

Asset Management Plan

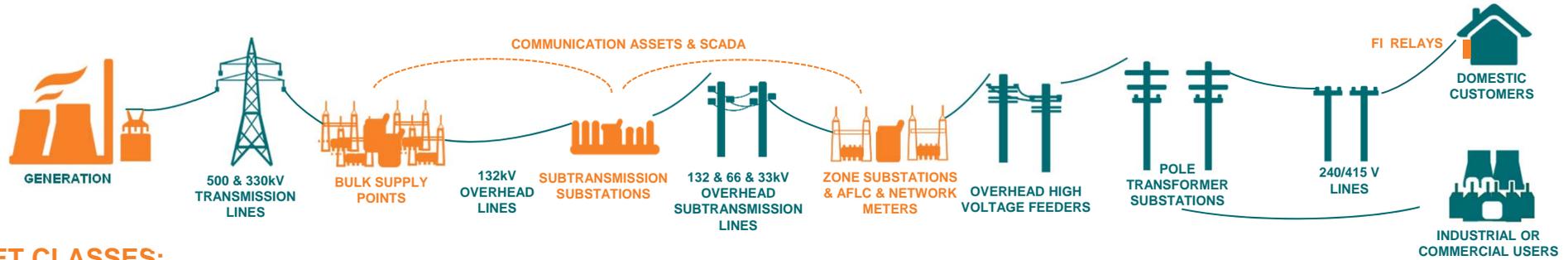
Secondary System Assets

April 2018

Supporting Document 12.1.12

Executive Summary

NETWORK ASSETS COVERED IN THIS ASSET MANAGEMENT PLAN



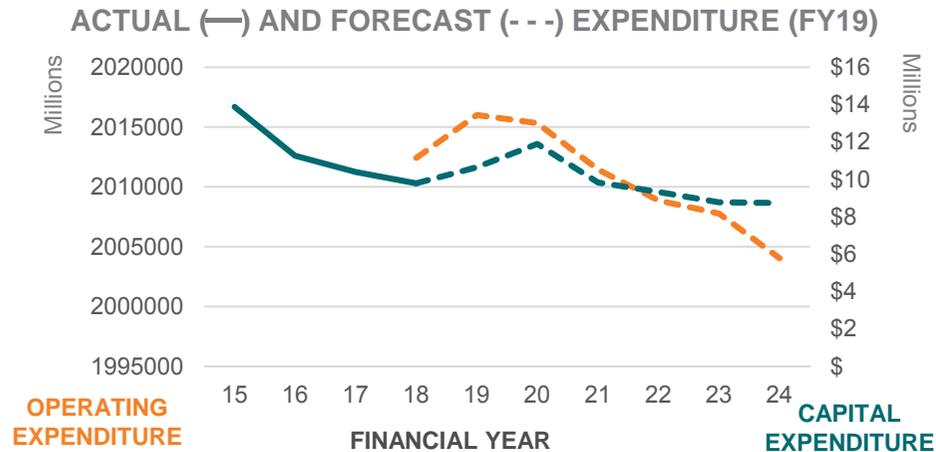
ASSET CLASSES:

COMMUNICATION ASSETS | ZONE SUBSTATIONS RTUS | DSA MODEMS| AFLC | FI RELAYS| GENERATORS | NETWORK METERS

THIS ASSET MANAGEMENT PLAN REPRESENTS:

\$197m OF TOTAL ASSET SYSTEM REPLACEMENT COSTS¹

0.7% OF TOTAL NETWORK REPLACEMENT COSTS¹



PROPOSED ANNUAL CAPITAL EXPENDITURE (CAPEX)

