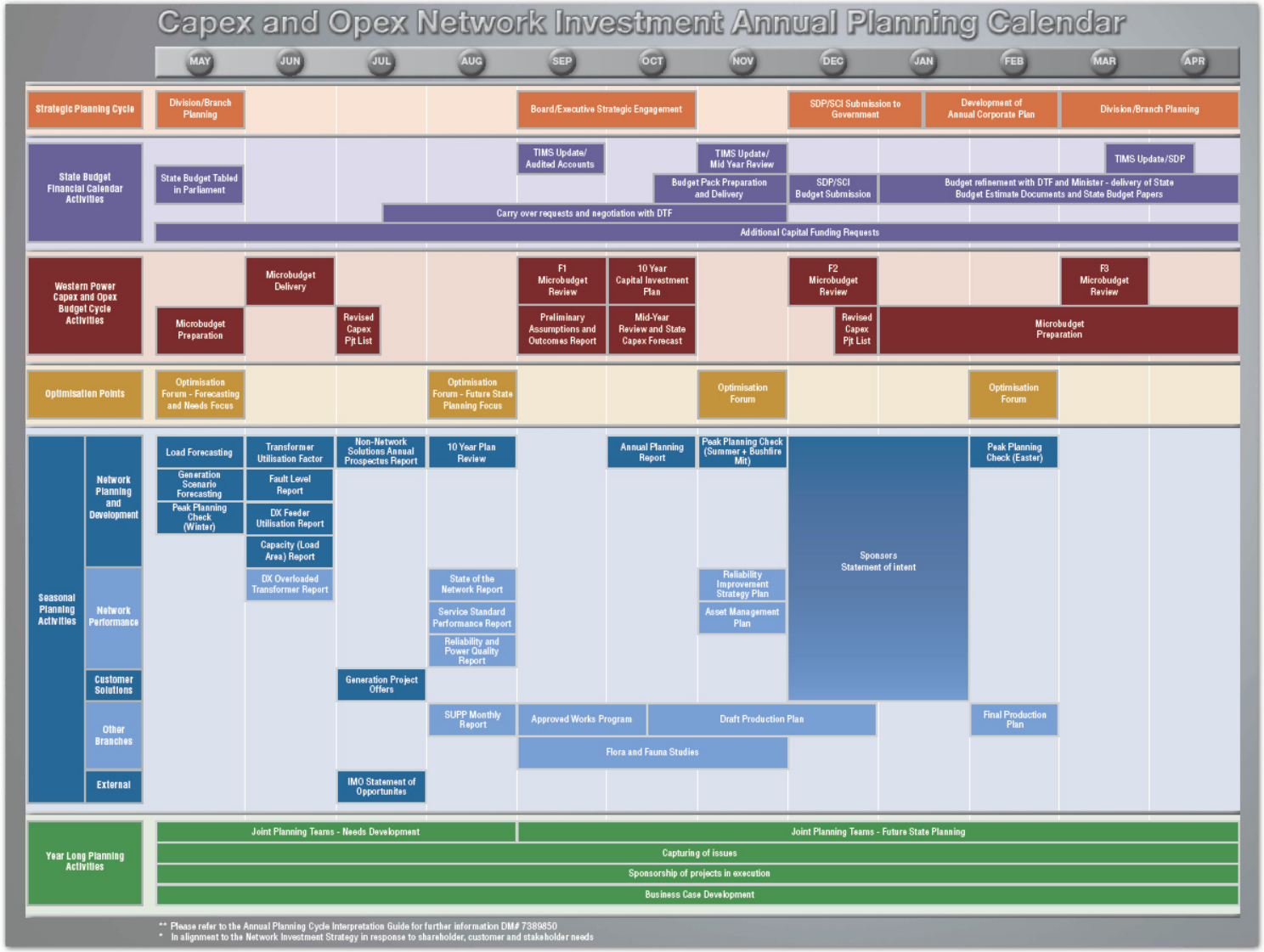


Figure 26: Annual planning calendar – linear view (see DM 7500617 for expanded view)

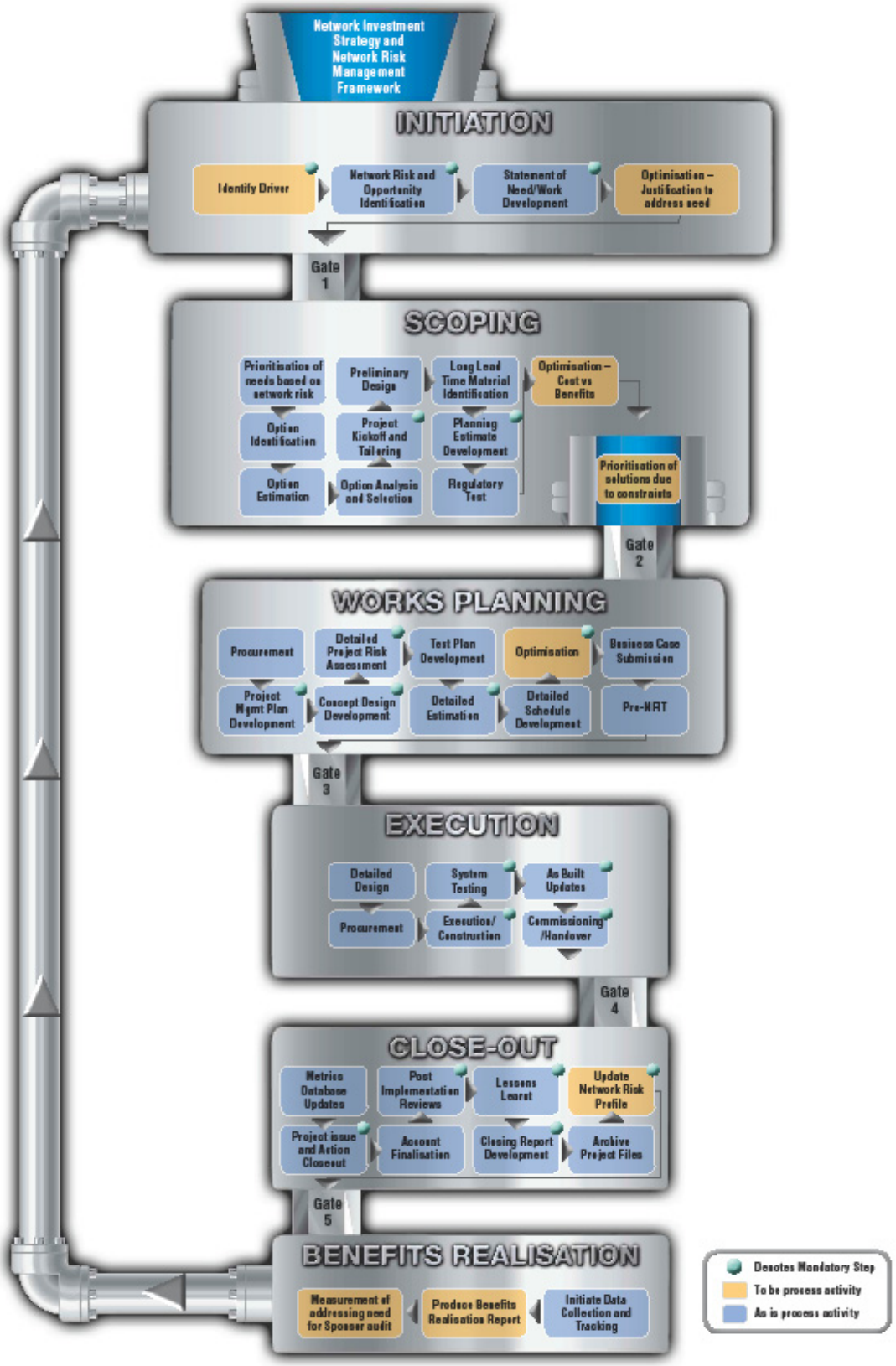
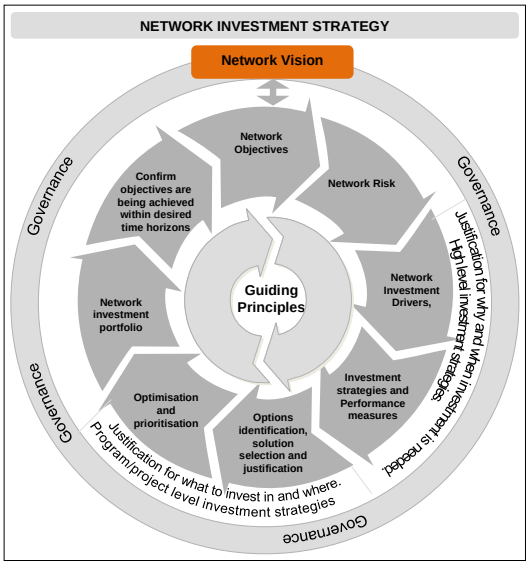


Figure 27: Annual planning calendar – pipeline view (see DM 7500593 for expanded view)

7 Network vision

7.1 Introduction



The purpose of this section is to introduce and describe Western Power's vision for the network and its importance within the NIS Framework.

This vision is intended to provide a 'beacon', and stretch thinking. It is based in the reality of 'what is' but articulates what 'can be'.

7.2 Overview

Conceptually, the NIS lifecycle begins with the formulation of a network vision. In the same way that the corporate vision describes the desired future state for the business, the network vision describes the desired future state for the network. This includes how electricity is supplied to customers, which may be via the network or via non-network solutions (such as stand alone power supplies).

Western Power's network vision is derived from and supports the delivery of the corporate vision, but is narrower in its focus. It concentrates on the future performance, functions and outcomes to be delivered through or enabled by the network, reflecting its interconnected nature and strategic importance in terms of providing options to and enabling outcomes valued by customers, the shareholder and other key stakeholders.

At the highest level, Western Power's network vision is shown in Figure 28. However, this vision is crystallised and translated into functional decision making through an associated set of network investment guiding principles and network objectives, which are described in subsequent sections.

Network Vision

An intelligent, connective and safe network that delivers sustainable shareholder and customer value, is compliant with statutory obligations, and enables the delivery of energy solutions that are customer oriented, environmentally responsible and socially acceptable.

Figure 28: Western Power's network vision

Western Power's network vision recognises that:

1. Customers and communities are ready for and desire change. They have a growing desire for greater control and choice around the way they use and manage electricity and have increasing expectations for the safety, reliability, quality, efficiency and cost of its supply.
2. The shareholder and other key stakeholders have increasing expectations for sustainable returns on investment, maintaining an acceptable level of risk and for the network to be an enabler for state development.
3. The network needs to accommodate and respond to external factors such as climate change, globalisation, population growth, changing technologies and changing energy policies.

Figure 29 depicts some of the challenges for the future network, and to which Western Power's network vision responds.

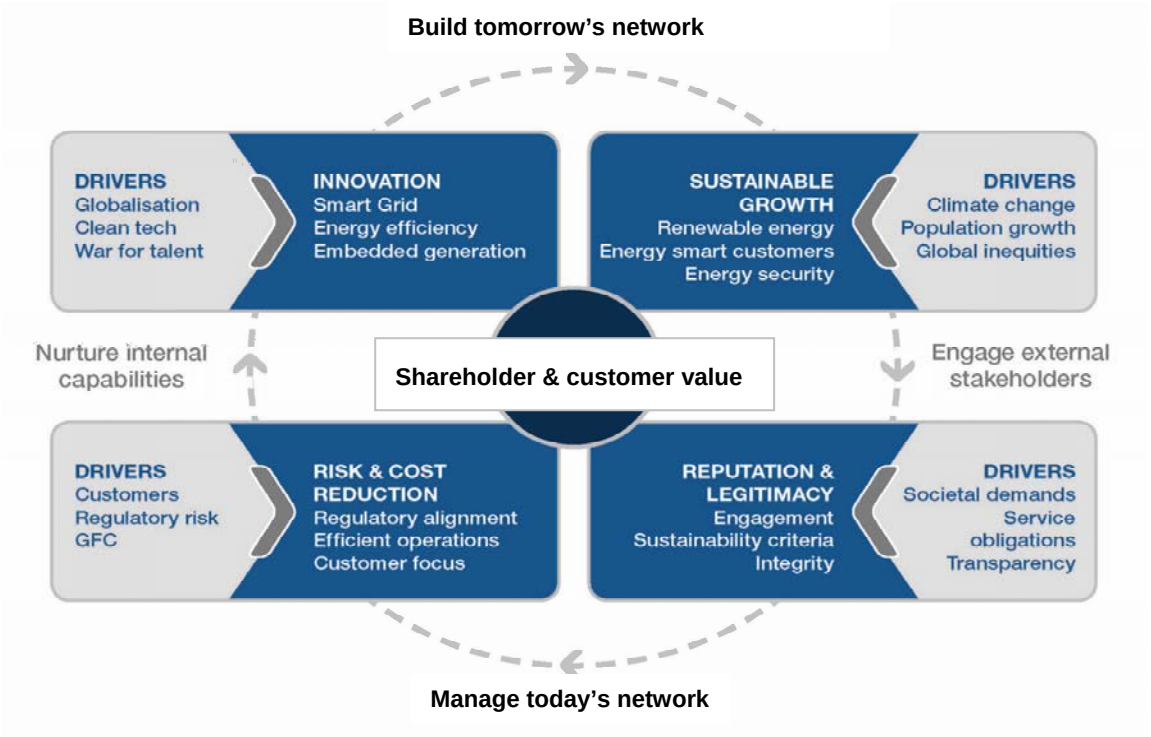


Figure 29: Challenges for the future network

7.3 The 'intelligent' network

Western Power's network vision recognises that the traditional network architecture of poles, wires and associated assets will play a key role in the delivery of electricity into the foreseeable future. However, it also recognises the need for this network to become more 'intelligent' and connective if it is to provide for the changing needs of customers and stakeholders.

To a large extent, Western Power's vision for a more 'intelligent' network is embodied in its 'Smart Grid[1] Roadmap' (DM# 7661962), which is being developed as a strategic

[1] Smart Grid is a term widely used within the industry to describe the journey to enhance the 'intelligence' of an electricity network through a combination of new technologies (smart metering, digital communications, smart sensors, smart appliances, remote control and monitoring) and new ways of managing the network.

initiative under the *Transform the Core* strategy. Many of the network challenges can be met through smart grid capabilities, with some examples shown in Table 1.

Table 1: Examples of how network challenges can be met through smart grid capabilities

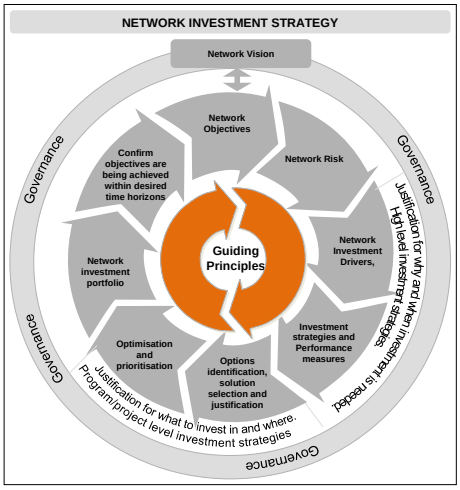
Current network	Smart grid features	Future network
Focused on protection of assets following system faults	**Self-heals**	Automatically responds to problems. Focused on prevention. Minimises customer impact.
Customers have limited information, choice or ability to manage electricity needs	**Engages the customer**	Customers informed, involved and active in managing their electricity needs. Broad penetration of demand management. Availability of choice.
Focused on outages rather than power quality (PQ) problems. Slow in resolving PQ issues.	**PQ for 21st century needs**	PQ meets industry standards and customer needs. Proactive issues resolution.
Relatively small number of large generation plants. Numerous obstacles exist for connecting renewables.	**Accommodates all generation and storage options**	Diverse distributed generation and storage devices complement the large generating plants. 'Plug-and play' convenience.
Minimal integration of limited operational data with asset management processes and technologies. Siloed business process. Significant time based maintenance.	**Optimises assets and operates efficiently**	Sensing of grid conditions. Grid technologies integrated with asset management processes for effective management of assets and costs. Significant condition based maintenance.

7.4 Future state

As part of the evolutionary process of the NIS and development of the Smart Grid Road Map, Western Power intends to engage internally and externally to identify, investigate and analyse a range of possible future scenarios. These scenarios will encompass how network services might be required to change in the future to deal with issues such as major shifts in the penetration/level of distributed generation, consumer metering and demand side elasticity, major changes in climate, changes in polices or changes in technology. This will facilitate the establishment of a more robust and expansive network vision that responds to a considered view of what the future might hold.

8 Network investment guiding principles

8.1 Introduction



The purpose of this section is to introduce and describe a set of guiding principles that are routinely and consistently applied during the network investment decision making process.

These are intended to provide a frame of reference for investment decision makers, where trade-offs between cost, risk and performance are required.

There is a strong link between these investment guiding principles and Western Power's values (described in Section 4).

8.2 Application of guiding principles

The consistent application of these principles will ensure transparent, commercially sound and sustainable investments in network and non-network solutions. It will provide increased assurance of regulatory compliance in the areas of technical, safety, environmental management and economic regulation (for example, where investments are required to satisfy prudency and efficiency tests in the Access Code).

These principles will also assist in dialogue with the shareholder, customers and other stakeholders.

Western Power's network investment guiding principles are shown in Figure 30 and described in more detail in the remainder of this section.

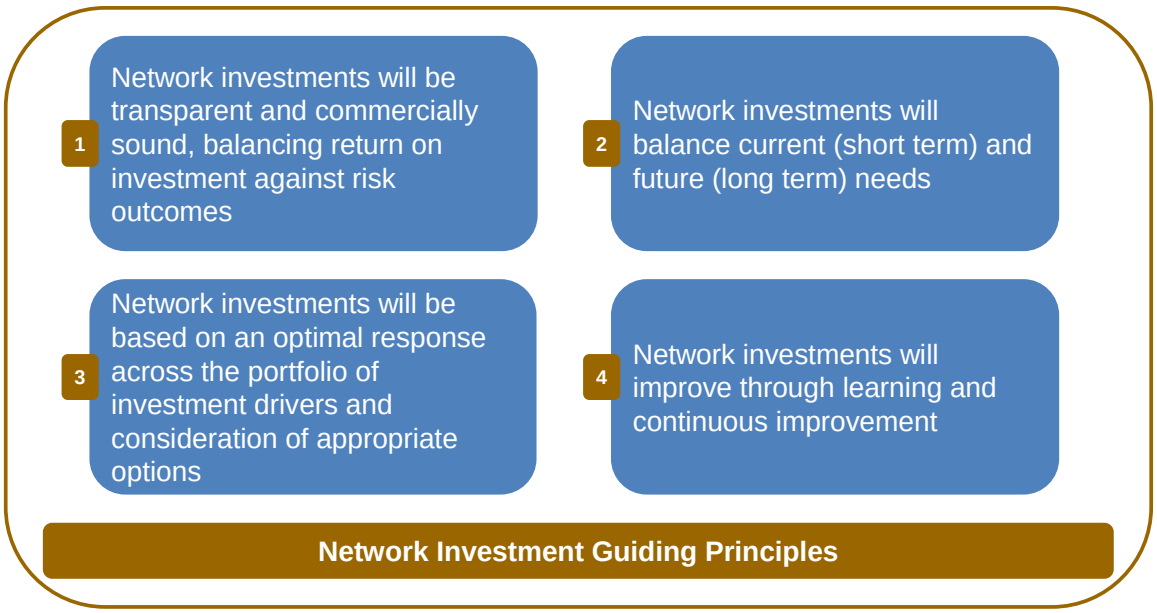


Figure 30: Network investment guiding principles

Guiding principle 1 – Network investments will be transparent and commercially sound, balancing return on investment against risk outcomes.

Western Power seeks to make commercially sound investments in network and non-network solutions that yield the most technically prudent and economically efficient outcomes, assessed by weighing the various options and selecting those that maximise the net benefit to all those who produce, transport, sell, or consume electricity across the network.

Western Power also recognises that the management of risk pervades all facets of the business, from the development of the corporate vision through to managing all aspects of the asset lifecycle. Western Power seeks to plan and make investment decisions using a risk based approach to ensure environmentally sound, socially responsible and safe outcomes.

Western Power also seeks to ensure that investment decisions are transparent and demonstrably justifiable. This includes satisfying prudency and efficiency tests in the Access Code, such as the NFIT.

Guiding principle 2 – Network investments will balance current (short term) and future (long term) needs.

Many network assets have high initial capital costs and very long lives. Investment decisions made today will therefore have implications for many years into the future.

Western Power seeks to plan and make investment decisions that take into account both short and long term outcomes, based on evaluating the whole of lifecycle cost of creating, owning, operating, maintaining and disposing of assets. This principle applies to all drivers for investment, including asset replacement, maintenance and growth.

The future value of options provided by investments will be routinely assessed to ensure investments that preserve efficient future options and deliver sustainable outcomes proceed.

Guiding principle 3 - Network investments will be based on an optimal response across the portfolio of investment drivers and consideration of appropriate options.

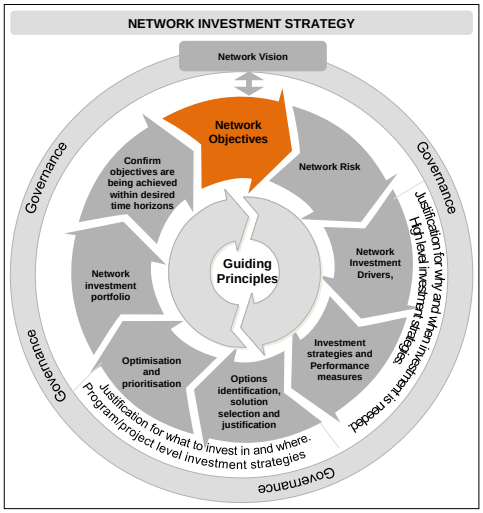
Western Power seeks to maximise the value of its investments by optimising work responses across the portfolio of investment drivers. Western Power also recognises the importance of considering an appropriate range of options to address network issues as part of the investment decision making process. This includes both traditional solutions and non-traditional (non-network) solutions. It also recognises the need for a consistent process for identifying, assessing and selecting the most appropriate option on the basis of a robust set of criteria.

Guiding principle 4 – Network investments will improve through learning and continuous improvement.

Western Power seeks to continuously improve the quality of its network investment decision-making through the application of learning from its own investment outcomes, through innovation and through collaboration with its peers and peak industry bodies.

9 Network objectives

9.1 Introduction



The purpose of this section is to introduce and describe Western Power's network objectives, which translate the network vision into more tangible outcomes.

Each network objective is described in terms of the outcomes Western Power seeks to deliver or enable via the network, and the goals Western Power has established to determine if the objective is being achieved.

These objectives are not pursued in isolation. They are usually interdependent rather than discrete. Efforts to achieve one objective will often contribute to the achievement of other objectives. For example, pursuing compliance is likely to result in better meeting customer requirements for performance and value.

These network objectives are shown in Figure 31 and described in the remainder of this section.

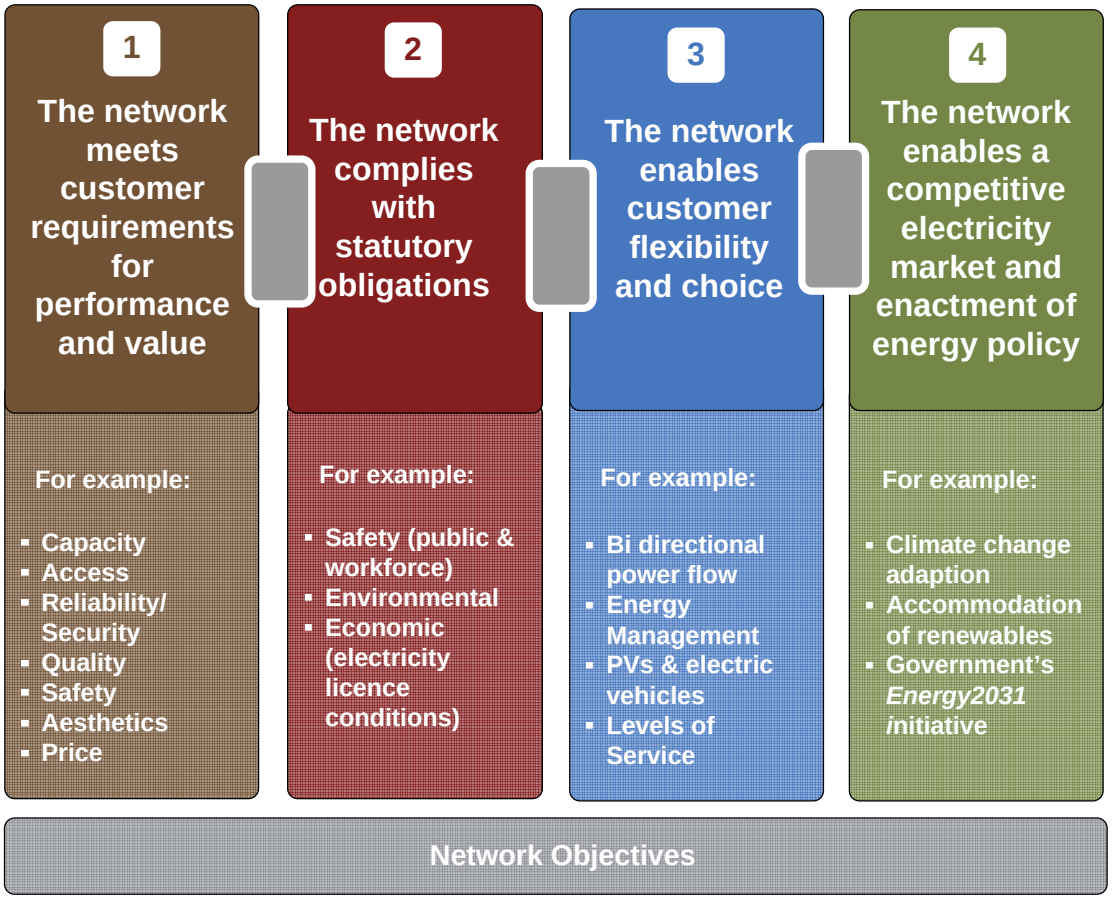


Figure 31: Network objectives

1 The network meets customer requirements for performance and value

Western Power seeks to develop a network that meets its customer's requirements for performance, including reliability/security/quality of supply, availability of capacity (to meet growth) access (the ability to connect to the network), safety and aesthetics. Western Power also seeks to deliver value to customers, recognising their segmented nature and differing needs.

In achieving this objective, Western Power will proactively engage with customers to develop a mutual understanding of the trade-offs that may be necessary between performance requirements and price impacts and to gain a clear understanding of the balance between performance and price that customers prefer.

Western Power will know that it is achieving this objective when the following goals have been met:

- Western Power is able to clearly articulate the relationships between service obligations, service targets and required investment,
- Customers are well informed about and have a clear understanding of the relationship between performance and price, and have articulated choices between the two,
- Western Power has obtained support from regulators and the shareholder for the level of investment required to deliver the levels of services customers value and choose (over time),
- Western Power is achieving agreed service targets across the range of network performance dimensions, and
- Customers believe that Western Power is providing an appropriate level of service at a fair price (value for money).

2 The network complies with statutory obligations

Western Power's network activities are governed by a range of federal and state statutory instruments such as legislation, regulations, codes and rules. These cover most aspects of its operations, including licensing, performance standards, the safety of the public and workforce, land access and environmental obligations.

From an NIS perspective, statutory obligations can be split into two broad categories:

1. Obligations which are industry specific (i.e. they exist to govern Western Power in its role as a regulated network service provider) and have a direct impact on Western Power's network investment decisions. The principle sources of such obligations are Western Power's electricity distribution licence (EDL1) and electricity transmission licence (ETL2), which prescribe the applicable licensing legislation that Western Power must comply with.
2. Obligations which are general in application but still have an impact on Western Power's network investment decisions. These include a number of environmental and safety obligations such as the Environmental Protection Act 1986 (WA), the Environmental Protection (Noise) Regulations 1997 (WA) and the Occupational Safety and Health Act 1984. These also include a range of obligations embedded in instruments such as Australian Standards or industry Codes of Practice.

An overview of key statutory obligations relevant to Western Power's network investment decisions is provided in Appendix B - Statutory obligations.

Western Power seeks to ensure that its network and the covered services it provides fully comply with all statutory obligations. However, Western Power recognises that this is a journey that occurs (and changes) over time. In some areas, an interim step will be strong progression on a pathway to compliance as agreed with the relevant regulator.

Western Power will know that it is achieving this objective when the following goals have been met:

- There is full internal visibility and external understanding of all statutory obligations, the controls in place to manage ongoing compliance and Western Power's current state of compliance,
- Western Power fully complies with all significant statutory obligations and has a pathway to compliance (where possible, agreed with the relevant regulator) for all other statutory obligations,
- The investment streams necessary to maintain existing levels of compliance and achieve all agreed pathways to close compliance gaps are fully supported by the ERA and fully funded by the shareholder,
- All public safety risks are managed within the framework of an approved Electricity Safety Case,
- There are no notices of, or prosecutions for, breaches of compliance obligations, and no safety-related 'orders' are received from safety regulators such as Energy*Safety*,
- There are no material adverse findings from Western Power's distribution and transmission licence audits, and
- Western Power is seen as a responsible corporate citizen by all relevant regulatory bodies and communities.

3 The network enables customer flexibility and choice

Western Power seeks to develop an 'intelligent network' (through the deployment of solutions such as new communication, automation, control and metering technologies). The network will empower customers through information, choice and flexibility in the way they manage their energy consumption, and will enable wide spread use of new technologies such as in-home displays, smart appliances, demand management, energy conservation, renewable energy sources and energy storage devices such as electric vehicles.

Western Power will know that it is achieving this objective when the following goals have been met:

- The network is intelligent, flexible, and easily able to accommodate bi-directional electricity flows, where it is efficient to do so,
- Western Power has a Smart Grid roadmap established and endorsed by key external stakeholders, with significant and growing penetration of non-network solutions where this is the most efficient way to deliver the required services,
- Customers have ready access to information and greater ability to respond to this when making decisions about their electricity usage, and

- Customers have flexibility and choice about performance levels to suit their individual needs.

4 The network enables a competitive electricity market and enactment of energy policy

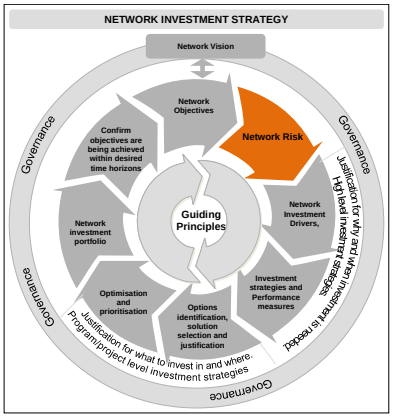
Western Power seeks to develop a network that enables the continued evolution of a competitive electricity market and innovation in energy efficiency to drive lower energy costs. Western Power also seeks to ensure that the network enables the enactment of Government energy policy, recognising the current and emergent nature of policy.

Western Power will know that it is achieving this objective when the following goals have been met:

- Efficient processes are in place to allow easy, timely and cost effective connection to the network,
- The network enables enactment of Government policy initiatives, such as any carbon related legislation or Government incentives driving wide-scale connection of embedded generation to the distribution network, and
- Credibility with the shareholder, regulators, customers and other key stakeholders, facilitates Western Power's influence over its current and future operating environment, including services and expectations, regulatory framework and policy development.

10 Network risk

10.1 Introduction



The purpose of this section is to introduce and describe the concept of network risk. It describes the relationship between network risk and corporate risk. It outlines the concept of acceptable and unacceptable network risks, and the relevance of these concepts to network investment decisions. There is a strong relationship between acceptance of network risk and Guiding Principle 1 (*network investments will be transparent and commercially sound, balancing return on investment against risk outcomes*).

10.2 Overview

Western Power's Risk Management Policy (DM# 3842495) states that: "*Risk management is integral to the successful achievement of Western Power's goals and a key requirement of effective corporate governance.*

All business decisions involve some degree of risk. Western Power's policy is to ensure that risk management is a living and dynamic process that is embedded throughout the business and managed in a structured and systematic manner to assist managers to make informed decisions and achieve successful business outcomes."

10.3 Network risk

Western Power's Risk Management Framework (DM# 3861477) defines risk as "the effect of uncertainty on objectives". Network risks are the subset of Western Power's risks that give rise to uncertainty in the achievement of the network objectives defined in Section 9.

Network risks arise through Western Power's ownership of the network and the provision of covered services, including the application of statutory obligations (refer to Appendix B – Statutory obligations). Uncertainty arises from issues such as load growth, the aging of assets, changing legislative and performance obligations, and changing customer and market requirements. Therefore risks will increase over time if left untreated.

Network risk does not extend to risks related to the execution of work on the network, or to occupational health and safety issues. Mitigation of these risks is principally achieved in how network investment is carried out, but are not drivers of network investment.

10.4 Link to network investment

At the strategic level, network risk is pervasive in the consideration of network objectives, definition of network risk tolerance, and the identification of network investment drivers.

At the functional level, network risk is also considered in options, solutions and justification (discussed in Section 12), and optimisation and prioritisation (discussed in Section 13) of network investments. Under option analysis, one of the dimensions to differentiate options is the effectiveness of the network risk treatment under each option. The option that is expected to deliver the greatest reduction in unacceptable network risk for the money invested would normally be the selected option.

If not all proposed network investments can be funded or delivered, prioritisation of proposed network investments must occur. Network investments with the least network risk impact (either lowest risk treatment for money invested, or treating less severe unacceptable risks) would normally be de-prioritised. In this event, the de-prioritised network risk would be reviewed to determine if either the network risk will now be accepted, or if an alternative network risk treatment will be adopted.

10.5 Acceptance of network risk

Evaluation of network risks aims to support decisions about which network risks require treatment, and the relative priority of network risk treatments. In making this evaluation, it is necessary to quantify the current experience of a network risk, and how that network risk will develop over time if left untreated. It is also necessary to define what level of network risk would be considered acceptable. Where the evaluation of a network risk over time shows that it is higher than acceptable, this may be a trigger for network investment.

The concept of acceptable risk is defined in Western Power's Risk Management Framework (DM# 3861477). If Western Power accepts a network risk, Western Power remains subject to the risk. Reasons for acceptance of a network risk may include:

- The network risk rating is low and further mitigation is not appropriate given available resources,
- There are no network or non-network investment options available to reduce the network risk,
- The cost of network or non-network investment is excessive compared to the network risk mitigation possible, or
- The opportunities presented outweigh the potential consequences to such a degree that the risk is justified (e.g. business investment).

This is consistent with the concept of ALARP (As Low As Reasonably Practical) as defined in AS/NZS ISO 31000 Risk Management.

Western Power's Risk Management Policy is embedded within all elements of the NIS. Currently, network risk attitude is reflected in a combination of the following:

- The Corporate Risk Assessment Criteria (DM# 3341162), specifically the likelihood and consequence definitions, the risk rating matrix, and the risk rating priority and guidance definitions. The Corporate Risk Assessment Criteria is part of the Corporate Risk Management Framework (DM# 3861477).
- The asset risk assessment criteria (DM# 6592701), specifically the asset ranking score for risks that are ranked low and moderate on the Corporate Risk Assessment Criteria. The asset risk assessment criteria are part of the Asset Risk Management Framework (DM# 6592239).

10.6 Future state

As a component of the *Transform The Core* strategy, Western Power is progressing a project that will enhance the asset risk management framework to develop a

Network Risk Management Framework (NRMF). The NRMF will implement Western Power's Risk Management Policy in the management of network risks. Network risks will be identified, analysed, evaluated, and treated in accordance with the NRMF.

The NRMF will clearly define acceptable network risk and a new methodology for the identification, evaluation and classification of network risks. It will clearly articulate the scope of network risks as distinct from corporate risks and will provide a platform to support continuous improvement in the network investment framework.

Figure 32 is a conceptual diagram showing the potential future state of Western Power's risk management environment, with particular focus on describing the type of risks that each risk framework covers.

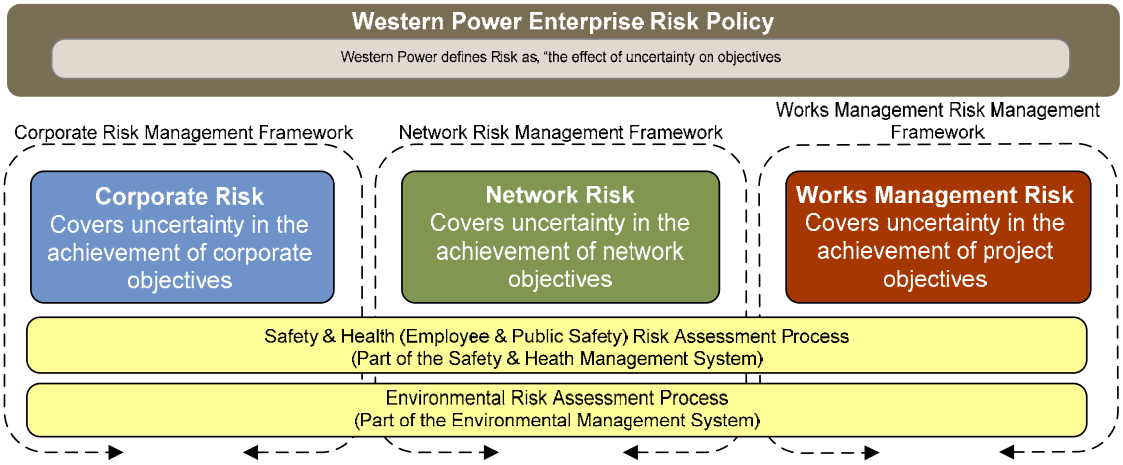
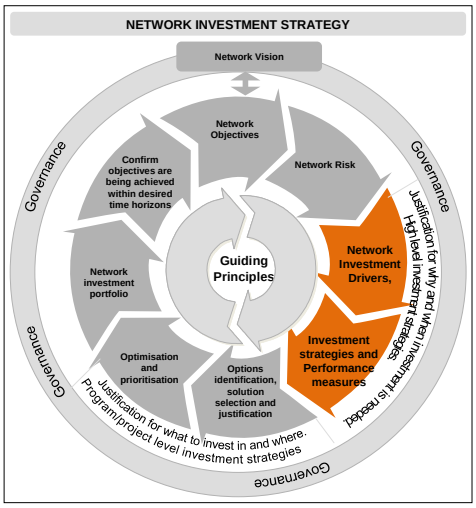


Figure 32: Conceptual future state of Western Power risk management environment with focus on describing the type of risks that each risk framework covers.

11 Network investment drivers, investment strategies and performance measures

11.1 Introduction



The purpose of this section is to introduce, categorise and describe the issues that drive Western Power to invest in the network (network investment drivers). At the strategic level, it describes how these drivers are linked to achieving network objectives. At the tactical level it outlines the high-level investment strategies and performance measures associated with each investment driver.

These establish the justification for why and when investment is needed.

This section also provides an overview of the relationship between network investment drivers and regulatory categories.