5%

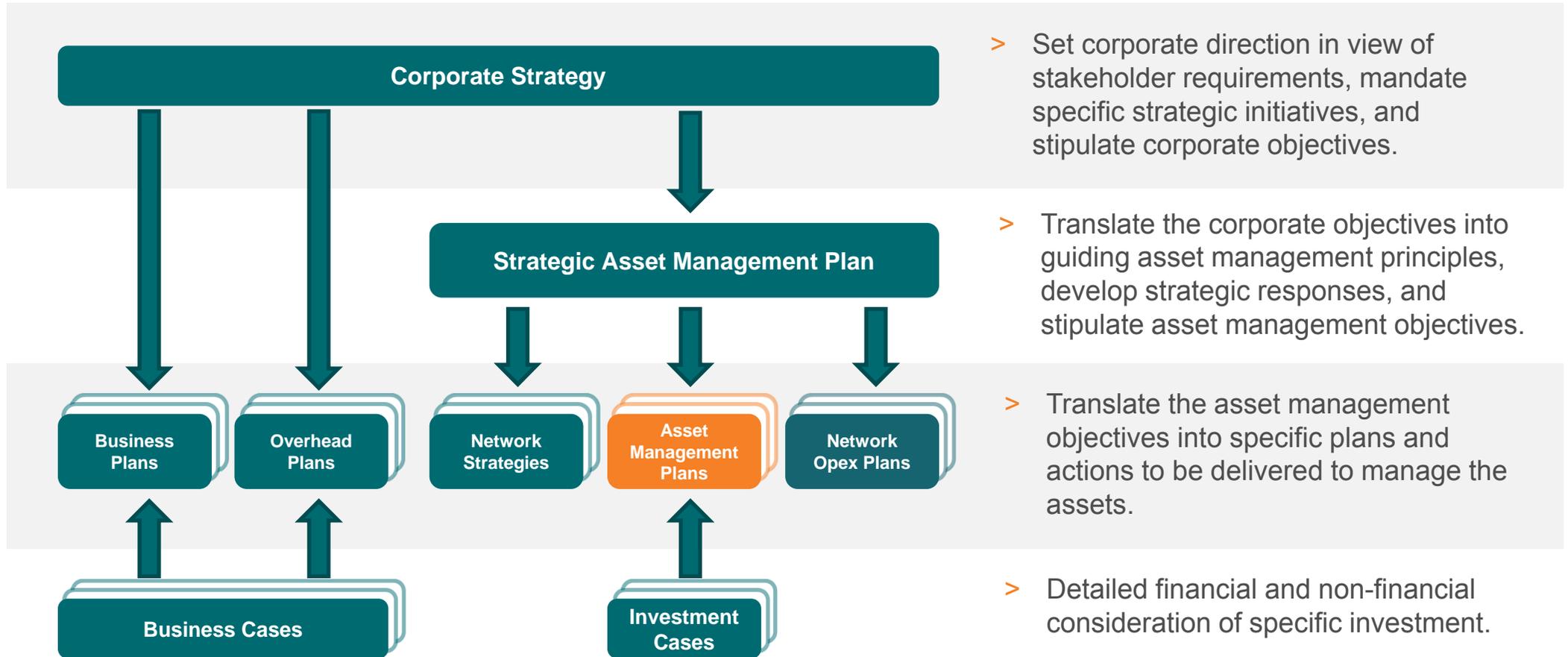
OF TOTAL ASSET SYSTEM REPLACEMENT COSTS¹

3% of secondary system assets are beyond their expected serviceable life

0% of asset-related safety incidents are associated with secondary system assets

0.42% of system reliability performance (SAIDI) is attributable to secondary system assets.

Document hierarchy and purpose



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Asset Overview

Secondary System Assets:

- > **SCADA** - Provide real-time visibility of the high voltage network behavior and performance
- > **Generation** - Provide and support 22 kV load associated with Broken Hill Bulk Supply Point
- > **Load control** – Provide control of domestic load through frequency injection.
- > **Communications** – Provide services related to control, management and monitoring of electrical assets and systems.
- > **Network meters** – Monitor the power quality and electricity use of the network.
- > **Includes:**
 - Generators, fuel farms, radios, infrastructure, data networks, remote terminal units (RTUs), modems, frequency injection (FI) relays, audio frequency load control (AFLC) plant, meters.