11.2 Overview of network investment drivers

Western Power's aim to achieve its network objectives is a journey that occurs and evolves over time. At any given point, pursuit of these network objectives is undertaken in the context of current and perceived future obligations, challenges and opportunities that exist.

Across some dimensions, the current state or performance of the network is delivering outcomes inconsistent with network objectives. In such cases, it may not be practical to achieve the desired level of performance over the short to medium term (e.g. due to funding or deliverability constraints). Instead, a realistic pathway to deliver the desires network objectives must be developed.

Network investment drivers are events, issues or factors that change the state of, or circumstances faced by, the network and apply 'pressure' to the network in terms of its ability to deliver desired network objectives. They can trigger an investment response if they result in a gap between actual or predicted state and desired future state relative to network objectives, depending on the risk that the gap presents and Western Power's risk appetite in relation to this.

Western Power has defined a suite of nine network investment drivers, which are shown in Figure 33 and briefly described in the remainder of this sub section.

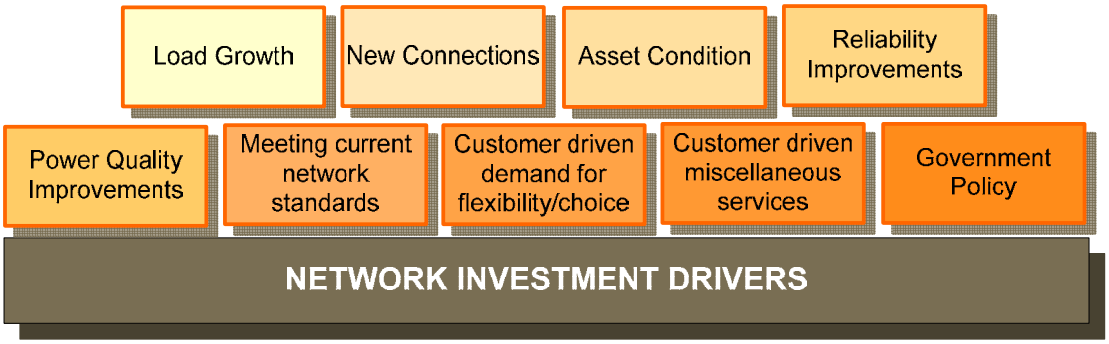


Figure 33: Suite of network investment drivers

11.2.1 Load growth

Peak demand is the maximum amount of electricity consumed at a single point in time (load). It can be measured either across the entire network or in specific parts of the network. Over time, peak demand (or peak load) increases. This load growth has two components:

1. Organic growth, as a result of existing customers using more electricity.
2. New loads connecting to the network, which includes high volume but small-to-medium size distribution customers, and large block loads.

The forecast annual peak demand is a key driver for investments which expand the capacity of the network in anticipation of load growth. Western Power has an obligation to meet or manage peak demand growth to ensure that network performance is not compromised due to an imbalance between peak demand and available capacity.

Insufficient capacity to meet peak demand can result in load being disconnected from the network to protect equipment and prevent system instability. Where load is not disconnected in overload situations, degradation of asset life can occur. In addition, overloaded plant can cause unacceptable safety outcomes (such as overhead conductors sagging below allowable electrical clearance levels).

Provision of sufficient network capacity at peak times mitigates the risk of outages, protects equipment, improves network security, reliability and safety outcomes, and achieves compliance with licence conditions.

11.2.2 New connections

Western Power has an obligation to provide access to its network services under the conditions of its electricity transmission and distribution licences. Western Power is therefore required to connect new loads or generators to its network, which includes an obligation to provide appropriate metering for these new connections.

New block load connections can range from large bulky loads connected to the transmission network (such as new mining projects) to small/medium enterprise loads connected to the distribution network. Similarly, new generator connections can range from large base-load power stations connected into the bulk transmission network to small renewables (such as PV cells) connected into the distribution network.

This driver is vey closely linked to the previous one (load growth), since new loads contribute to peak demand growth and new generation is influenced by the expected growth in demand. The key difference between this driver and the previous one is that this driver responds to the need to expand the network to enable physical connection of individual, known customers. The previous driver (load growth) responds to the need to expand the network to ensure future demand can be economically supplied from the shared network.

11.2.3 Asset condition

Network performance is influenced by the condition of individual assets. Poor performance or failure of existing assets compromises Western Power's ability to maintain the quality, reliability and security of its services and the safe operation of its network.

Throughout the life of an asset, investment may be required to maintain the asset to ensure it achieves its full design life. The need to replace an asset arises when its condition unacceptably compromises performance or safety.

11.2.4 Reliability improvements

Reliability is a key measure of network performance and Western Power is required to ensure it is maintained at an acceptable level. To a large extent, reliability performance is achieved through investments driven by load growth, new connections and asset condition. However, such investments will predominantly result in sustaining current levels of reliability performance. Additional, targeted investment will still be necessary where improvement in reliability performance is required (e.g. where there is a gap between present and desired reliability performance), particularly in specific locations across the network.

11.2.5 Power quality improvements

Power quality is the degree to which the electricity supply system is free from major distortions in supply voltage and frequency. Network power quality, as distinct from reliability, is becoming an increasingly important issue for all classes of customer. Western Power is required to ensure that the quality of electricity supplied to customers is acceptable.

Power quality management focuses on characteristics such as voltage limits, voltage flicker, waveform distortion and waveform unbalance on the network. It also focuses on the impact of disturbing loads and renewable generation.

Disturbing loads and renewable energy systems can result in waveform distortion, voltage fluctuations and may cause voltage excursions outside regulatory limits. The impacts of customer loads and generating systems need to be managed to ensure they do not adversely affect other customers connected to the network.

As with reliability, power quality performance is predominantly achieved through investments driven by load growth, new connections and asset condition. and also through investments to achieve reliability improvements. However, improvement between present and desired power quality performance may still exist after the application of investments associated with these drivers. Additional or targeted investment may still be required to achieve improvements in power quality performance outcomes, particularly in specific locations within the network.

11.2.6 Meeting current network standards

Governing standards bodies, including IEC, AS and ENA, issue standards for the electrical industry, many with direct application to the network.

As new legislation, regulation and technology is introduced, and the experience with electricity networks continues to mature, existing standards are updated and new standards introduced to meet new and emerging issues.

The nature of an electricity network is such that many of its assets have very long design lives, often remaining in service for over 40 years. Despite being installed to comply with the standards of the day, some will not meet current standards, which may be either internal or external standards. Such gaps often arise in relation to safety, environmental or regulatory (licence condition) compliance, or in meeting customer requirements.

In addition, technologies associated with both primary and secondary network assets can advance rapidly. Investment in new standards/technologies may be required to achieve better or more efficient outcomes, or meet changing customer expectations. Equipment and technology obsolescence may also result in changing standards.

Investments applied in response to other drivers, such as load growth, new connections, asset condition and reliability or power quality improvements all provide opportunities the bring existing assets up to current standards. However, there may

cases where the gap to current standards represents a level of risk that justifies separate investment to ensure assets are brought to a state of compliance.

11.2.7 Customer driven demand for flexibility/choice

The emergence of new technologies, increasing energy costs and sustainability considerations are influencing customer behaviour and expectations. Customer requirements for flexibility and choice in the levels of performance they receive and the way they manage their electricity consumption and generation needs are increasing.

This is an emergent driver for network investment and Western Power has not yet fully developed a strategy in response to it.

11.2.8 Customer driven miscellaneous services

Miscellaneous services include a suite of regulated, network-related activities (predominantly Opex) that are requested and fully funded by the customer. These include activities such as asset relocations (e.g. requested by local governments for road works), network reconfigurations to accommodate high-load movements and local streetscape enhancement projects.

11.2.9 Government policy

There are occasions were network related investments are driven out of the need to comply with Government policy/directives (e.g. the State Underground Power Project).

11.3 Overview of investment strategies and performance measures

For each network investment driver, Western Power has established high level strategies to guide investment decisions (investment strategies). These strategies generally reflect the current state of the network and a realistic pathway over time towards the achievement of network objectives. They also have a corresponding set of performance measures against which progress is assessed.

The high level investment strategies associated with each network investment driver are described in Appendix F – Investment strategies for network investment drivers. For consistency, a number of key dimensions are also articulated for each investment strategy. These key dimensions are shown in Figure 34 and briefly explained in following subsections. Collectively, these dimensions provide justification for why and when investment is needed on the basis of the strategies and in response to the associated network investment driver.

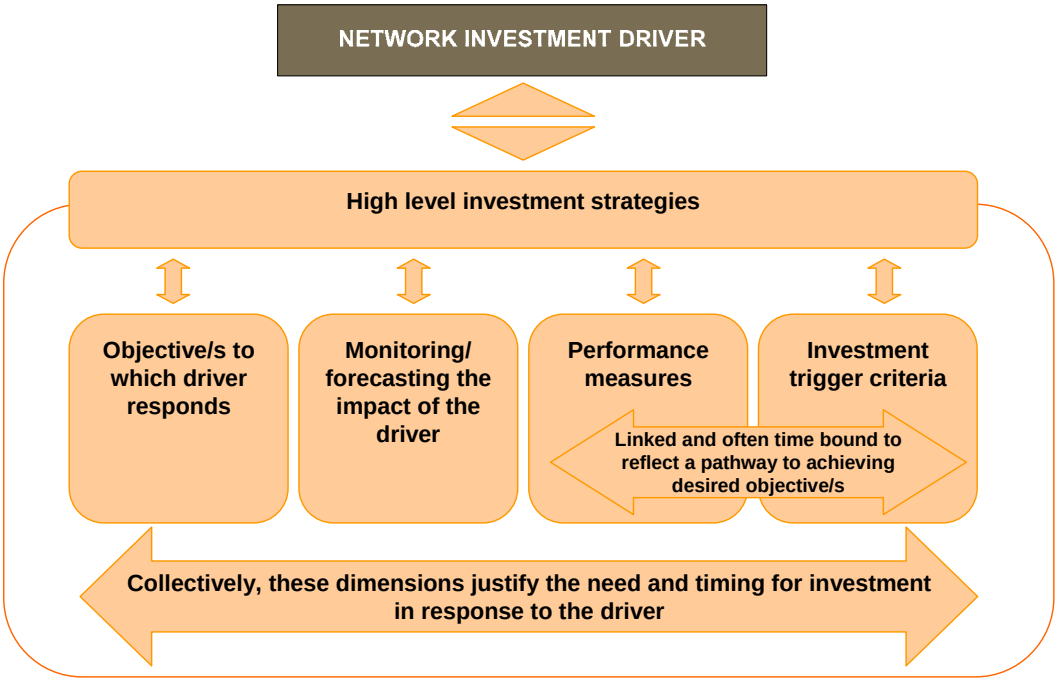


Figure 34: Dimensions of investment strategies associated with investment drivers

11.3.1 Objectives to which driver responds

There is a direct link between network objectives and network investment drivers. Each network objective must have at least one corresponding network investment driver and each network investment driver must respond to one or more network objectives. Figure 35 shows the main network objective/s to which each network investment driver responds.

This diagram also reinforces the concept that investments made in response to one driver will usually contribute to more than a single objective.

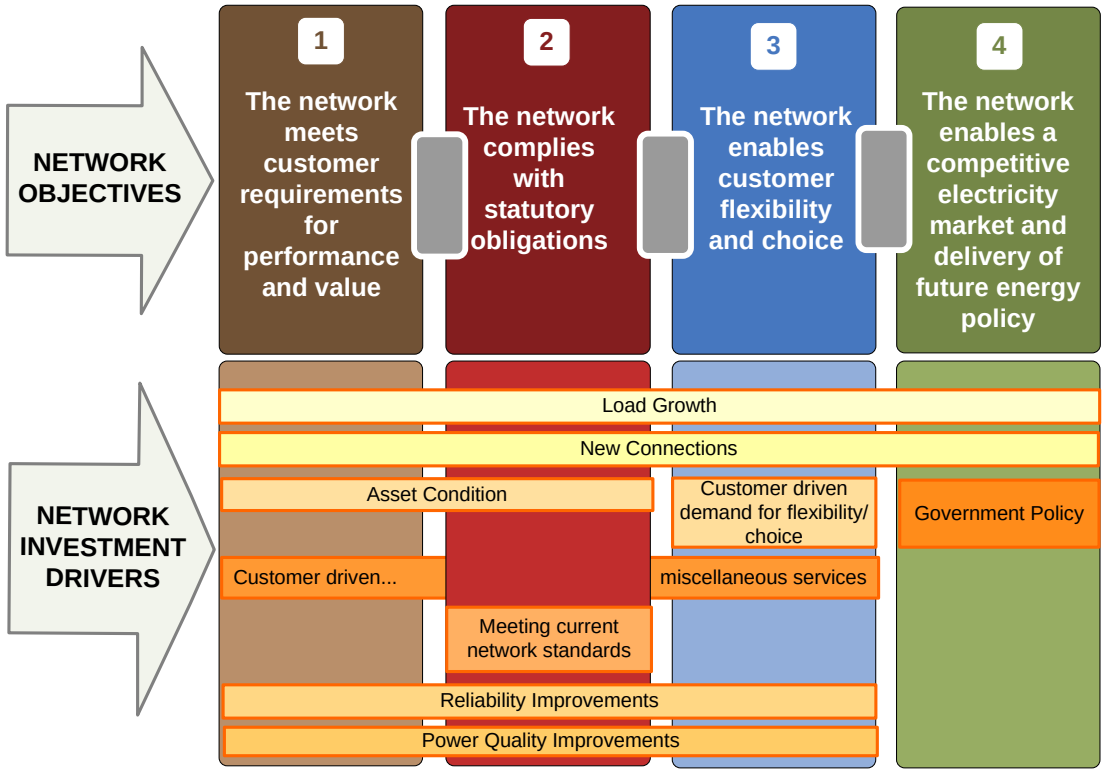


Figure 35: Link between network objectives and investment drivers

11.3.2 Monitoring/forecasting the impact of network investment drivers

A key dimension of an investment strategy for a driver, and a critical element in justifying investment on the basis of the strategy, is a robust, transparent and defensible methodology for monitoring (current state) and forecasting (future state) the impact of the driver.

To ensure ongoing alignment with or progress towards its network objectives, Western Power regularly assesses the current and likely future impact of the various network investment drivers by monitoring/forecasting:

- The present and predicted future state of the network (such as asset condition, available capacity, utilisation levels, and current performance levels), and
- The present and predicted future circumstances faced by the network (such as forecast load growth, known or potential new generator or block load connections, changing standards, changing government policies, changing customer expectations, or new statutory obligations).

Such monitoring/forecasting is performed within the context of an annual planning review, with the outcomes captured in a set of planning reports. This process is undertaken based on Western Power's Annual Planning Cycle, which was described in Section 6 – Governance framework. The various planning reports arising from the annual planning review are listed in Appendix E – Related internal documentation.

11.3.3 Performance measures and investment trigger criteria

Monitoring/forecasting the likely impact of the various network investment drivers is undertaken within a framework of qualitative and quantitative performance measures. An associated suite of criteria (levels of performance) is then used to determine when an unacceptable gap between current or predicted state and desired future state relative to the network objectives exists or is forecast to arise.

Therefore, another key dimension of an investment strategy, and a critical element in justifying investment on the basis of the strategy, is a robust and defensible set of performance measures and associated criteria (levels of performance) that trigger the need for an investment response (trigger criteria).

Western Power has established two guiding principles in defining and establishing performance measures and associated trigger criteria, which are that:

1. They are underpinned by an authoritative external frame of reference, and
2. They are robust in terms of providing justification for a need to invest. This means that they are either unchallengeable, (i.e. not subject to interpretation), or represent a sound and defensible interpretation.

The primary sources of performance measures/trigger criteria are:

- Statutory obligations (i.e. hard and fast legal requirements),
- Government policy, where such policy is either reflected in statutory obligations or is underpinned by some other form of contract,
- Requirements contained within the Technical Rules,
- Performance standards agreed with or imposed by a regulator (such as an order from EnergySafety),
- Performance standards accepted as 'industry good practice' and documented in an appropriate industry guideline or standard (eg, an Energy Networks Association (ENA) guideline),
- Requirements contained within Australian or other applicable standards, or
- Clear evidence of 'customer choice' (e.g. obtained through robust and defensible 'customer preference' or 'willingness to pay' studies).

Typically, for the various network investment drivers and related investment strategies, the associated performance measures/trigger criteria are reflected in a range of internal documents such as Policy Documents, Planning Criteria, Asset Missions, and Engineering Standards. These provide interpretations and/or application guidelines, taking into account Western Power's particular circumstances. A full list of these documents is provided in Appendix E - Related internal documentation.

There is often a strong time element involved in establishing performance measures/trigger criteria for network investment drivers, particularly where the current state or performance of the network is delivering outcomes inconsistent with network objectives.

Where it is not be practical to achieve the desired level of performance over the short to medium term (e.g. due to funding or deliverability constraints), a realistic pathway to deliver the desires network objectives must be developed. Performance measures/trigger criteria that change over time to reflect the desired pathway can then be established.

Across the full range of network investment drivers, there is significant variability in the robustness of associated performance measures/trigger criteria in terms of visibility, consistency, interpretation, clarity and consistency of application.

A key component in the evolution of the NIS is a project to identify, build and document a robust suite of performance measures/trigger criteria. This work will be prioritised based on a combination of the magnitude of investments they underpin and the level of confidence in their currency and appropriateness.

11.4 Relationship between investment drivers and regulatory categories

Under its Access Arrangement, Western Power is required to establish a set of regulatory categories (or expenditure categories as they are referred to in the Access Arrangement) for funding and reporting purposes. Budgets are established and expenditure is monitored against these regulatory categories, which are categorised into capital expenditure (Capex) and operating expenditure (Opex) for both the transmission and distribution networks. Across transmission and distribution, expenditure is then grouped into five high level regulatory categories for Capex (growth, asset replacement and renewal, improvement in service, compliance, and corporate) and five high level regulatory categories for Opex (operations, maintenance, customer service and billing, corporate, and other).

Western Power's broad expenditure structure based on the high level regulatory categories is shown in Figure 36, with a detailed listing of all regulatory categories provided in Appendix C – Western Power's regulatory categories.

There is a very strong link between regulatory categories and network investment drivers, which is also explored in Appendix C.

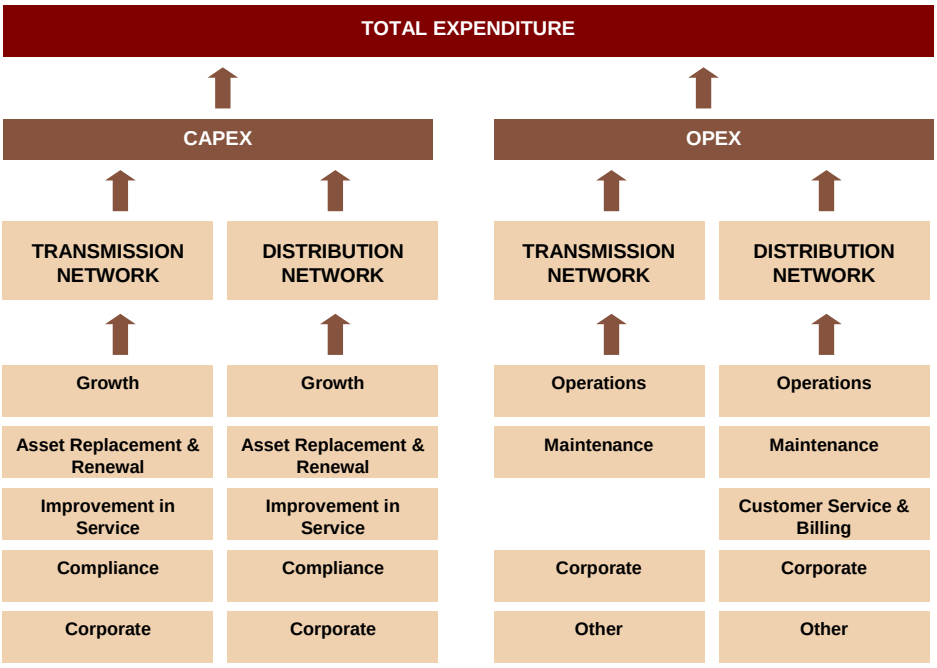
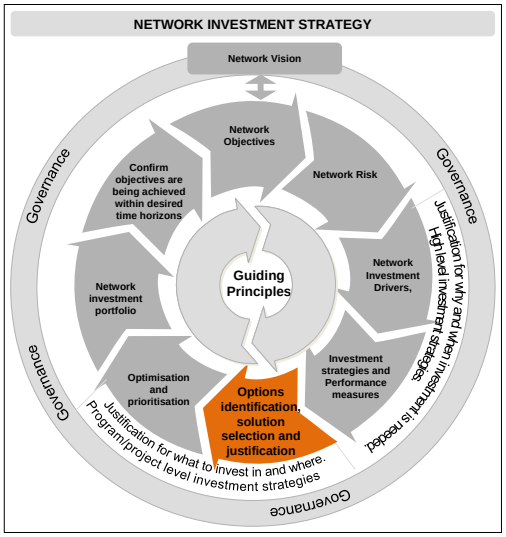


Figure 36: Expenditure structure by high level regulatory categories

12 Options, solutions and justification

12.1 Introduction



The purpose of this section is to provide an overview of how Western Power identifies, evaluates, selects and justifies the most appropriate solution option once a need to invest has been triggered in response to a network investment driver (i.e. a network issue has been identified).

In a functional sense, this section outlines the justification for what investments are required and where.

12.2 Current state

Once a network issue (risk or opportunity) has been identified and clearly defined, the next step in the process is to determine the most appropriate solution. The process of identifying, evaluating, selecting and justifying the most appropriate option must be undertaken in a transparent, systematic, consistent and thorough way. In so doing, the reasons behind the eventual approval of an option are auditable and defensible and enable the business to learn and adjust.

Western Power has begun to formalise and standardise the process for option selection, which is described in DM# 7024405. This process is summarised in Figure 37 and briefly described in the remainder of this subsection.

The option selection process is the key component of Phase 2 (Scoping) of the six phase/six gate process shown in Figure 25.

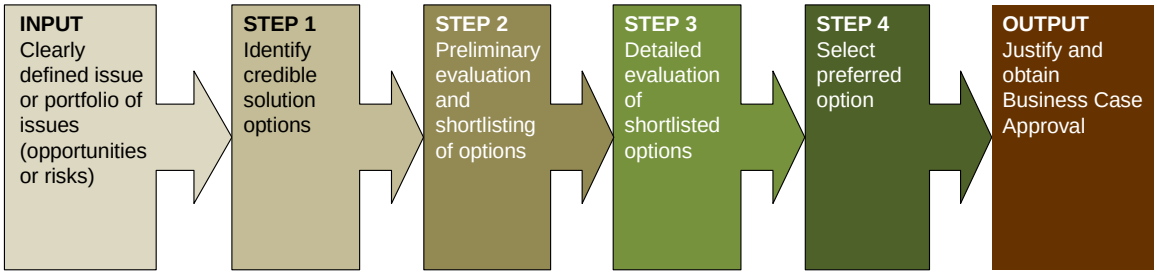


Figure 37: Option selection and justification process

Input – The input to the option selection process is a clearly identified issue or portfolio of issues, which precipitate from Phase 1 (Initiation) of the six phase/six gate process. These issues are identified through the process of monitoring/forecasting the impact of investment drivers.

Step 1 – Identify credible solution options. From both a commercial and regulatory perspective, it is important that Western Power considers a range of solution options,

including traditional (network) or non-traditional (non-network), Capex or Opex, and transmission or distribution solutions.

Western Power has established a suite of typical network and non-network solutions, which can be deployed individually or in combination. Examples of these are shown in Figure 38 and described in more detail in Appendix D – Suite of typical network and non-network solutions, noting that this suite is not intended to be exhaustive.

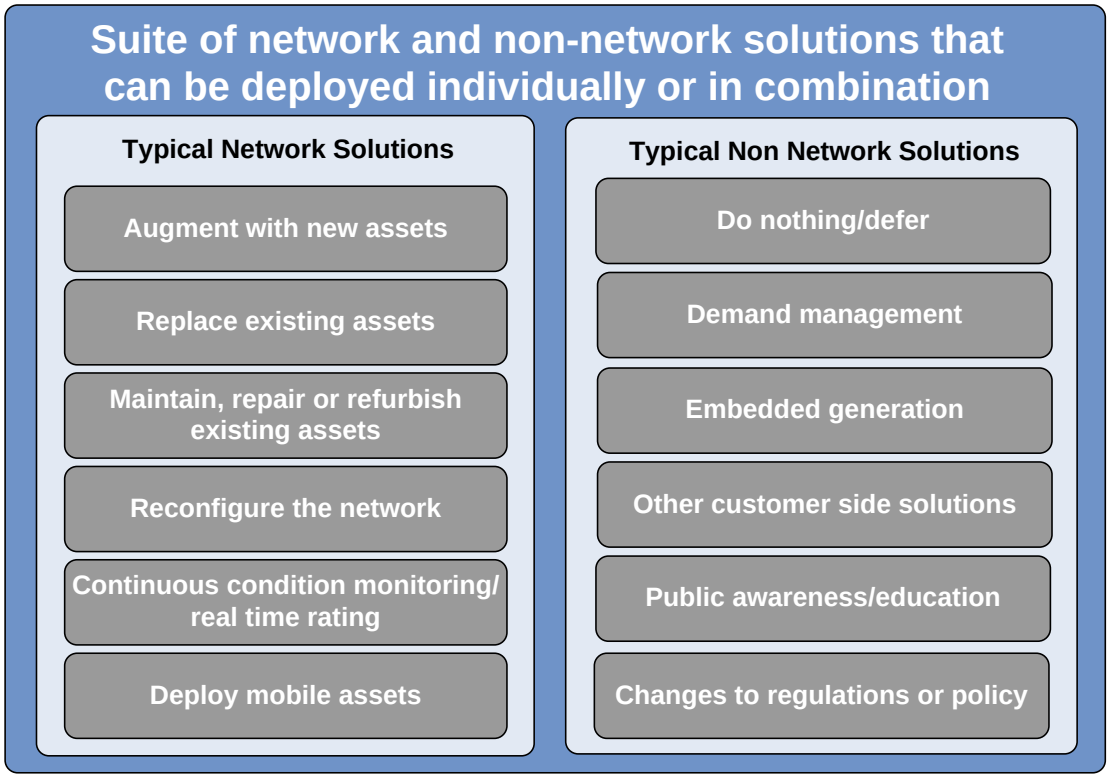


Figure 38: Suite of typical network and non-network solutions

Step 2 – Preliminary evaluation and short listing of options. To ensure efficiency in the investment evaluation process, only a limited number of options are shortlisted for detailed evaluation. Although this is often based on experience, there needs to be a transparent and objective rationale for not short listing particular options.

Step 3 – Detailed evaluation of shortlisted options. Selection of the preferred option can only be done after assessing the relative net benefits of each option against a set of evaluation criteria. The key evaluation criteria used by Western Power are:

1. Economic – this involves assessing the cost and value of the various options.
2. Technical – this considers the technical merits of the various options, including things such as line losses or energy efficiency.
3. Environmental – this considers any environmental constraints associated with the various options, such as proximity to environmentally sensitive areas, or impact on protected or threatened species of flora or fauna.
4. Social – this considers the social impact of the various options, such as visual impact, proximity to homes and impact on land use.
5. Risk – this deals with the influence each option will have on addressing the current risks. It also involves an assessment of new risks that each option exposes Western Power to during or after execution.

6. Strategic alignment – this deals with the need to ensure that the option is consistent with the long term strategies for the network (see Section 12.2.1).

Step 4 – Select preferred option. The preferred option should be the option that delivers the highest Net Present Value (NPV) of benefits, whilst achieving an acceptable level of risk. Relevant internal and external stakeholders need to be involved in the evaluation process and briefed on the outcome. Endorsement of the evaluation will support justification of the selected option.

This step will include a detailed financial and commercial assessment, capturing all of the benefits that the selected option delivers. It also includes confirmation that the selected option satisfies prudency and efficiency tests in the Access Code (e.g. the Regulatory Test and the NFIT).

Output – The output from the option selection process is fed into Phase 3 (Planning) of the six phase/six gate process. Ultimately the process for selection of the preferred option will be embedded in the business case, which will also contain the detailed justification for the option selected.

12.2.1 Linkage to long term strategies

In the process of option selection, a key element of evaluating options must be an assessment for consistency with long term strategies for network development. This is to ensure that the best long term value is being achieved, rather than, for example, providing only short term value that may result in the installation of an asset that will become redundant well before its normal life span. However, it must be remembered that long term strategies reflect possible responses to a range of scenarios. They do not, of themselves, drive investment. Rather, once the need to invest arises (based on trigger criteria), any investment needs to support the long term strategy.

Clearly, the establishment and regular review of long term growth and asset management strategies, which identify targeted network outcomes, are critical to successful option selection and justification. Western Power develops detailed long term strategies covering different areas of the network. These cover growth, reliability and asset condition driven investments.

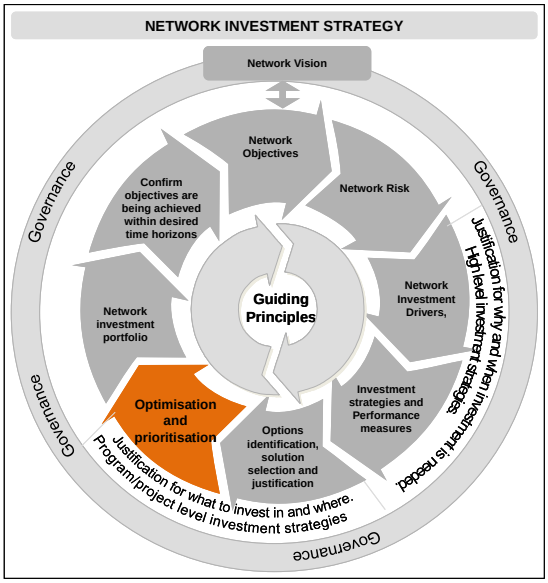
12.3 Future state

Historically, within Western Power, the option selection process has been very dependent on the experience, knowledge and expertise of individual planners, with limited guidance or a standard process to follow. While Western Power has established a high level framework for option selection, it recognises that further improvements can be achieved in standardising and documenting the process.

As a component of the *Transform The Core* strategy, Western Power is progressing an initiative that will enhance the option selection process within Western Power. A key outcome of this initiative will be a documented and embedded formal options analysis process. A briefing paper on this initiative is contained in DM# 7530074.

13 Optimisation and prioritisation

13.1 Introduction



The purpose of this section is to introduce and describe Western Power's approach to optimising and then prioritising investments across the various issues arising from all network investment drivers.

Optimisation is intended to deliver maximum benefits from the investments made (best 'bang for buck') and often occurs within the context of competing needs.

Prioritisation is closely linked to optimisation, but is generally undertaken in response to constraints imposed on investment opportunities. Prioritisation is intended to ensure the delivery of those projects that deliver maximum value or achieve the greatest reduction in risk across the suite of possible investment options.

13.2 Optimisation - current state

Irrespective of the primary driver for investment, the interconnected nature of the network generally results in flow-on benefits from investment for the whole system. For example, the addition of new assets to meet forecast growth will typically result in safety and reliability improvements, as will maintenance or replacement of assets in response to poor condition. Understanding this interconnected nature of the network provides significant scope to optimise investments across multiple drivers. Where it is efficient to do so, planners aim to address issues arising from multiple drivers with the same project.

Throughout the investment lifecycle, there are a number of opportunities for optimisation, across both the planning and execution phases. Within the planning phase (the focus of the NIS), there are three principle opportunities for optimisation:

1. At the Initiation Phase (identify the need) – where optimisation can occur across needs arising from the various network investment drivers and from both the transmission and distribution networks,
2. At the Scoping Phase (identify the solution) – where optimisation across the dimensions of cost, risk and benefits can occur, and
3. At the Planning Phase (plan execution of the solution) – where optimisation across the range of solutions can occur (e.g. network or non-network, Opex or Capex).

Western Power does not currently have a formally documented, consistently applied optimisation process across the planning phase of the network investment lifecycle. Until recently, the process relied predominantly on individual planners liaising both within and across network investment driver categories to identify opportunities for optimisation – largely on an ad-hoc basis. For example, distribution and transmission planners liaising to identify the optimum mix of distribution and transmission reinforcement work to address a particular capacity constraint or capacity planners

liaising with network performance planners to identify opportunities for optimisation across growth and asset condition related issues.

However, two initiatives recently delivered as part of the *Transform the Core* strategy have improved the optimisation process. These are:

1. Introduction of the Annual Planning Cycle. Four formal optimisation forums have been introduced into the annual planning calendar and described in the Annual Planning Cycle Interpretation Guide (DM# 7389850). These will be key points in the annual planning cycle where optimisation will be done both within and across all network investment driver categories.
2. Establishment of the Sponsors Forum. This is a monthly forum where all sponsors of network related investments meet and share planning information on a regular basis. Optimisation is a prime focus of these forums. The Terms of Reference for the monthly Sponsors Forums is contained in DM# 6673890.

13.3 Optimisation - future state

In spite of recent progress, Western Power recognises that there is still significant opportunity to improve the way optimisation is done. As a component of the *Transform the Core* strategy, Western Power is progressing an initiative that will further enhance the optimisation process during the planning phase of the network investment lifecycle. A key outcome of this initiative will be a documented and embedded formal optimisation and prioritisation process covering the complete planning phase. The charter for this project is contained in DM# 7324545.

13.4 Prioritisation – current state

Western Power has many network issues and many projects or programs to address these network issues. However, internal and external constraints (such as labour or funding availability) limit the amount of work that can be delivered within a particular planning horizon. Consequently, projects and programs need to be prioritised to ensure those which contribute most to the achievement of Western Power's network objectives progress first.

Currently, Western Power prioritises projects and programs predominantly on the basis of risk, which involves evaluating the risk, cost and performance trade-off. This is done through the application of the Corporate Risk Framework.

There is also the opportunity to prioritise on the basis of the value that a project or program delivers, as indicated in the 'risk-value equation' shown in Figure 39. However, at this stage, limited prioritisation is done on the basis of value within Western Power.

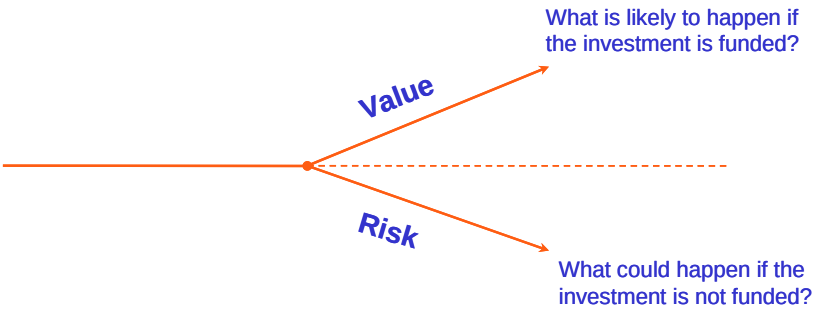


Figure 39: The risk/value equation

To date, Western Power has not established relative weightings for its network objectives. Instead, it has ranked its top four areas of focus in priority order as follows:

1. Public safety,
2. Regulatory compliance,
3. Load and generator connections, and
4. Performance (reliability).

In conjunction with risk, this is used as the basis to prioritise investments as shown in Figure 40.

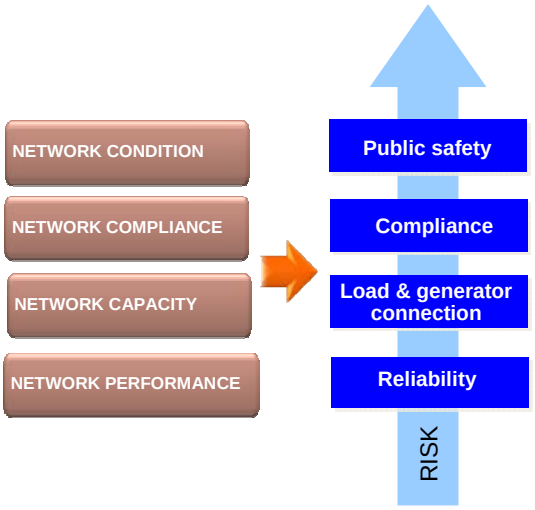


Figure 40: Current prioritisation model

13.5 Prioritisation - future state

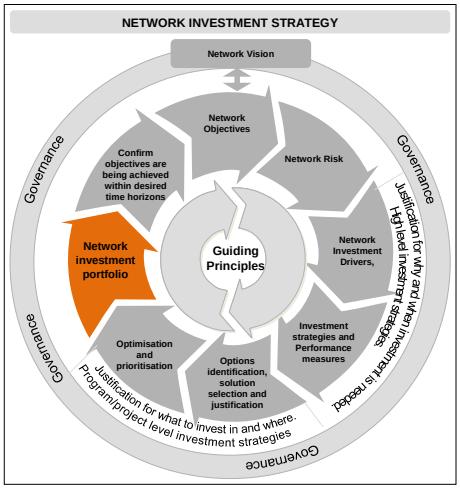
The above is a relatively coarse approach to prioritisation, since the reality is that Western Power is required to invest across the full spectrum of its network objectives. In addition, it does not easily account for the fact that individual investment opportunities may contribute to more than one objective to a greater or lesser extent.

In the future, Western Power intends to establish the relative weightings of its network objectives to enable a much more robust evaluation of the value provided by various investment opportunities. The relative weightings of network objectives will be established using an Analytic Hierarchy Process (AHP), which is based on a 'pairwise' comparison of each objective relative to each other objective. These weighted network objectives will then be used in a Multi Criteria Decision Making (MCDM) process to support both optimisation and prioritisation of investment options. This work is expected to be completed by late 2011.

In addition, as a component of the *Transform the Core* strategy, Western Power is progressing an initiative that will enhance the asset risk management framework to develop a Network Risk Management Framework (NRMF). The NRMF will clearly define network risk appetite and a new methodology for the assessment of network related risks. This combination of value and risk will provide a much more robust and defensible approach to the prioritisation process.

14 Network investment portfolio

14.1 Introduction



The purpose of this section is to provide an overview of how Western Power establishes its investment portfolio, which consists of the various projects and programs that are identified to address network issues, along with the timing and level of investment.

In a functional sense, this section outlines how planning activities are translated into physical outcomes.

14.2 Overview

The network investment portfolio contains a 25 year view of all existing, proposed and potential capital and operating projects and programs identified to address known or forecast network issues. These projects and programs exist with varying levels of confidence, definition and approval and will be at various stages of development, from fully approved and in progress to a simple forecast needs statement.

It facilitates the development of a number of different views of current and future work and associated level of investment for a variety of business purposes. This includes macro and micro budgets, funding and regulatory submissions and programs of work. Figure 41 depicts some of the key views that are assembled from the network investment portfolio.

Assembly of the various views of the network investment portfolio is undertaken within the context of the Annual Planning Cycle referred to previously. It is also managed in accordance within the Western Power Budgeting Guidelines (DM# 3479872).