Risk Management Issues



Safety



Increased Network Costs

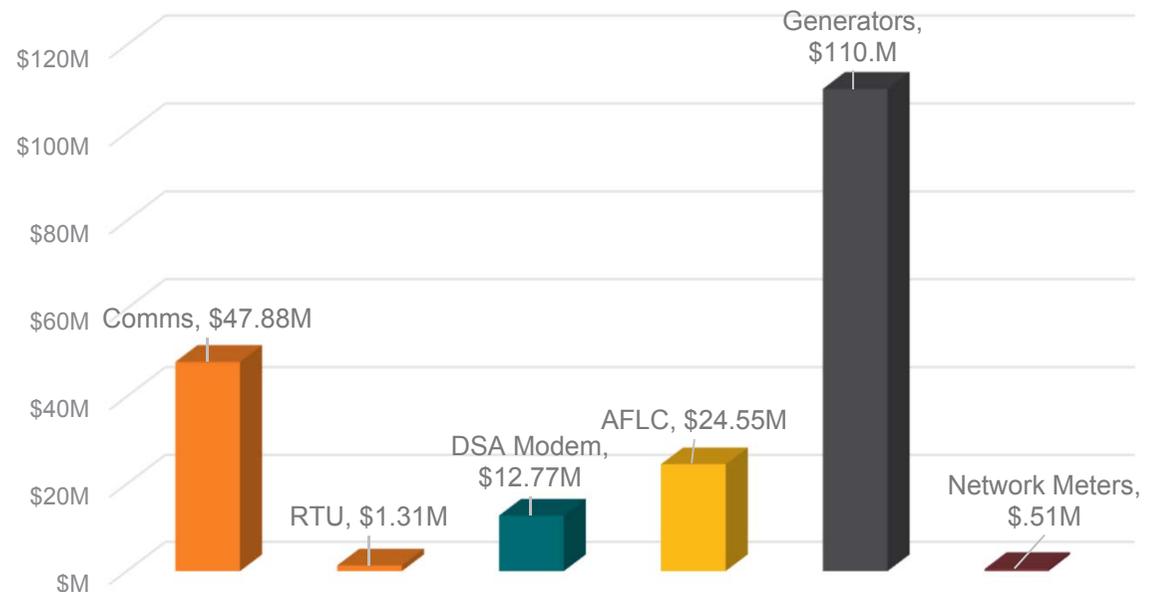


Network Reliability



Environment (and bushfire zones)

Total Replacement Value of Secondary System Assets



Asset Scope, Population & Management

Scope and Asset Population

	SCADA, Network Control and Protection Systems			Load Control Equipment	Generation	Network Metering
	Communications Network Assets	Field Devices (ZS RTUs)	DSA Modems	AFLC	Generators and Fuel Farm	Meters
Quantity	685	354	4,503	70	3	728
Average Age – RIN (yrs)	7	10	6	9	32	5
Expected Serviceable Life (yrs)	10	20	10	20	50	10

Management Of Assets

- > At a high level, we may use age as a proxy for condition and health, but at an individual level this is not how Essential Energy treats assets.
- > With the use of risk-based differentiators, we optimise our REPEX spend (which may result in an increase in an asset's average age profile) while maintaining the network's overall asset risk profile.
- > Expected serviceable life is the average expected service life of an Essential Energy asset. We arrive at this figure by working out when the risk of continuing to operate the asset will outweigh the reasonable cost of replacing it. The assessment considers the operating environment and total network risk.

Asset Age Profile

> Each pie chart indicates how far through the assets expected serviceable life they presently are

> Charts are listed left to right, top to bottom, in terms of overall total value to the network (see Total Replacement Value graph on slide 4).

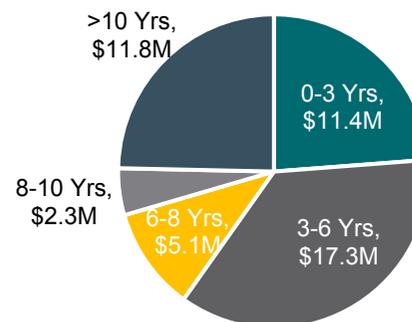
- > Segments represent
 - 0-30% - Turquoise
 - 31-60% - Dark Grey
 - 61-80% - Yellow
 - 81-100% - Light Grey
 - >100% - Charcoal

Of expected serviceable life consumed.