How they are assembled and the nature and purpose of these key views is described briefly in the remainder of this sub section.

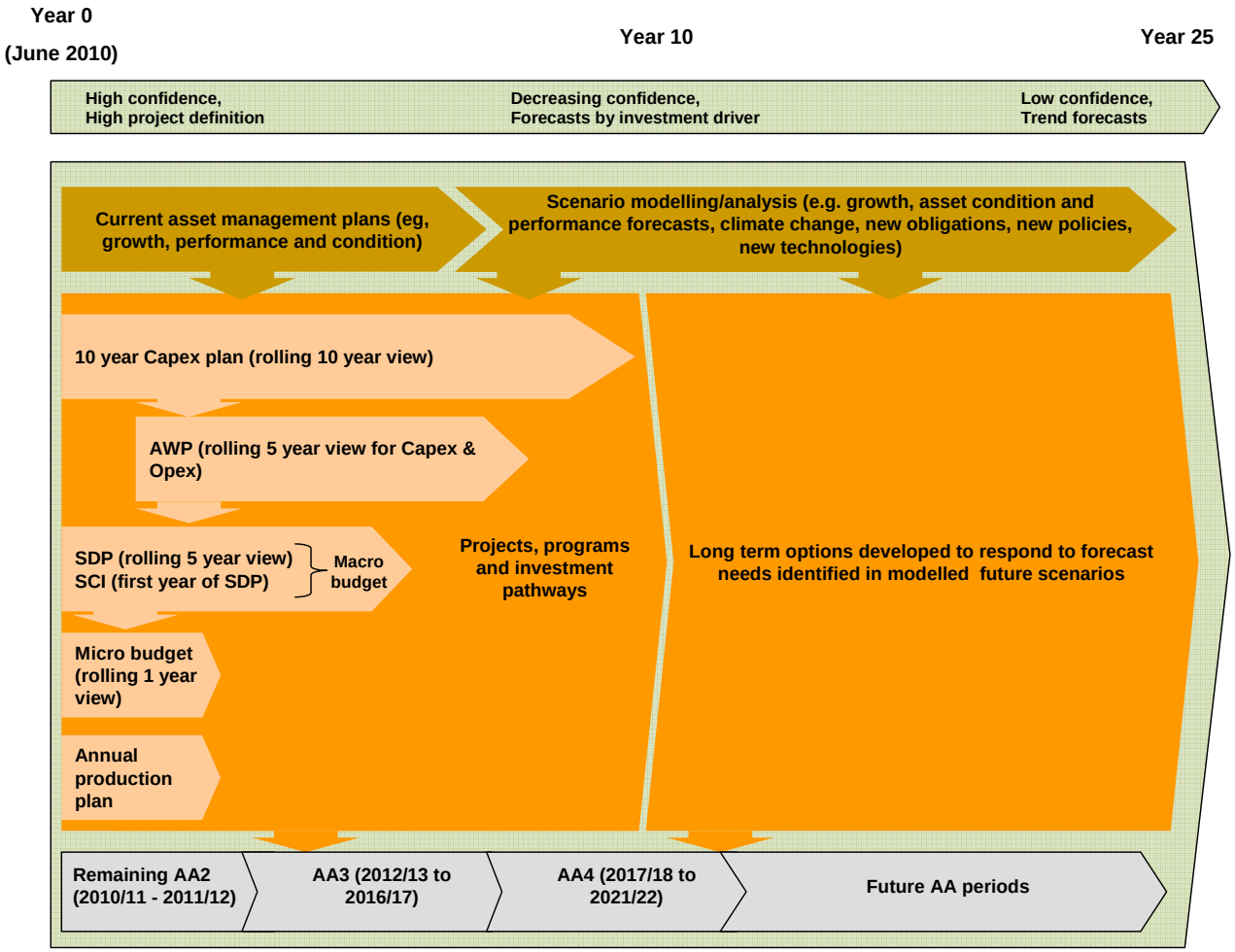


Figure 41: Network investment portfolio and key views

14.2.1 Ten year Capex plan

The 10 year Capex plan provides a high level view of proposed capital expenditure based on known, planned and forecast capital work. In terms of the network investment portfolio, it includes growth, performance and asset replacement driven capital expenditure.

14.2.2 Approved works program

A key subset of the network investment portfolio is the Approved Works Program (AWP), which provides an annually refreshed view of forecast capital and operating expenditure over the 5 financial years following the existing year. It reflects an optimised, prioritised and constrained view - based on Western Power's optimisation and prioritisation processes and funding and deliverability constraints that are forecast to exist during the AWP period.

It is important to understand that not every project or program contained in the AWP has individual approval at the business case level (although many in the early period of the AWP will). Rather, the investment stream as a whole is an approved 'current view' of the timing and level of investment necessary over the AWP period. All projects and programs in the AWP require individual business cases to be approved prior to execution. In addition, the AWP is not 'set in concrete'. Rather, it is reviewed and updated on a regular basis (through a Change Control Process) to reflect changing circumstances, needs and priorities.

The investment portfolio beyond the AWP horizon has diminishing certainty and clarity the further out in time it is, and largely represents a view that is not necessarily optimised, prioritised or constrained.

Further detail on the establishment and maintenance of the AWP is contained in Western Power's Works Program Governance Manual (DM# 5200741).

14.2.3 Strategic development plan and statement of corporate intent (macro budget)

The Strategic Development Plan (SDP) is submitted annually by the Western Power Board to the Minister for approval in accordance with Section 88 of the Electricity Corporations Act 2005 (WA). It sets out the business objectives, strategies, financial objectives and operational targets for Western Power over a five year period. The SPD also provides Western Power's proposed works program and associated expenditure (Capex and Opex) over the SPD period (four years from the previous year's SDP plus a forecast for the fifth year).

The Statement of Corporate Intent (SCI) articulates Western Power's accountability requirements as agreed with the Minister for Energy. It provides an annual, high level overview of Western Power's objectives, major activities and performance targets for the financial year.

The financial submissions within the SDP and SCI form the approved budget for Western Power, consistent with the Government's policy and budgetary requirements. These documents represent the agreement between Western Power and the Minister in terms of financial and non-financial expectations and requirements for the coming financial year (SCI) and five-year expectations (SDP) and are effectively Western Power's 'Macro' budget.

14.2.4 Micro budget

While the Macro budget may be subject to some variations (up or down), it provides sufficient framing to create the 'Micro' budget. The Micro budgeting process translates the outcomes of the Macro budget process into detailed branch, section and team budgets for year 1 of the 5 year SDP period. The micro budget is reviewed and updated three times per year.

14.2.5 Annual production plan

The annual production plan provides a detailed annual view of the AWP, incorporating the output from Operational Asset Management, including asset specific activity schedules. The detailed activity information provided in the production plan enables the Work Delivery Strategy to be translated into detailed resource planning for internal and external service providers, and supports the micro budgeting requirements to profile the AWP expenditure monthly at a program/project level.

14.2.6 Access arrangement revisions

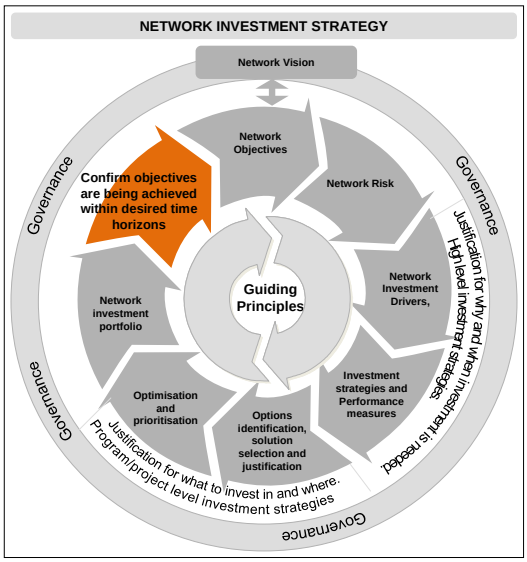
The Access Code requires Western Power to have in place, and periodically submit revisions to an Access Arrangement (AA). The AA and subsequent revisions are reviewed and subject to approval by the ERA.

Revisions to an AA require a whole of business review of historic and forecast expenditure, services, tariffs and performance in order to submit a robust proposal to the ERA. The AA sets out the terms and conditions, including price, for access to Western Power's electricity transmission and distribution services. It is therefore the mechanism that determines the revenue Western Power receives for the provision of regulated services. The timelines covered by the first three AA periods are as follows:

- The first AA (AA1) covered the three year period from 2006/07 to 2008/09,
- The current AA (AA2) covers the current three year period from 2009/10 to 2011/12, and
- The third AA (AA3) is proposed to cover a five year period from 2012/13 to 2016/17.

15 Confirm objectives are being achieved

15.1 Overview

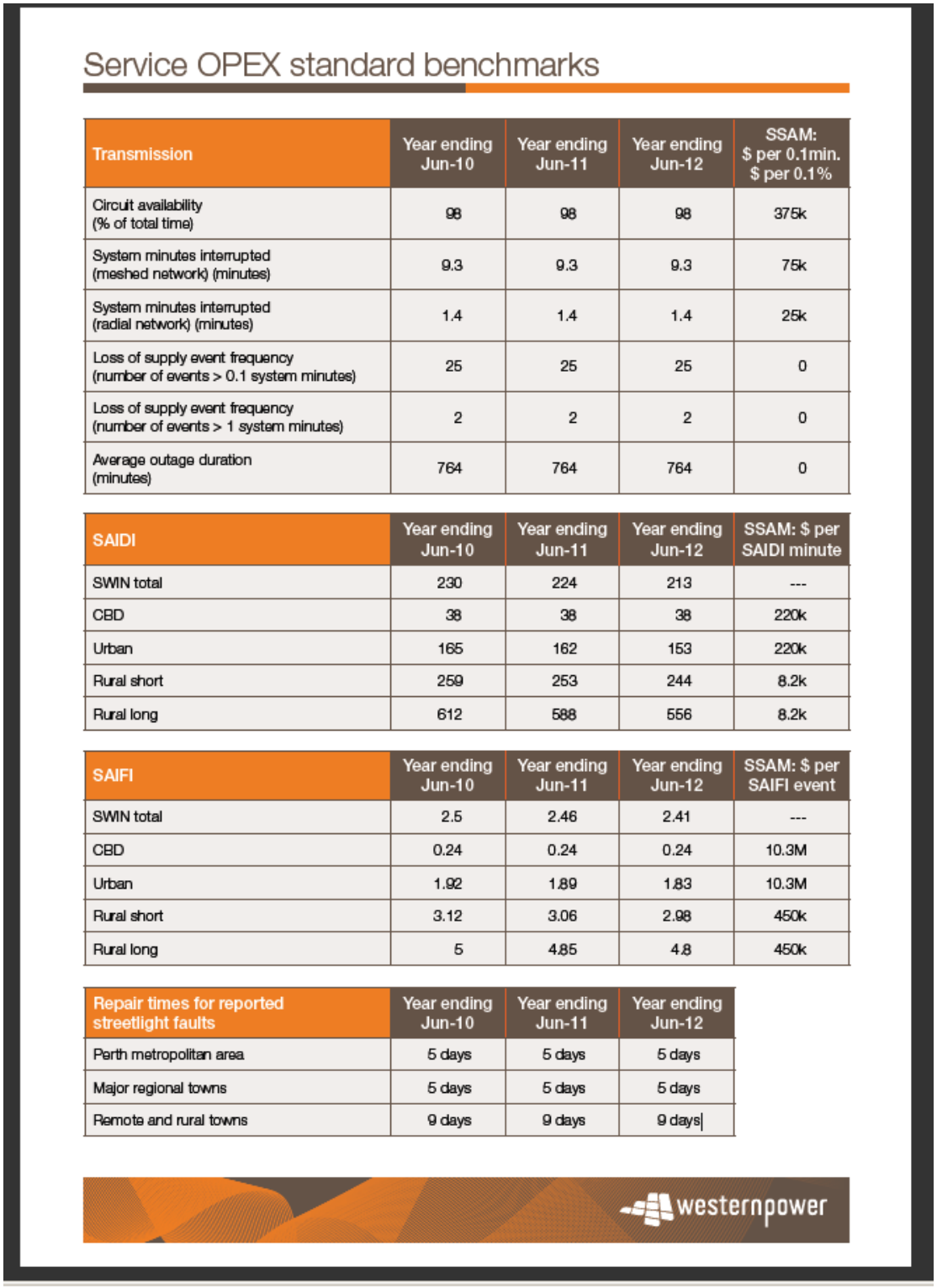


Reviewing progress against network objectives is a key element of the feedback loop into the strategic planning process. It is achieved by monitoring a set of performance metrics at various levels within the business. At the highest level, progress is monitored against a suite of corporate Key Performance Indicators (KPIs) contained in the SCI.

Figure 42 shows the Corporate Scorecard for 2010/11, which will be reflected in the 2010/11 SCI and includes measures related to network outcomes. Figure 43 shows the Service Standard Benchmarks (SSBs), which reflect network outcomes to a greater level of detail.

Accountability for compiling, monitoring and reporting against relevant performance measures is done in accordance with the NIS Governance framework described in Section 6.

Figure 42: Western Power corporate scorecard performance measures



Service OPEX standard benchmarks

Transmission	Year ending Jun-10	Year ending Jun-11	Year ending Jun-12	SSAM: $ per 0.1min. $ per 0.1%
Circuit availability (% of total time)	98	98	98	375k
System minutes interrupted (meshed network) (minutes)	9.3	9.3	9.3	75k
System minutes interrupted (radial network) (minutes)	1.4	1.4	1.4	25k
Loss of supply event frequency (number of events > 0.1 system minutes)	25	25	25	0
Loss of supply event frequency (number of events > 1 system minutes)	2	2	2	0
Average outage duration (minutes)	764	764	764	0

SAIDI	Year ending Jun-10	Year ending Jun-11	Year ending Jun-12	SSAM: $ per SAIDI minute
SWIN total	230	224	213	---
CBD	38	38	38	220k
Urban	165	162	153	220k
Rural short	259	253	244	8.2k
Rural long	612	588	556	8.2k

SAIFI	Year ending Jun-10	Year ending Jun-11	Year ending Jun-12	SSAM: $ per SAIFI event
SWIN total	2.5	2.46	2.41	---
CBD	0.24	0.24	0.24	10.3M
Urban	1.92	1.89	1.83	10.3M
Rural short	3.12	3.06	2.98	450k
Rural long	5	4.85	4.8	450k

Repair times for reported streetlight faults	Year ending Jun-10	Year ending Jun-11	Year ending Jun-12
Perth metropolitan area	5 days	5 days	5 days
Major regional towns	5 days	5 days	5 days
Remote and rural towns	9 days	9 days	9 days

Figure 43: Western Power Service Opex standard benchmarks

16 Glossary

This document incorporates the defined terms and acronyms detailed in the Western Power corporate glossary (DM# 3551143), together with the additional terms and acronyms detailed below:

Acronym / term	Meaning
AA/AA1/AA2/AA3	The Access Arrangement approved by the ERA (AA1 is for the period 1/7/2006 to 30/6/ 2009, AA2 is for the period 1/7/2009 to 30/6/2012, AA3 will be for the period 1/7/2012 to 30/6/2017)
Access Code	Electricity Networks Access Code 2004 (WA)
ALARP	As Low As Reasonably Practical (in relation to risk treatment)
APR	Annual Planning Report (public document)
AS	Australia Standards
AWP	Approved Works Program
BAU	Business As Usual
Capex	Capital expenditure
CBD	Central Business District
Covered Services	Refer to Appendix A
DTF	Department of Treasury and Finance
Dx	Distribution
EBT	Earnings Before Tax (corporate KPI)
EDL1	Electricity Distribution License
ETL1	Electricity Transmission License
ENA	Energy Networks Association
ERA	Economic Regulation Authority
ESAA	Electricity Supply Association of Australia
FTE	Full Time Equivalent (employee)
GTE	Government Trading Enterprise
HV	High Voltage
IMO	Independent Market Operator
ICT	Information and Communication Technology
KPI	Key Performance Indicator
kA	Kilo Amperes (measure of electrical current)
kV	Kilo Volts (measure of electrical potential)
LTIFR	Lost Time Injury Frequency Rate (corporate KPI)
LV	Low Voltage
MVA	Mega Volt Amps (measure of electrical power)
N	Planning term referring to the number of network elements in service
NFIT	New Facilities Investment Test

Acronym / term	Meaning
NIS	Network Investment Strategy (this document)
NPV	Net Present Value
NRMF	Network Risk Management Framework
OHI	Organisational Health Index (corporate KPI)
Opex	Operating expenditure
PoE	Probability of Exceedance (relating to load forecasts)
RAB	Regulated Asset Base
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCADA	Supervisory Control and Data Acquisition
SCI	Statement of Corporate Intent
SDP	Strategic Development Plan
SOO	Statement of Opportunities document published by the IMO
SSAM	Service Standards Adjustment Mechanism
SSB	Service Standard Benchmarks
Tx	Transmission
WATC	Western Australian Treasury Corporation
WEM	Wholesale Electricity Market
Western Power	Electricity Networks Corporation ABN 18 540 492 861

Appendix A Categories of service

The Access Code defines a covered service in the following terms:

Covered service means a service in relation to the transportation of electricity provided by means of a covered network, including:

a) a connection service; or

b) an entry service or exit service; or

c) a network use of system service; or

d) a common service; or

e) a service ancillary to a service listed in paragraphs (a) to (d) above, but does not include an excluded service."

The Code provides for three categories of covered services that are relevant to the access arrangement:

- Reference services,
- Non-reference services, and
- Excluded services.

The Access Code defines reference, non-reference and excluded services as follows:

"**reference service** means a covered service designated as a reference service in an access arrangement under section 5.1(a) for which there is a reference tariff, a standard access contract and service standard benchmarks."

"**non-reference service** means a covered service that is not a reference service."

"**excluded service** means a service provided by a covered network which meets the following criteria:

- The supply of the service is subject to effective competition; and
- The cost of the service is able to be excluded from consideration for price control purposes without departing from the Access Code objective."

Western Power uses the following categories of service:

1. covered transmission services,
2. excluded transmission services,
3. covered distribution services,
4. excluded distribution services,
5. IMO system management, and
6. unregulated activities and services.

However, Western Power does not currently provide any services that are classified as excluded transmission services or excluded distribution services (refer A.6).

Figure 44 sets out the categories of covered transmission and distribution services and the types of other services provided.

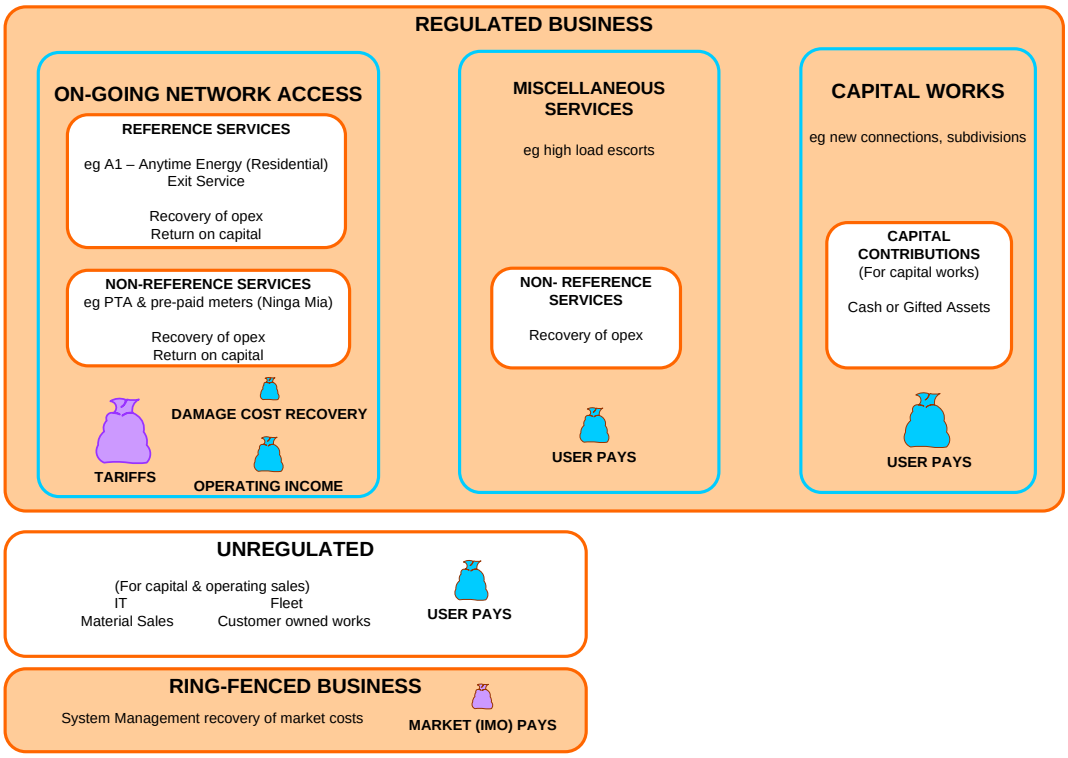


Figure 44: Categories of covered transmission and distribution services and the types of other services provided

A.1 On-going Network Access

On-going network access is provided through reference and non-reference services. On-going network access is subject to a revenue cap.

Reference Services

These services are subject to revenue regulation by the ERA for the distribution and transmission network services provided to retailers and generators.

Reference services are provided to users in accordance with the terms and conditions of the electricity transfer access contract. Western Power offers two entry services as reference services (distribution entry service and transmission entry service) and 11 exit services as reference services and one bi-directional service.

Non-Reference Services

Regulated non-reference services are provided to the Public Transport Authority and to Ninga Mia (pre-paid meters).

A.2 Miscellaneous Services

Miscellaneous services are covered services (a service provided in relation to the transportation of electricity by means of a covered network) provided by Western Power.

Miscellaneous services include a suite of regulated operational activities that are charged to the initiating customer, including customer requested activities.

These charges are not regulated by means of the AA, rather commercial terms and conditions are negotiated between the parties. Miscellaneous services activities are restricted to operating expenditure activities and exclude any work that is capitalised (refer DM# 7338052 for further information).

A.3 Capital Contributions

"Capital contribution" means a payment or provision in kind made, or to be made, by a user in respect of any new facilities investment (or forecast new facilities investment) in required work.

Capital contributions are calculated in accordance with Western Power's Developer and Customer Contributions policy (refer to DM# 2803087 for further information). This policy is applied where it is necessary for Western Power to undertake required work, or procure a non-network option (such as contracting with a generator for network support) in order to provide to an applicant a covered service which is sought in an access application.

This policy describes the circumstances in which a contribution will be payable by the applicant and the method for calculating the contribution.

The charges for non-reference services are negotiated in good faith, consistent with the Access Code objective and will be reasonable.

A.4 Unregulated Services

Western Power also undertakes work on assets owned by external parties (known as unregulated work). These are services that Western Power are not obliged to provide and which are capable of being provided on a contestable basis by a range of suppliers and include external sales, customer owned works and fleet services.

Unregulated services also include work associated with obligations to provide IT support services under service level agreements established with Horizon, Synergy and Verve following the disaggregation in 2006.

Commercial terms and conditions are negotiated between the parties.

A.5 System Management

System Management is a segregated business unit within Western Power established under the WEM Rules.

System Management is responsible, under the WEM Rules, for ensuring that the power system is operated in a safe, secure and reliable manner through the operation and control of generator facilities, transmission and distribution networks, and large customer retailer supply management including demand side management. It has a central role in the scheduling of generator and transmission outages, and manages the real-time operation of the power system. In order to fulfil this obligation, System Management controls key technical characteristics of the power system such as frequency and voltage, through ancillary services.

The IMO expenditure has an allowable revenue determination, approved by the ERA, and is fully recovered through IMO revenue. All other System Management operating expenditure is a recovered operating expenditure, except for direct labour costs which are recovered to the Supervisory Control and Data Acquisition (SCADA) services activity within the AWP.

A.6 Excluded Services

Western Power's AA does not provide for a determination on excluded services for a covered network and Western Power does not intend to seek a determination on excluded services. Accordingly, there are presently no excluded services identified in Western Power's access arrangement.

Appendix B Statutory obligations

From an NIS perspective, statutory obligations can be split into two broad categories:

1. Obligations which are industry specific (i.e. they exist to govern Western Power in its role as a regulated network service provider). Principle sources of such obligations are Western Power's electricity distribution licence (EDL1) and electricity transmission licence (ETL2). Specifically, EDL1 and ETL2 prescribe that Western Power must comply with all applicable licensing legislation, including the following:
    - Electricity Industry Act 2004 (WA),
    - Code of Conduct for the Supply of Electricity to Small Use Customers 2004 (WA),
    - Electricity Industry (Licence Conditions) Regulations 2005,
    - Electricity Industry Metering Code 2005 (WA),
    - Electricity Industry Customer Transfer Code 2004 (WA),
    - Electricity Industry (Network Quality and Reliability of Supply) Code 2005 (WA),
    - Electricity Networks Access Code 2004 (WA) and associated Technical Rules,
    - Electricity Industry (Wholesale Electricity Market) Regulations 2004 (WA), and
    - Electricity (Supply Standards and System Safety) Regulations 2001.
2. Obligations which are general in application but have industry specific impacts on Western Power. These include a number of environmental and safety obligations such as the Environmental Protection Act 1986 (WA), the Environmental Protection (Noise) Regulations 1997 (WA) and the Occupational Safety and Health Act 1984. These also include a range of obligations embedded in instruments such as Australian Standards or industry Codes of Practice.

    Such statutory obligations can be further categorised as:

    a) Obligations that drive network investment (that is, Western Power is required to invest to either achieve or maintain compliance with the obligation) For example, Western Power has an obligation to connect new network customers and is driven to invest to comply with this obligation.

    b) Obligations that only shape the nature or magnitude of investment (that is, they do not, in and of themselves, drive Western Power to invest, but having decided to invest, they influence option selection or the amount that must be invested). For example, obligations relating to environmental impact do not drive Western Power to invest, but if an investment is required, they can have significant influence over the option chosen (e.g. the line route) or the cost (e.g. overhead or underground). Similarly, obligations contained within Australian Standards can influence the design required and associated level of investment.

Some obligations can exist in both categories at the same time depending on the circumstances and network asset condition. For example, for new network assets, obligations relating to noise levels simply shape the option, design and cost of the investment. However, where existing network assets do not comply with mandated noise levels, Western Power may be driven to invest to achieve compliance.

As shown in Figure 45, the NIS predominantly focuses on those obligations which **drive** network investment. Those that shape network investment are predominantly referenced and dealt with in subordinate documents such as internal processes or design and construction standards.

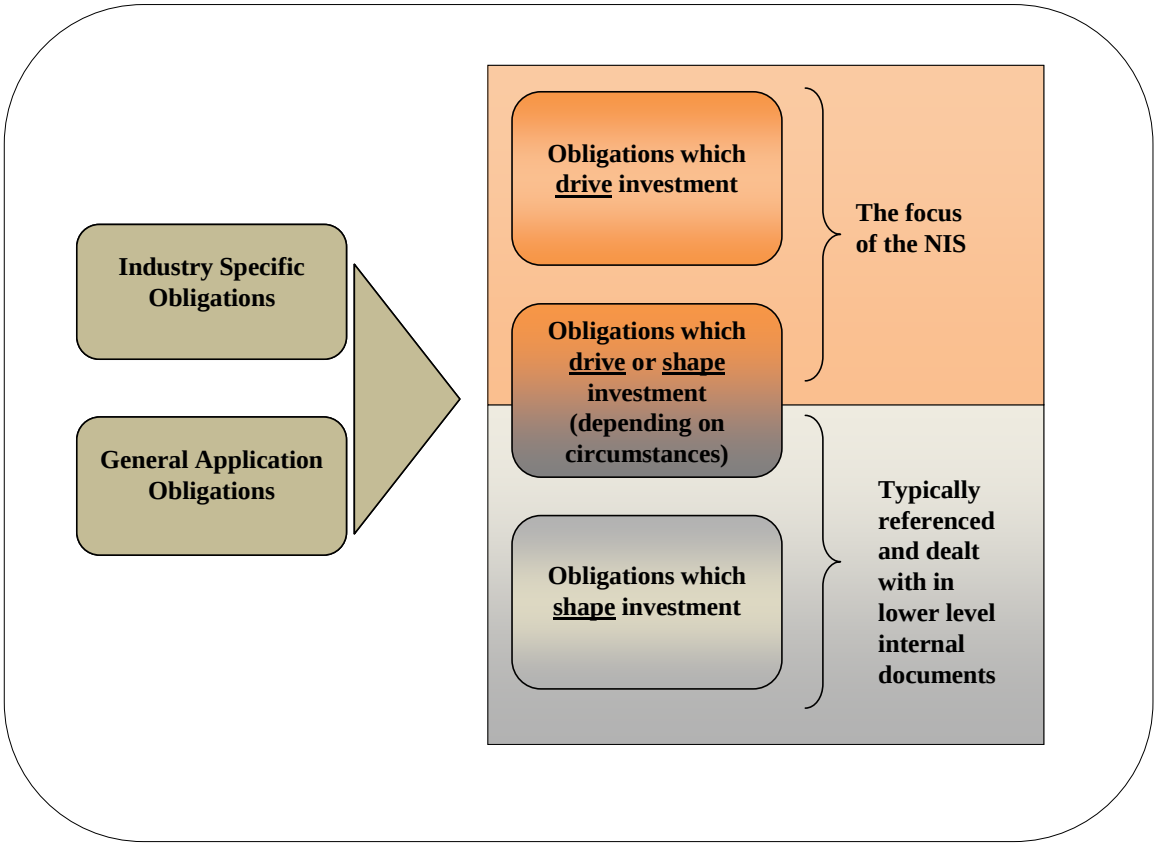


Figure 45: Categories of statutory obligations

Appendix C Western Power's regulatory categories

A list of the Regulatory Categories included in the AA2 is provided below. For more detailed descriptions of Regulatory Categories and their use at Western Power please refer to the Regulatory Categories Definition Document.

		CATEGORY	DESCRIPTION
Distribution Covered Services	OPEX	**Operations**	
		Reliability	Reliability-driven maintenance is specifically targeted at improving network reliability, and consists primarily of pole top inspections and line patrols.
		SCADA & Comms	The Western Power SCADA and Communications group provides strategic planning, maintenance and operations, and radio communication licenses for the distribution network. Projected operating costs for distribution SCADA and communications over the review period includes the operation and maintenance of the radio network including licences, strategic planning and network optimization for the distribution SCADA, communications systems and distribution automation, and now SCADA field maintenance which was previously included in System Management.
		System Management excl. IMO	
		Network Operations	Work related to the provision of control, switching, operations planning and monitoring for the Western Power Distribution network
		Miscellaneous Network Services	Work related to the activities associated with the provision of a variety of service to customers, including: requested relocation of assets; network planning studies; and requested network switching/isolation.
		Maintenance	
		Preventive Condition	Preventive Condition Maintenance relates to the follow-up maintenance and repair activities identified through the preventive routine maintenance programs.
		Preventive Routine	Preventive Routine Maintenance is proactive maintenance carried out to reduce the probability of failure or degradation of the performance of specific network assets. The activities relate, primarily, to the monitoring or maintenance of equipment and the work is generally of short duration and typically includes visual inspections, testing, lubrication regimes and routine minor part replacement.
		Corrective Deferred	Corrective Deferred maintenance includes the repair of failed or damaged equipment which do not present an emergency situation. These works usually arise following an emergency supply restoration where the supply is restored and/or the situation has been made safe and crews can be scheduled to complete the work or rebuild the assets at a later stage.

		CATEGORY	DESCRIPTION
Distribution Covered Services	OPEX	Corrective Emergency	Corrective Emergency maintenance includes maintenance activities carried out to immediately restore supply or make a site safe following equipment failure usually as a result of unplanned equipment failures, an accident or inclement weather. This type of work generally occurs without warning and is performed immediately to establish restoration of supply, ensure safety to the public and personnel, and prevent further damage to equipment.
		Meter Maintenance	
		Customer Service and Billing	
		Call Centre	Work related to the ongoing operations of a call centre function.
		Metering	Metering services forecast operating expenditure relates to the provision of the following meter and connection related services: · regulatory inspections services · metering provision including field maintenance and laboratory activities · data management including administration and meter reading.
		Corporate	
		Business Support	
		Other	
		Non Recurring opex	Non recurrent distribution operational expenditures include four projects: 1) Demand Side Management (DSM) projects, 2) Energy Solution projects 3) Field Survey Information Capture project, 4) Training new contractors and staff, and 5) Distribution automation – sequence switching
		Distribution Unregulated Opex	
		Private Vegetation	
		SUPP Opex	
	CAPEX	**Growth**	
		Capacity Expansion	The Capacity Expansion (CE) expenditure category includes all growth driven reinforcement of the distribution system, but excludes the work for the local connections to give customer access to the network for new connections. The magnitude and timing of distribution capacity capital expenditure is driven by two key inputs to the distribution capacity planning process; they are, transmission capital works, and the application of Western Power's distribution network planning criteria under forecast load growth.

		CATEGORY	DESCRIPTION
Distribution Covered Services		Customer Access	Distribution customer access includes all capital expenditures associated with the connection of customer loads onto Western Power's distribution network. It does not include expenditures associated with the installation of meters or capacity related network augmentations. The Distribution Headworks Scheme is associated with this expenditure category, and applies to the provision of distribution infrastructure; particularly to customers seeking to connect to the network in rural and regional areas.
		Gifted Assets	Customer driven works or subdivisions undertaken by the customer and gifted to Western Power. Gifted assets are accounted for as revenue in the year that the asset is energised but the value of assets are not added to the capital base and therefore do not generate any future revenue or profit.
		Asset replacement and Renewal	
		Asset Replacement	The capital expenditure in the Asset Replacement (AR) category relates to the replacement of existing assets with a modern equivalent asset. Replacement triggers can include age, condition, risk and prediction modelling.
		State Undergrounding Power Program (SUPP)	Program to retrofit older urban areas with underground power. Government set target for underground power services to be provided to 50% of residential properties in Perth by 2010, with corresponding improvements in regional towns. SUPP is a partnership b/w Western Power, the State Government, and local Governments, which involves a funding arrangement of 25%, 25% and 50% respectively.
		Metering	Metering capital expenditure includes all expenditures relating to the supply of meters and communications equipment, capitalised meter installation and commissioning activities, new CT metered installations, and the creation of the network connection points.
		Improvement in Service	
		Reliability Driven	Project work relating to upgrade and augmentation work required to maintain the performance of the Distribution network in the area of reliability. This may be in the form of specific projects or additions to other projects to achieve the targets in the Electricity Industry (Network Quality and Reliability of Supply) Code 2005.
Distribution Covered Services	CAPEX	Rural Power Improvement Program (RPIP)	The Rural Power Improvement Program (RPIP) is partially funded by the State Government through funding contributions by the Office of Energy. The objective of the program is to enhance power supply for rural customers, particularly in relation to projects that are difficult to justify due to the high cost of the work, and the relatively small numbers of customers benefiting from them.

	CATEGORY	DESCRIPTION
	SCADA & Communications	This expenditure captures: the remote SCADA infrastructure and interlinking communications systems; the SCADA and communications components of capital works for new substations and generators; expenditure directly related to telecommunications for the pro
	Compliance	
	Regulatory Compliance	This program of work aims to meet the safety, environmental and statutory compliance obligations of Western Power, particularly in regard to public safety, environmental management, and power quality (PQ) codes.
	Corporate	
	Admin & Support	Capital items to support and maintain office and depot accommodation. Includes tools and equipment required for construction, commissioning and maintenance functions and labour costs for the management of the capital works processes and programs.
	IT - Regulated	Capital expenditure relating to all Information Technology capital projects (excluding SCADA) and all capital purchases for printers, PDAs, software, and specialised IT based hardware such as Power Quality recorders and mobile work management hardware.
	Distribution Unregulated Capex	
	IT - Unregulated	
	Mobile Plant & Vehicles (Fleet)	

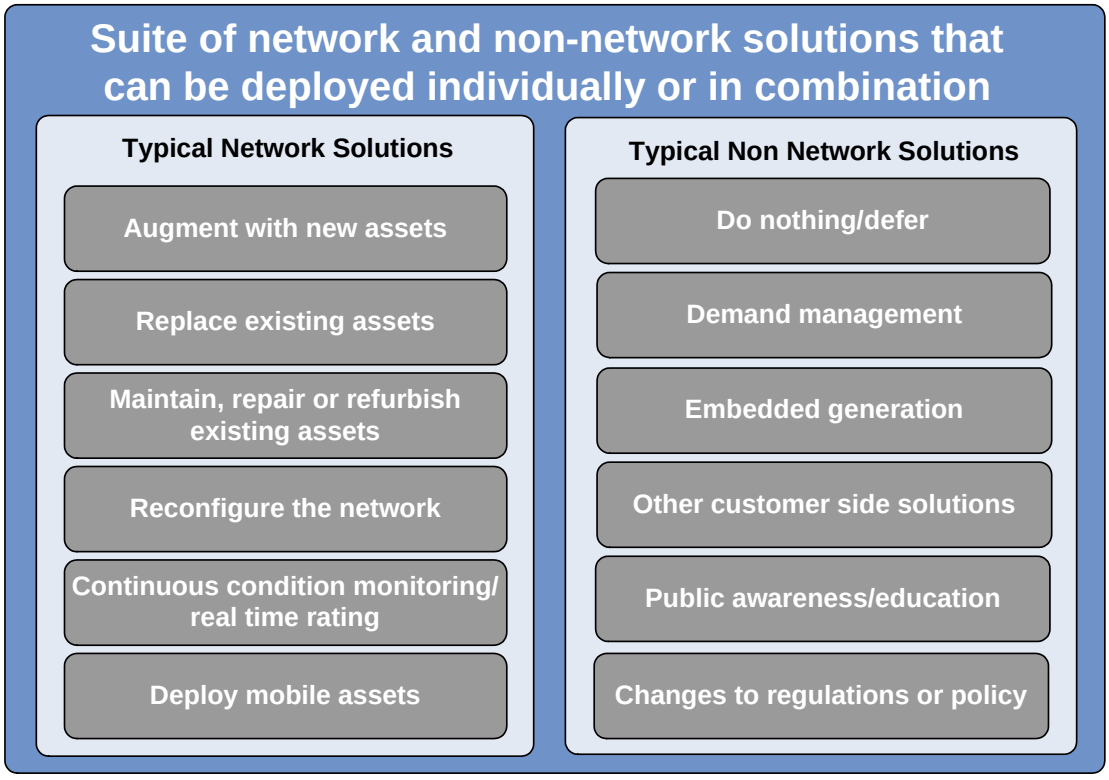
		CATEGORY	DESCRIPTION
Transmission Covered Services	OPEX	**Operations**	
		SCADA & Comms	Transmission SCADA and communications includes the strategic planning and asset management, as well as the preventative and corrective maintenance for all communication and SCADA field assets. It also includes all the communications operations network management monitoring and control and the management of all licensing and 3rd party support.
		System Management excl. IMO	
		Network Operations	Transmission network operational expenditure includes 50% of the System Management administration costs, maintenance of the XA/21 Energy Management System, 50% of the operating expenses of the SCADA & Information Systems Branch. It also includes operating costs of the Operations Control Branch, operating costs of maintaining the Emergency Backup Control Centre and the costs of providing a network control service. A brief description of each function is provided below.
		Miscellaneous Network Services	Work related to the activities associated with the provision of a variety of service to customers, including: network planning studies access application fees.
		Maintenance	
		Preventive Condition	Preventive Condition Maintenance costs relate to the follow-up maintenance activities performed as a result of conditions/defects identified through preventive routine maintenance programs.
		Preventive Routine	Transmission Preventive Routine Maintenance is the proactive maintenance carried out to reduce the probability of failure or the degradation in performance of transmission network assets. The activities include the monitoring, testing or inspection of equipment that is undertaken either at predetermined intervals or is initiated by equipment operations or condition. This work typically includes visual inspection, testing, lubrication regimes and routine minor part replacement.
		Corrective Deferred	Corrective deferred maintenance includes the repair of failed or damaged equipment that does not present an emergency situation. These works usually arise following an emergency supply restoration where the supply is restored and/or the situation has been made safe and crews can be scheduled to complete the works or rebuild the assets at a later stage.
		Corrective Emergency	Corrective emergency maintenance includes maintenance activities carried out to immediately restore supply or make a site safe following equipment failure – usually as a result of an accident, an unplanned equipment failure or inclement weather. The need for this type of work generally occurs without warning and is performed immediately to establish restoration of supply, ensure safety to the public and personnel, and prevent further damage to equipment.
		Corporate	