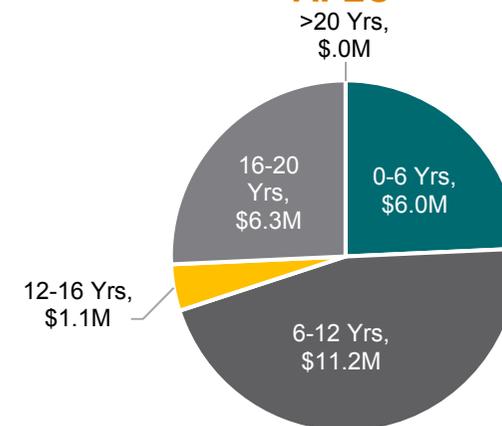
Generators



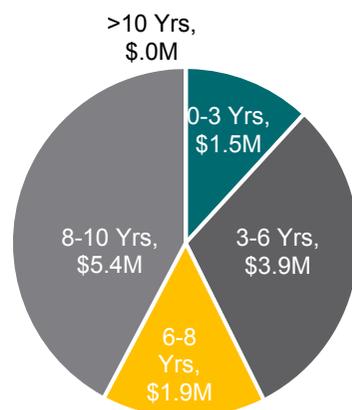
Communications Network Assets



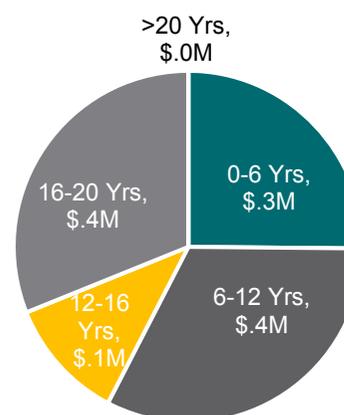
AFLC



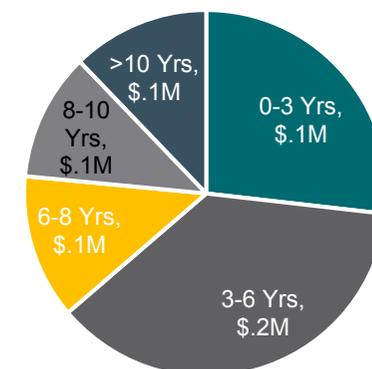
DSA Modem



ZS RTU



Network Meters



Key Challenges

Metering requirement changes

- > Due to developments in technology, customers increasingly expect high quality, cheaper electricity.
- > To achieve this, we require more metering to monitor power quality and power usage.
- > We have selected a meter installation program at a cost of \$0.51M p/a.

**Represents 5% of
asset system CAPEX**

Generator with type faults

- > Built in 1985, these Frame 5 Gas Turbines utilise a rotor end ring of a specific alloy composition (18/5 Cr)
- > These types of rings have been identified as a risk failure due to stress cracking. Failure is usually at full rotational speed with catastrophic consequences
- > A remediation program is in place costing \$0.27M p/a.

**Represents 3% of
asset system CAPEX**

Legacy communication and SCADA assets

- > Essential Energy has more than 350 zone substations.
- > We also have more than 4,500 electronic reclosers that use electronic and software-driven SCADA and communications technology.
- > While we use recovered equipment to keep the relevant legacy fleet working until it is decommissioned, this does not happen with programming devices, the firmware platforms used, or indeed the internal/external IP available to support the devices
- > This means that devices have to be replaced due to their technological obsolescence.
- > Replacement program will cost of \$3.61M p/a.