		CATEGORY	DESCRIPTION
		Business Support	
		Other	
		Non Recurring opex	Two projects: Removal of redundant transmission assets Asbestos removal from substations
		Transmission Unregulated Opex	
		Supply Chain external sales	
		Fleet external sales	
		IT external sales	
		PTS external sales	
		IMO	
	CAPEX	**Growth**	
		Capacity Expansion	The Capacity Expansion (CE) expenditure category (previously referred to as System Capacity) includes all growth driven reinforcement of the transmission and sub-transmission systems, including zone substations, but excludes the work for the local connections to give customer access to the network for new generators and bulk loads. The primary driver for capacity expansion Capex is growth of the peak summer demand supplied within the network.
		Customer Driven	The Capex in the Customer Driven (CD) category includes that required for the access of new generators to the system, which is related to work required to maintain compliance with network planning criteria, and to meet load growth needs caused by discrete customer loads (Block Loads). This category includes projects that are either partly or fully funded by the customer. It generally includes assets (often dedicated) installed at the connection point to the network.
		Generation Driven	The Capex in the Generator Driven (GD) category includes that required for the connection of new generation to the system. This includes the upgrades and augmentations necessary to move power from the generation point to the load centre under the most feasible dispatch scenarios and the cost of connecting the generation to the system. It excludes the costs of assets (often dedicated) at the connection point for generation access (GA) to the network which is either partially or fully funded by the proponents, and which is presented in the Customer Driven category.
		Asset replacement and Renewal	
		Asset Replacement	The capital expenditure in the Asset Replacement (AR) category relates to the replacement of existing assets with a modern equivalent asset. Replacement triggers can include age, condition, risk and prediction modelling.
		Improvement in Service	

		CATEGORY	DESCRIPTION
Transmission Covered Services	CAPEX	Reliability Driven	Western Power's transmission based Reliability Driven (RD) Capex is associated with upgrade and augmentation work required to maintain the performance of the transmission network in the area of reliability. This may be in the form of specific projects or additions to other projects to achieve the targets in the Electricity Industry (Network Quality and Reliability of Supply) Code 2005.
		SCADA & Communications	Western Power's transmission based SCADA and communications Capex is related to the supervisory control and data acquisition (SCADA) system that provides the link between system operations and the primary system assets: the communications systems that carry SCADA information, tele-protection signalling information, voice communications and ancillary communications (such as Ethernet) to operational sites.
		Compliance	
		Regulatory Compliance	Project work relating to meeting external obligations including technical and safety requirements and to achieve the targets in the Electricity Industry (Network Quality and Reliability of Supply) Code 2005.
		Corporate	
		Admin & Support	Capital items to support and maintain office and depot accommodation. Includes tools and equipment required for construction, commissioning and maintenance functions and labour costs for the management of the capital works processes and programs.
		IT - Regulated	Project work relating to all Information Technology capital projects (excluding SCADA) and all capital purchases for printers, PDAs, software, and specialised IT based hardware such as Power Quality recorders and mobile work management hardware.
		Land Procurement	
		Transmission Unregulated Capex	
		IT - Unregulated	
		Mobile Plant & Vehicles (Fleet)	
		Transmission Line Relocations	Relocation of existing transmission infrastructure on request of the customer
		Non-Reference Services	Miscellaneous Transmission network services provided to and paid for by customers, such as requested relocation of assets, network planning studies, and requested network switching/isolation.

Appendix D Suite of typical network and non-network solutions

Western Power's suite of typical network and non-network solutions is shown in the diagram below and described briefly in the remainder of this Appendix, noting that the suite is not intended to be exhaustive.



D.1 Network solutions

Augment with new assets - This involves augmenting the network with new assets, including:

- Substation and 'poles-and-wires' type assets (such as circuit breakers, reclosers, sectionalisers, transformers, overhead/underground conductors and reactive support equipment),
- Secondary assets for metering, protection, SCADA and communication,
- Land (including bio diversity offsets) and easements for the installation of network infrastructure.

Replace existing assets – This involves replacing existing assets where they are either beyond their serviceable life, cannot be relied upon to function in a manner consistent with their intended design or can no longer be supported due to obsolescence. Typically, replacement assets are designed to meet current standards.

Maintain, repair or refurbish existing assets – This includes maintenance or repair of assets to ensure they achieve their full design life, enhancement of assets where

they can be cost-effectively enhanced to meet higher levels of duty, or refurbishment to cost-effectively extend the life of ageing assets that would otherwise need to be replaced.

Reconfigure the network – This involves reconfiguring the network to transfer load from an overloaded element to an element with spare capacity.

Continuous condition monitoring/real time rating – Where it is likely that plant in poor condition will not deteriorate rapidly and condition monitoring is likely to detect further deterioration before failure, installation of continuous condition monitoring can be considered as a way to defer expenditure.

Real time rating is used to reduce the risk of overloading plant. Real time rating gives greater accuracy in knowing the actual load carrying capability of plant at any point in time rather than using broader estimates. This may lead to better utilisation and deferral of expenditure.

Deploy mobile network assets – These are mobile network assets that can be rapidly deployed if a contingency event occurs (such as rapid response transformers or switchboards or mobile substations). Holding such assets can mitigate risk and allow deferral of expenditure.

D.2 Non-network solutions

Do nothing/defer – Effectively, the option of doing nothing or deferring simply means taking a higher risk than may otherwise be taken; hence the action is to accept the higher risk. Doing nothing also involves the exercise of discretion.

Embedded generation – This involves the installation of generation at some point in the network, thus allowing deferral of capital expenditure on new network assets.

Demand management – This involves identifying and implementing options that reduce the peak demand for electricity at some point in the network, thus allowing deferral of capital expenditure on new network assets.

Other customer side solutions – In addition to demand management solutions, there are other solutions which reside totally on the customer's side. These include things such as installation of uninterruptable power supplies (to address power quality or reliability issues), stand alone or back up generators, or even things like double glazing on window to address noise concerns arising from Western Power assets.

Public awareness/education – Through the use of awareness and education programs, Western Power aims to increase public knowledge of electrical supply, demand and transport.

Western Power recognises that effective public awareness and education underpins the successful deployment of non-traditional solutions, along with supporting a sense of shared responsibility for existing and future network infrastructure.

Changes to regulations or policies - This involves lobbying government to change legislation that may be driving unnecessary or inefficient investment.

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Appendix E Related internal documentation

Network Investment Strategy Reference	Related documentation Document Title	Relevant DM References
Strategic Planning Environment	Transform the Core Strategy	http://busbar.westernpower.com.au/ourBusiness/StrategicDirection/Transform_The_Core.html
Governance	Corporate Governance Framework	DM# 3444604.
	Functional Governance - Works Program Governance Manual	DM# 5200741
	Functional Governance - Annual Planning Cycle Interpretation Guide	DM# 7389850
Network Vision	Smart Grid Roadmap	DM# 7661962
Network Risk Appetite	Western Power's Risk Management Policy	(DM# 3842495)
	Corporate Risk Assessment Criteria	(DM# 3341162),
	Corporate Risk Management Framework	(DM# 3861477
	The asset risk assessment criteria	(DM# 6592701
	Asset Risk Management Framework	(DM# 6592239).
Network investment drivers, investment strategies and performance measures	Technical Rules	http://www.era.wa.gov.au/2/156/48/technical_rules.pm
	Load Forecasting	Documents are reviewed and updated in accordance with Annual Planning Cycle and as such DM references are changed regularly. Please refer to responsible branch for latest DM reference.
	Generation Scenario Forecasting	
	Fault Level Report	
	Transformer Utilisation Factor	
	Distribution (DX) Overloaded Transformer Report	
	State of the Network Report	
	Capacity (Load Area) Report	
	DX Feeder Utilisation Report	
	Service Standard Performance Report	

Network Investment Strategy Reference	Related documentation Document Title	Relevant DM References
	Distribution Asset Management Plan	
	Transmission Asset Management Plan	
	Asset Mission Statements	
	Annual Planning Report (APR)	
	Reliability Improvement Strategy Plan	
Optimisation and Prioritisation	Sponsors Forum Terms of Reference	DM# 6673890
Investment Portfolio	Western Power Budgeting Guidelines.	DM# 3479872
	Ten year Capex plan	Documents are reviewed and updated in accordance with Annual Planning Cycle and as such DM references are changed regularly. Please refer to responsible branch for latest DM reference.
	Approved Works Program (AWP)	
	Strategic development plan and statement of corporate intent	
	Micro budget	
	Annual production plan	
	Individual Business Cases	

Appendix F Investment strategies associated with investment drivers

The high level investment strategies associated with each of the nine investment drivers (repeated in Figure 46), is outlined in this Appendix, including the key dimensions for the investment strategies as described in Section 11.3 (and repeated in Figure 47).

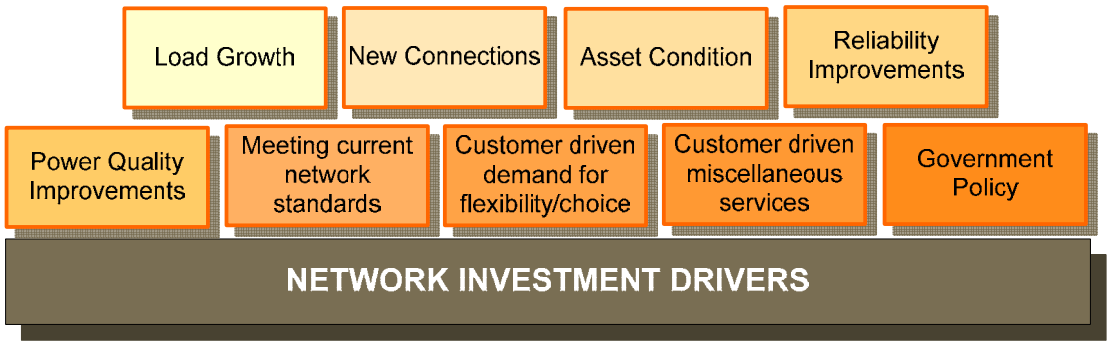

Figure 46: Suite of network investment drivers

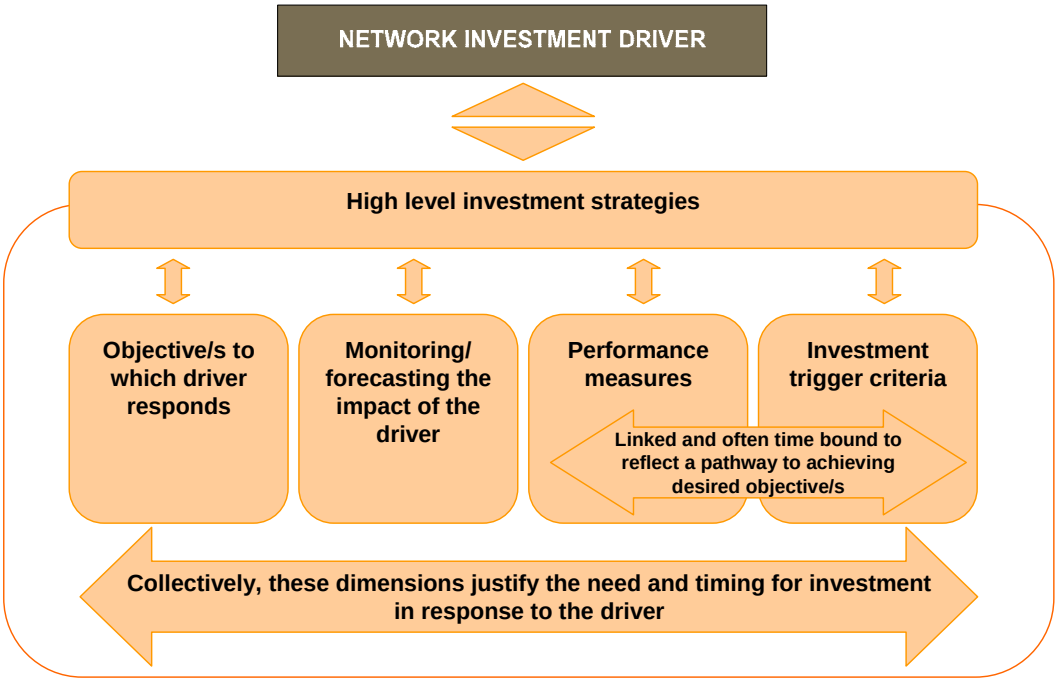

Figure 47: Dimensions of investment strategies associated with investment drivers

F.1 Load growth

When forecast growth in peak demand at a particular network location reaches the 'trigger' point, Western Power is obliged to either invest in additional network capacity, transfer load to better utilise existing network capacity or invest in non-network solutions to manage demand in that location. However, the decision to invest and the choice of preferred investment will also take into account the risk associated with the particular circumstances and the level of risk Western Power is prepared to accept.

This risk analysis takes into account:

- The size, extent and sensitivity of load or generation which may be affected,
- The potential for the investment to pass the regulatory test and the NFIT, considering any uncertainty regarding the investment driver and the relative size of the net market benefits predicted to be delivered by the alternative investment options,
- The physical location of various components of the network and their exposure to damage or potential to cause harm to the public,
- The ability to deliver proposed alternatives in the time required to meet the forecast load, and
- The potential cost of being late or the demand growing at greater than the forecast rate.

Western Power currently adopts a 'just in time' investment strategy to manage peak load growth. That is, investments are planned to deliver solutions just in time to manage the peak demand. However, Western Power sizes investments not just to meet the demand at the time the solution is delivered, but to also meet the forecast demand for a reasonable time into the future.

Individual investment decisions also take into account alignment with longer term strategies that exist for various elements of the network. These strategies are contained in other planning documents as shown in Western Power's Strategic Planning and Investment Architecture shown earlier in Figure 17. Examples of these longer term strategies include:

- Increasingly unleashing and utilising surplus capacity in the 330kV network (currently constrained by the highly meshed nature of the 132kV network),
- Removing shortfalls in the 132kV capacity to supply load centres,
- Removing shortfalls in zone substation power transformer capacity,
- Progressively replacing the 66kV network with a 132kV network,
- Progressively replacing the 6.6kV and 11kV networks with 22kV networks (except in the CBD) to increase feeder capacities,
- Progressively reducing the utilisation on distribution feeders to more sustainable levels of around 80%.
- Removing thermal constraints on distribution networks to increase capability to supply new loads or transfer loads between substations,
- Removing voltage regulation constraints on long distribution feeders to increase capability to supply new loads, and
- Addressing voltage imbalance issues on single phase distribution networks.

Related network objectives

The two primary network objectives that investments to meet organic load growth respond to are:

1. Objective 1 - The network meets customer requirements for performance and value - particularly the dimensions of capacity and reliability/security.
2. Objective 2 - The network complies with statutory obligations - particularly the dimensions of safety compliance and economic regulation (licence conditions).

Monitoring/forecasting

The key input to assessing the timing and level of investment required to meet load growth is a forecast of capacity constraints. These are determined by comparing installed capacity with forecast peak demand. Western Power's network development plans are based on forecasts of peak demand at a feeder, substation and regional level, assumptions about generation developments and a detailed understanding of the capacity of the exiting network (including how that will change as committed projects are delivered).

The capacity of the network is established taking into account the thermal ratings of plant, stability limits and fault current limits. Thermal and fault current limits are established using equipment ratings based on manufacturer's standards, industry standard practice and Western Power's own experience and history with individual items of equipment. In addition detailed analysis is undertaken to establish the system stability limits and to predict whether future demand will be able to be met without exceeding the capability of the network.

Peak demands are forecast using Western Power's standard demand forecasting methodology. This methodology is described in detail in Western Power's System Forecasting Section's Operating Manual (DM# 6296884). Western Power's forecasts are published each year as a Summer Trends Load Forecast report, which is used internally by the network planners. A summarised version of this report is published in the APR which is made publicly available.

Performance measures/trigger criteria

The current performance measures and associated trigger criteria for load growth related investment are derived from the Technical Rules. These impose obligations on Western Power as outlined in Chapter 12 of the Access Code and mandate the planning criteria for Western Power's transmission and distribution networks.

Western Power has developed a suite of transmission and distribution planning criteria documents, which provide an interpretation of, and guidelines for, the application of the Technical Rules given Western Power's particular circumstances. A complete list of these planning criteria documents is contained in Appendix E - Related internal documentation. These documents contain the performance measures/trigger criteria for the various elements of Western Power's transmission and distribution networks.

Western Power uses sophisticated network analysis to ensure that each element of the network satisfies the relevant technical and planning criteria.

F.2 New connections

In the case of new load connections, Western Power's key strategy is to proactively engage with customers, stakeholders and other planning bodies to identify possibilities early. This allows such loads to be factored into peak demand forecasts and ensures the greatest likelihood of being able to accommodate new loads when they actually require connection.

In the case of new generator connections, within the framework of the Access Code, Western Power sends pricing signals to aid in the optimisation of the development of the system. However, because Western Power cannot direct the location of new generators, it must make prudent assumptions regarding possible generation development scenarios in its network development planning process.

Western Power currently plans for the connection of generation through the network access process. Its planning process manages the high levels of uncertainty associated with the size, timing and location of new generation by developing scenarios from the various generation proposals that it is aware of. As particular generators commit to connecting to the network, specific network investment decisions are then made to accommodate them.

Related network objectives

The two primary network objectives that investments to accommodate new connections respond to are:

1. Objective 1 - The network meets customer requirements for performance and value - particularly the dimensions of access and capacity.
2. Objective 2 - The network complies with statutory obligations - particularly the dimension of economic regulation (licence conditions), since Western Power has a regulatory obligation to connect new customers.

Monitoring/forecasting

Monitoring/forecasting for new connections is undertaken as part of the forecasting process described in the previous section. In the case of large block loads and generators, Western Power relies on proponents to provide details of projects early enough to be incorporated in scenario planning. Western Power also uses externally published planning documents from a variety of sources to supplement this information for forecasting purposes. In the case of new generation, the Statement of Opportunities (SOO) published by the IMO is a key source of information for forecasting purposes.