Represents 37% of asset system CAPEX

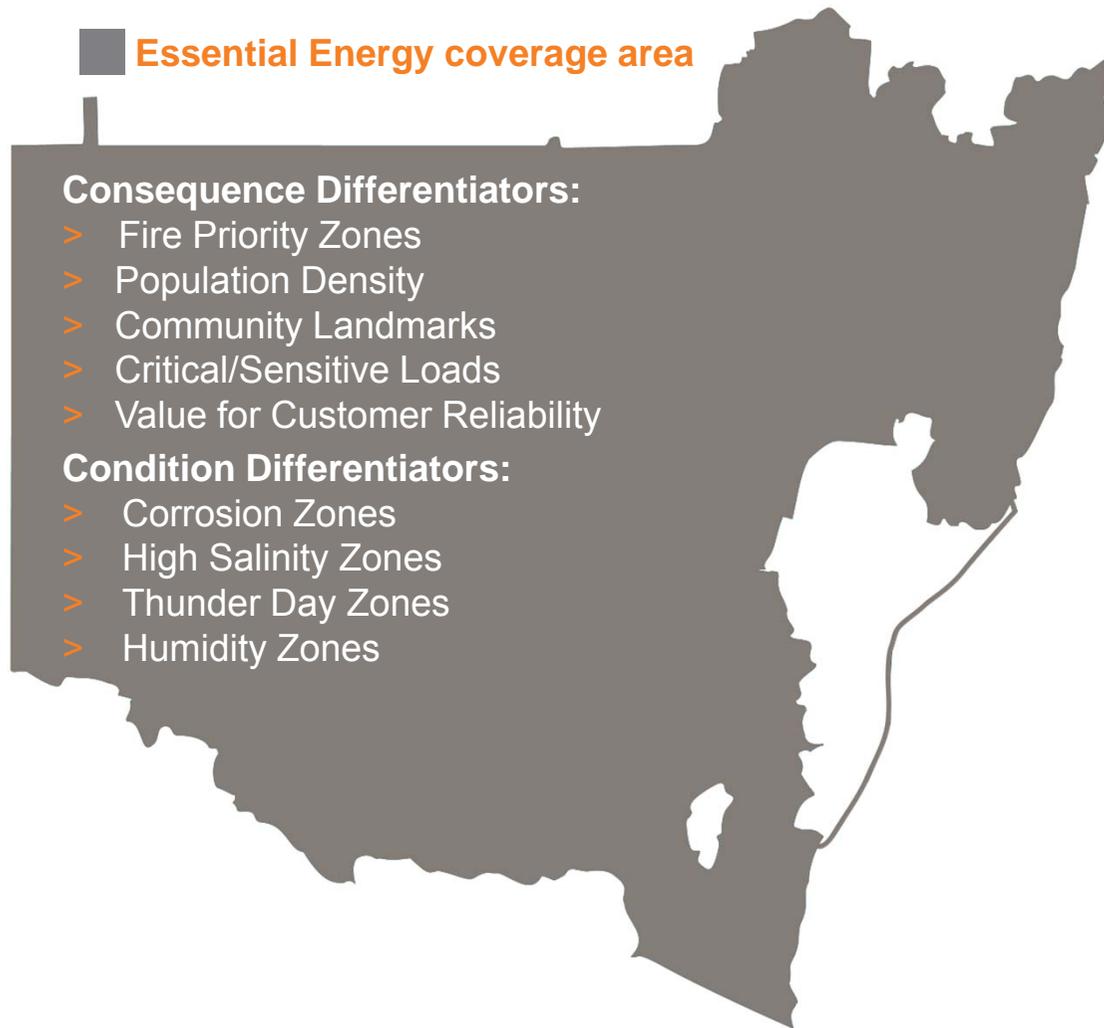
Strategic Objectives, Targets and Performance

Purpose:	Strategies & Objectives	Targets	Performance (16/17)
<ul style="list-style-type: none"> > Asset Management Plans enable the overhead network assets to achieve the objectives and targets established in the overarching strategy documents. > The asset class objectives and targets established within the overarching strategy documents are designed to achieve the National Electricity Rules (NER) CAPEX and OPEX objectives. > These targets and performance measurements are for secondary system assets. 	1. All Strategies		
	<p>National Energy Regulator (NER) Cl. 6.5.6 (a) (1) (2) (3) and (4) To ensure, at the lowest cost, assets are operated and maintained in a manner that extracts maximum value from the assets.</p>	<p>Programs have been valued and optimised by using a consistent, approved Value Framework</p>	<p>Programs have been valued and optimised using a consistent, approved value framework .</p>
	<p>NER cl. 6.5.7 (a) (2) (3) and (4) To ensure, at the lowest cost, assets are renewed in a manner that extracts maximum value from the assets.</p>	<p>Unit rates captured and benchmarked.</p>	<p>Achieved. Continual improvement items identified and improvement in internal efficiency achieved.</p>
	2. Growth		
<p>NER cl. 6.5.7 (a) (1) To ensure, at the lowest cost, the network assets have the capacity to meet growth requirements.</p>	<p>Required secondary systems assets installed in new growth- driven projects.</p>	<p>Satisfactory.</p>	