Performance measures/trigger criteria

The same planning criteria apply to load and generator customer connections as for load growth. The key trigger criteria for investment to connect a new load or generator is a formal agreement between Western Power and the proponent.

F.3 Asset condition

Other than those assets that are managed on a 'run to failure' basis, Western Power uses a condition based maintenance regime to monitor asset condition and facilitate investment decisions to balance performance and risk and to ensure assets continue to provide their required functions at the least whole-of- lifecycle cost.

Western Power reviews asset performance, maintenance history, asset failure data and condition information to identify emerging issues with individual assets or asset types/classes. Where assets are not performing to the required levels, or a change in failure rates has been identified, maintenance strategies are reviewed to identify if the issue can be effectively managed via maintenance. However, where the issue cannot be efficiently mitigated through maintenance practices, a decision to repair or replace the asset is required.

On the transmission network, the decision to replace or repair an asset is generally made at the individual asset level. This is because the value of assets in the transmission network makes it cost effective to obtain condition data and undertake analysis/risk assessment for individual assets.

On the distribution network, such decisions are generally based on an assessment of types or classes of assets using aggregate information. Where there are large volumes of assets of the same type, Western Power also consider factors such as age profiles, size of the asset population, environmental factors, accessibility, criticality and the consequences of failure. Western Power also considers the likelihood and consequence of failure across an entire asset class, which could result in widespread outages and significant unplanned investment if an entire class of asset need to be replaced under emergency conditions.

Western Power makes decisions to maintain, repair, replace or let assets run to failure based on a detailed risk assessment methodology.

Detailed investment strategies at the individual asset/asset class level are contained in a comprehensive suite of Asset Mission documents. These are referenced in Appendix E – Related internal documentation.

Related network objectives

The two primary network objectives that investments driven by asset condition respond to are:

1. Objective 1 - The network meets customer requirements for performance and value - particularly the dimensions of capacity and reliability/security.
2. Objective 2 - The network complies with statutory obligations - particularly the dimensions of safety and environmental compliance and economic regulation (licence conditions).

Monitoring/forecasting

Western Power's asset condition driven investments are based on a rigorous condition assessment methodology. Condition assessment is performed to establish an understanding of the assets and their service status and is used as one of the key tools for predicting the need for asset maintenance or renewal activities. Past reliability, future likelihood of failure and consequence of failure are all considered as part of this assessment.

Western Power's condition assessment methodology includes inspections, testing programs or specific asset investigations.

Performance measures/trigger criteria

To a large extent, performance measures/trigger criteria associated with asset condition are reflected in other investment drivers, since asset condition has a significant impact on reliability, security, power quality, safety, and environmental outcomes.

Investments in managing the condition of assets is therefore driven from a range of performance measures/trigger criteria outlined in other sections of this Appendix (e.g. SAIDI and SAIFI measures as described in Section A.4 – Reliability improvements). They can also be driven out of requirements to comply with specific safety or environmental obligations or in response to formal orders from regulators such as EnergySafety.

In addition, Electricity (Supply Standards and System Safety) Regulations 2001 requires prudent levels of asset replacement in order to deliver acceptable public safety outcomes. Additionally as part of licence conditions, the Electricity Industry Act 2004 requires effective asset management systems that ensure prudent management of assets to ensure they remain fit for service. Western Power aligns its asset management practices with good industry practice to achieve this.

E.4 Reliability improvements

Reliability performance improvement relies on the identification and elimination of outage root causes, minimisation of the number of customers affected, and improvements in restoration times.

Western Power's current strategy to achieve improvements in reliability focuses on the distribution network, as this is where a large proportion of customer outages occur and where performance measures are assessed. On the distribution network, Western Power's investment strategy in response to this driver has two key components as discussed below.

Non-targeted investments, which are aimed predominantly at sustaining current levels of reliability performance. Such investments can result in some degree of improvement in reliability performance. However, they occur primarily in response to other investment drivers and hence generally do not target areas in the network with the worst reliability performance.

They include investments to provide adequate network capacity (to meet load growth or new connections), investments to maintain or improve the condition of existing network assets (e.g. pole replacement/reinforcement, carrier replacement or undergrounding) and investments in Opex programs such as vegetation management. However, Western Power ensures that such investments are optimised to deliver additional outcomes such as reliability performance improvement, potentially through incremental additional investment where it is economically efficient to do so.

Targeted investments, which are aimed specifically at improving reliability performance. There are two categories of targeted investment as follows:

1. Network reinforcement programs, which reinforce weak/high fault sections of the network. They include undergrounding or reconductoring, reconfiguration or augmentation, lightning mitigation, and wildlife proofing.
2. Distribution automation programs, which provide the ability to remotely identify, isolate and reconfigure the network. They include additional reclosers, load break switches, fault indicators, and automated ring-main units.

Typically these targeted investment programs are applied to localised areas of the network that have particularly poor reliability performance. As described later in this section, Western Power measures reliability performance across four categories of distribution feeders, these being Central Business District (CBD), Urban, Rural Short and Rural Long, as well as across the whole network.

Western Power's investment philosophy is to invest in targeted programs that deliver the highest reliability improvement return for the amount invested. However, this philosophy is applied at the level of the four feeder categories rather than at the whole of network level.

If this philosophy were applied at the whole of network level, limited investment would occur in rural areas due to the relatively low numbers of customers. However, even applying this philosophy at the feeder category level means that there is limited investment in targeted reliability improvement programs at the edges of the grid, since low customer numbers means that significant investments can result in minimal overall improvement in reliability performance, even at the feeder category level.

In recognition of this, Wester Power is pursuing the introduction of a six year capital program to improve the reliability of localities in country areas of the network that experience significantly worse reliability performance compared to other similar localities.

Areas that will be considered are generally small communities in rural areas supplied by long distribution lines, which are more prone to faults and may have no alternative points of supply should an interruption occur. Due to the high cost relative to the number of customers that would benefit from this work, these projects are difficult to justify under Western Power's normal prioritisation process for its reliability improvement driven investment.

This proposed program is similar to the Rural Power Improvement Program (RPIP) which was a $60 million five year targeted investment program jointly funded by the State Government and Western Power and was established to improve reliability performance in country areas of the network.

Related network objectives

The two primary network objectives that investments in reliability improvements respond to are:

1. Objective 1 - The network meets customer requirements for performance and value - particularly the dimensions of reliability/security.
2. Objective 2 - The network complies with statutory obligations - particularly the dimensions of economic regulation (licence conditions).

Monitoring/forecasting

Establishing areas requiring targeted reliability improvement is done based on an assessment of the fault data across the distribution network on the basis of the four feeder categories. Statistical analysis of this data is undertaken to determine the number of customers affected and the overall impact on reliability performance. It is also analysed to determine the underlying cause/causes of faults affecting reliability, enabling appropriately targeted improvement programs to be identified. Forecasting of improvements in reliability on the basis of targeted programs is then calculated using a set of assumptions aimed at determining the effect a program will have on the number of faults/outages and the corresponding improvement in reliability that will result.

The impact of non-targeted programs can be similarly forecast.

A reliability analysis tool is currently being developed to model probabilistic reliability rather than using the current historical analysis method to forecast future reliability performance. This tool will significantly improve capability to determine where best to make investments in reliability improvement and the impact of this improvement.

Performance measures/trigger criteria

The two performance measures associated with reliability performance are:

1. The System Average Interruption Duration Index (SAIDI), which represents the average total number of minutes without supply for each customer during a 12 month period.
2. The System Average Interruption Frequency Index (SAIFI), which represents the average number of sustained supply interruptions for each customer during a 12 month period.

Minimum standards are established to trigger network investment if the average reliability performance falls below the standards. There are two primary sources for establishing minimum acceptable levels for SAIDI and SAIFI, these being:

1. Service Standard benchmarks (SSBs), which are established under Section 3.18 of Western Power's Access Arrangement with the ERA. These SSBs are established for the network as a whole and also for four categories of feeders;

CBD, Urban, Rural Short and Rural Long. Related to the SSBs, the Access Arrangement also includes a Service Standards Adjustment Mechanism (SSAM), which establishes an incentive/penalty regime for over/under performance relative to the SSBs. The SSAM applies only for the four categories of feeders, not the network as a whole.

2. Sections 13.2 and 13.3 of the *Electricity Industry (Network Quality and Reliability of Supply) Code 2005*, which specifies levels for SAIDI on the basis of three areas; Perth CBD, urban areas other than Perth CBD, and any other area of the state.

There is misalignment in the way these two sources categorise reliability performance measures. There is also misalignment in the performance levels required. At present, Western Power is not fully compliant with all aspects of the *Electricity Industry (Network Quality and Reliability of Supply) Code 2005.*

Over the short to medium term, Western Power will invest to meet the SSBs contained in the Access Arrangement. In the longer term, Western Power aims to align the reliability performance measures embodied in SSBs with those in the *Electricity Industry (Network Quality and Reliability of Supply) Code 2005* and invest to progressively meet the reliability performance standards specified in the code. The new probabilistic reliability modelling tool will enable Western Power to more accurately determine the volume, timeframes and cost of programs necessary to achieve this full compliance, and hence establish an appropriate pathway.

E.5 Power quality improvements

There are differences between the transmission and distribution networks in terms of the strategies adopted by Western Power to manage power quality performance as described below.

Transmission network

On the transmission network, Western Power's strategy is to predominantly manage power quality performance proactively. This is achieved by ensuring that all new assets installed on the network (regardless of the driver) will not result in degradation of power quality below the accepted standards. This is achieved through things such as plant specifications, network configuration and the imposition of emission limits on new load or generation customers at the point of connection to the network. This approach ensures that power quality on the transmission network is generally maintained at the required standard.

The need for improvements in power quality on the transmission network only arises when proactive monitoring or reactive feedback from customers indicate that the required standard is not being met. In such cases, the strategy is to assess the degree of non-compliance and determine the most appropriate solution to bring the network to a condition of compliance.

The basis for this predominantly proactive strategy recognises that the consequences of power quality issues on the transmission network can be far reaching and the timeframe to rectify them can be long (e.g. due to the lead time to purchase and install remedial equipment such as reactors or harmonic filters).

Distribution network

Traditionally, on the distribution network, Western Power's strategy to manage power quality performance has predominantly been opportunistic or reactive.

Opportunistic investments occur primarily in response to other investment drivers such as provision of network capacity (to meet load growth or new connections), or maintaining/improving the condition of existing network assets (e.g. pole replacement/reinforcement, carrier replacement or undergrounding).

Such investments can result in some degree of improvement but generally do not target areas in the network with the worst power quality performance. However, Western Power ensures that such investments are optimised to deliver additional outcomes such as power quality performance improvement, potentially through incremental additional investment where it is economically efficient to do so.

Reactive investments are aimed specifically at improving power quality performance, but only in direct response to specific customer complaints or network faults.

However, increasingly, Western Power is establishing a strategy of proactively pursuing improvements in power quality performance on the distribution network.

Proactive investments target specific areas of the network with the worst power quality performance. Such investments include targeted LV network upgrades, voltage management projects and programs to upgrade overloaded assets.

Related network objectives

The two primary network objectives that investments in power quality improvements respond to are:

1. Objective 1 - The network meets customer requirements for performance and value - particularly the dimension of power quality.

2. Objective 2 - The network complies with statutory obligations - particularly the dimensions of economic regulation (licence conditions).

Monitoring/forecasting

There are three primary approaches for monitoring power quality performance on the network:

1. Simulation modelling of the impact of proposed new Western Power assets (e.g. assets installed in response to load growth) or new load or generator connections.
2. Proactive monitoring of PQ performance on the existing network via permanent or temporary data recorders installed at key nodes.
3. Reactive Investigation and evaluation of equipment failures or malfunctions on the network or in response to feedback/complaints from customers.

These approaches are used to a greater or lesser extent on both the transmission and distribution networks.

Performance measures/trigger criteria

The current performance measures and associated trigger criteria for power quality improvement related investments are derived primarily from standards specified in the following three statutory instruments:

1. Electricity Industry (Network Quality and Reliability of Supply) Code 2005,
2. Technical Rules 2007 (WA), and
3. Electricity Act (1945).

Power quality issues can also result in breaches of the safety requirements under the Electricity (Supply Standards and System Safety) Regulations 2001.

E.6 Meeting current network standards

Western Power's strategy is to refresh its suite of network standards to ensure that they are compliant, well justified, satisfy NFIT requirements and meet the needs of customers.

However, like many other network operators across Australia and globally, Western Power has a backlog of legacy network standards that are outdated, often undocumented and in many cases have not been reviewed for compliance with relevant current external industry standards. Given the magnitude of the task to refresh this suite of standards, enactment of this strategy is based on a 'pathway to compliance'. This pathway is prioritised on the basis of:

- customer needs,
- assessed network risk, and
- opportunity for efficiency gains.

The introduction of industry level standards from bodies such as the ENA, provide a basis to align with good industry practice, and deal with many of the legacy issues. However, their application in a West Australian and Western Power context still requires significant investment to ensure the residual risks are managed, and the changes (if any) are adequately integrated.

From a technology perspective, Western Power's strategy is to investigate and implement new technology in a way that maintains a balance between innovation and a stable suite of engineering standards.

Related network objectives

The primary network objective that investments in meeting current network standards respond to is:

Objective 2 - The network complies with statutory obligations - particularly the dimensions of safety and environmental compliance.

Monitoring/forecasting

Western Power has a robust methodology in place to monitor the impact of new and emerging standards as described its *Framework for the Investigation of New Technology and Management of Network Standards* (DM# 6173739). This methodology is based on regular review of internal and external triggers that could prompt the need for a new or changed standard, as shown in Figure 48.

In addition, Western Power keeps abreast of and has input to changing and emerging standards and technology through engagement with industry peers and active involvement in industry peak body organisations such as CIGRE, ENA and ESAA.

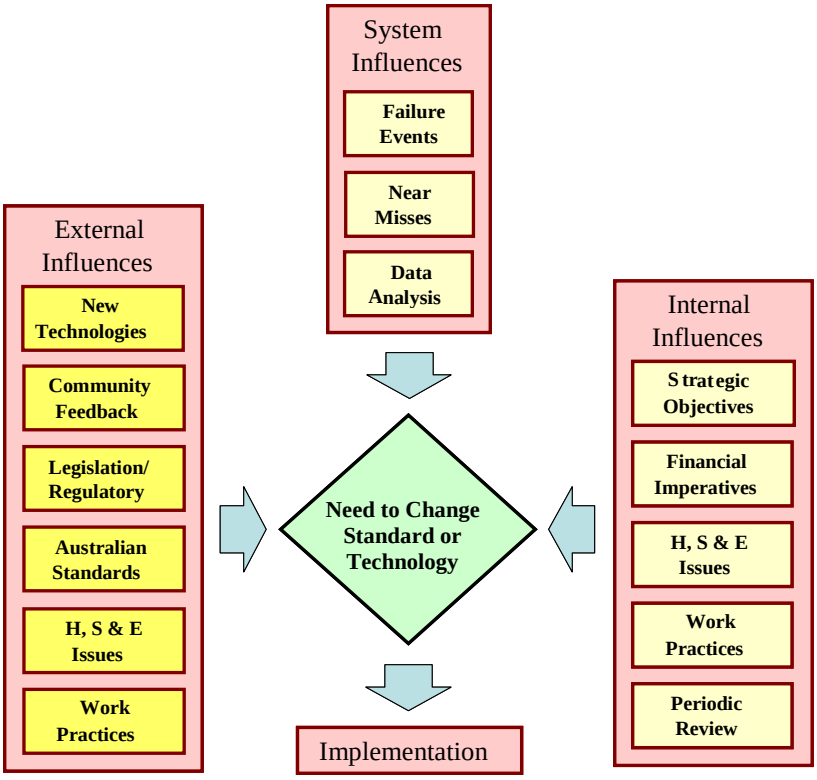

Figure 48: Triggers for changing standards

Performance measures/trigger criteria

There are no explicit performance measures associated with this driver. Predominantly, it is associated with changed or new technical standards, which may be internal standards, or external standards such as Australian of international standards or industry guidelines (e.g. ENA publications).

From a compliance perspective, Western Power has an obligation to comply with the *Electricity (Supply Standards and System Safety) Regulations 2001.* These regulations list a number of publications (such as Australian Standards or industry guidelines) that Western Power must comply with.

When an existing standard is changed or a new standard is introduced, Western Power assesses its impact on both future and existing assets, including the extent to which they comply with the new standard and the cost, benefit and risk of remedial actions required to ensure existing assets are at an appropriate level of compliance. For each new or changed standard, a detailed risk assessment is undertaken to establish the level of compliance required, the work necessary to achieve this, the assets affected and the strategy/timeframe for undertaking the work (e.g. opportunistically or through a specific program).

E.7 Customer driven demand for flexibility/choice

This is an 'emergent' driver for network investment and Western Power has not yet fully developed a strategy in response to it. This strategy will emerge initially out of the work currently being done to develop a "Smart Grid Roadmap' (DM# 7661962). The roadmap will develop options and solutions that respond to this driver, although it is important to recognise that the Smart Grid roadmap will predominantly develop solutions to address other network investment drivers such as growth and reliability and power quality improvements.

Related network objectives

The primary network objective that investments in customer driven demand for flexibility/choice respond to is:

Objective 3 - The network enables customer flexibility and choice.

Monitoring/forecasting

Western Power is the key participant in the Perth Solar City consortium. Through this consortium, Western Power is conducting pilots and trials to understand the true impact of smart grid technologies on the customer and their responsiveness to new technologies and energy efficiency measures. In addition, input is sought directly from customers through community engagement activities and periodic surveys to explore customer appetite for solutions providing choice and flexibility.

Performance measures/trigger criteria

Given the emergent nature of this driver, Western Power has not established clear performance measures or the criteria that may trigger the need to invest. These will also be developed as part of the Smart Grid Roadmap work.

E.8 Customer driven miscellaneous services

Western Power's strategy in response to this driver is largely reactive, and involves dealing with customer's requests as they arise. However, as part of the desire to optimise investments, opportunities to leverage such work to achieve additional outcomes are pursued wherever possible.

Related network objectives

The primary network objective that investments in customer driven miscellaneous services respond to is:

Objective 1 - The network meets customer requirements for performance and value.

Monitoring/forecasting

This work is driven by individual customer demand for specific services at specific locations on the network. Such work does not lend itself to rigorous forecasting or trend analysis. Rather, Western Power forecasts the likely demand for such services on a volumetric basis, predominantly using historical data, coupled with any specific information obtained through other sources (e.g. the need for a transmission line relocation may be identified as part of a land subdivision development project).

Performance measures/trigger criteria

There are no explicit performance measures or associated criteria that trigger the need to invest on the basis of this driver. Investment is reactive and requires limited justification, as it is fully customer funded.

E.9 Government policy

There are occasions were asset related investments are driven out of the need to comply with Government policy/directives (e.g. the State Underground Power Project). In the majority of cases, this would not be a separate driver of investment, as Government policy would be reflected in some form of statutory instrument that would underpin justification for investment on the basis of the drivers identified previously. However, there may be instances where the Government (as the shareholder) directs Western Power to implement a specific policy.

Related network objectives

The primary network objective that investments in Government policy initiatives respond to is:

Objective 4 - The network enables a competitive electricity market and enactment of energy policy.

Monitoring/forecasting

There is no explicit process for monitoring or forecasting the impact of this driver. Rather, this is done through the normal process of engagement between Western Power and the Government.

Performance measures/trigger criteria

Performance measures and trigger criteria associated with this drive would be specifically relevant to the policy directive.