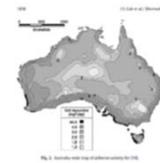
Strategic Objectives, Targets and Performance Continued

Strategies & Objectives	Targets	Performance (16/17)
3. Reliability		
NER cl. 6.5.7 (a) (3) Compliance with the NSW Reliability and Performance Licence Conditions for Electricity Distributors (the Licence Conditions).	Achieve network reliability targets.	Network target achieved (Some feeders not meeting reliability targets).
	Achieve full compliance in annual licence conditions audit.	Audit passed (continual improvement items identified).
Achievement of the Service Targets Performance Incentive Scheme (STPIS) targets for Reliability.	Achieve network STPIS targets	-\$11M
4. Safety & Environment		
NER cl. 6.5.7 (a) (4) To ensure that safety risk minimised as much as practicable; at a minimum, compliance with legislative requirements.	Number of Fatal/Serious Worker injuries attributed to assets in TotalSAFE = 0	0
	Number of Worker HPIs attributed to assets in TotalSAFE = 0	0
	Number of Public IPART Cat 1 incidents attributed to assets in TotalSAFE = 0	0
	Number of Public IPART Cat 2 incidents attributed to assets in TotalSAFE = 0	0
	Number of Public IPART Cat 3 incidents attributed to assets in TotalSAFE = 0	0
NER cl. 6.5.7 (a) (4) To ensure that environmental harm is minimised as much as practicable; at a minimum, compliance with legislative requirements.	Number of fire starts caused by assets per financial year =0. (Maintain or reduce the risk associated with asset related firestarts. Note: Strategic targets based on historical average)	0
	Contamination incidents = 0.	0
5. Power Quality		
NER cl. 6.5.7 (a) (3) To ensure, at the lowest cost, that customers are not subject to power quality issues outside the tolerances of equipment that meets AS/NZS standards.	Steady-state voltage levels within nominal voltages +10%, -6%.	Not compliant. Commence alignment this regulatory period.
	Flicker, harmonics and unbalance within required thresholds.	Not compliant. Power quality monitoring at zone substations underway.

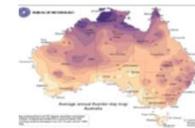
Identifying Investment Priorities: Risk Differentiators



- > Essential Energy's new risk framework has emphasised sophisticated risk differentiators.
- > A differentiator allows an asset to be assessed based on the conditions it will be exposed to and the consequence of a failure, which both depend on an asset's location and purpose.
- > With such a large and diverse network, the use of differentiators will allow us to have greater control of risk and expenditure requirements.



Corrosion Zones



Thunder Day Zones



Humidity Zones



High Salinity Zones



Fire Priority Zones

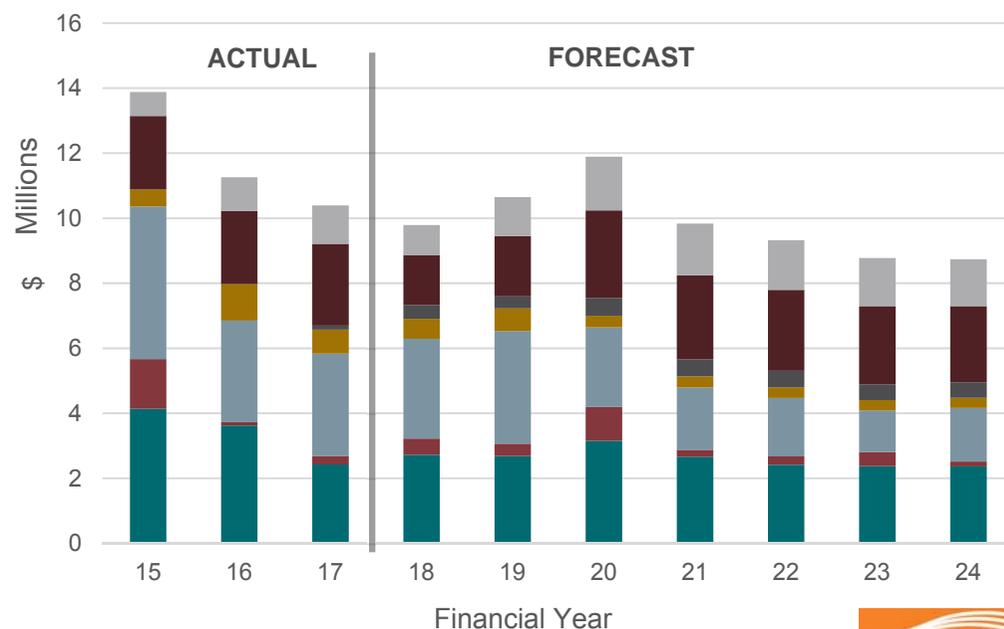
Investment Program Summary

OPEX (FY19 \$ millions)							
	FY18	FY19	FY20	FY21	FY22	FY23	FY24
Routine Inspections	\$.00	\$.00	\$.00	\$.00	\$.00	\$.00	\$.00
Planned Maintenance	\$2.01	\$2.01	\$2.01	\$2.01	\$2.00	\$2.00	\$2.00
Unplanned Maintenance	\$.00	\$.00	\$.00	\$.00	\$.00	\$.00	\$.00
Total	\$2.01	\$2.02	\$2.02	\$2.01	\$2.01	\$2.01	\$2.00



Expenditure Trade-Offs > The proposed CAPEX and OPEX expenditure is a five-year snapshot of the projected long-term strategies that Essential Energy has in place. This expenditure has been through an optimised risk output which included trade-offs between various combinations of OPEX and CAPEX.

CAPEX (FY19 \$ millions)							
	FY18	FY19	FY20	FY21	FY22	FY23	FY24
Growth	\$2.7	\$2.7	\$3.2	\$2.7	\$2.4	\$2.4	\$2.4
REPEX – Other ¹	\$0.5	\$0.4	\$1.0	\$0.2	\$0.3	\$0.4	\$0.2
Communications	\$3.1	\$3.5	\$2.4	\$1.9	\$1.8	\$1.3	\$1.6
AFLC	\$0.6	\$0.7	\$0.4	\$0.3	\$0.3	\$0.3	\$0.3
Meters	\$0.4	\$0.4	\$0.6	\$0.5	\$0.5	\$0.5	\$0.5
Relays	\$1.5	\$1.9	\$2.7	\$2.6	\$2.5	\$2.4	\$2.3
ZS RTUs	\$0.9	\$1.2	\$1.7	\$1.6	\$1.5	\$1.5	\$1.4
Total	\$9.8	\$10.7	\$11.9	\$9.8	\$9.3	\$8.8	\$8.7



¹ REPEX - Other includes projects which contained multiple asset classes and may have a safety and environmental focus. Includes Generation.



Lifecycle Management Strategy: Secondary Systems Assets

PLAN

- > Identify Need/ Objectives/ Risk and align to corporate strategy using the Strategic AMP
- > Optimise investment portfolio using our Asset Investment Planning System.
- > Cater for growth (inc. growth strategy and subtransmission project scopes).
- > Predict growth and embedded generation impacts on system ratings and capacity.
- > Renewal may be required if the asset is no longer capable of achieving its purpose or if condition deteriorates, to prevent assets failing in service (although some low-risk assets are “run-to-failure”). Renewal can involve replacement or refurbishment:
 - > **Piecemeal** – the overhead network is mainly high-volume/low-value assets, with varied lifespans. Most assets are piecemeal renewed e.g. pole renewal program.
 - > **Holistic renewal** – when an asset class/asset subset is experiencing systemic defects/failures it may be preferable to have bulk rectification for the asset class/subset..
 - > **Workshop renewal** – high-value assets such as transformers and switchgear are removed from service, refurbished in the workshop and redeployed.
- > Plan and set work program.

ACQUIRE

- > Procure and negotiate.
- > Decide on lowest whole-of-life costs for product selection.
- > Develop technical specifications and standards.

CONSTRUCT & COMMISSION

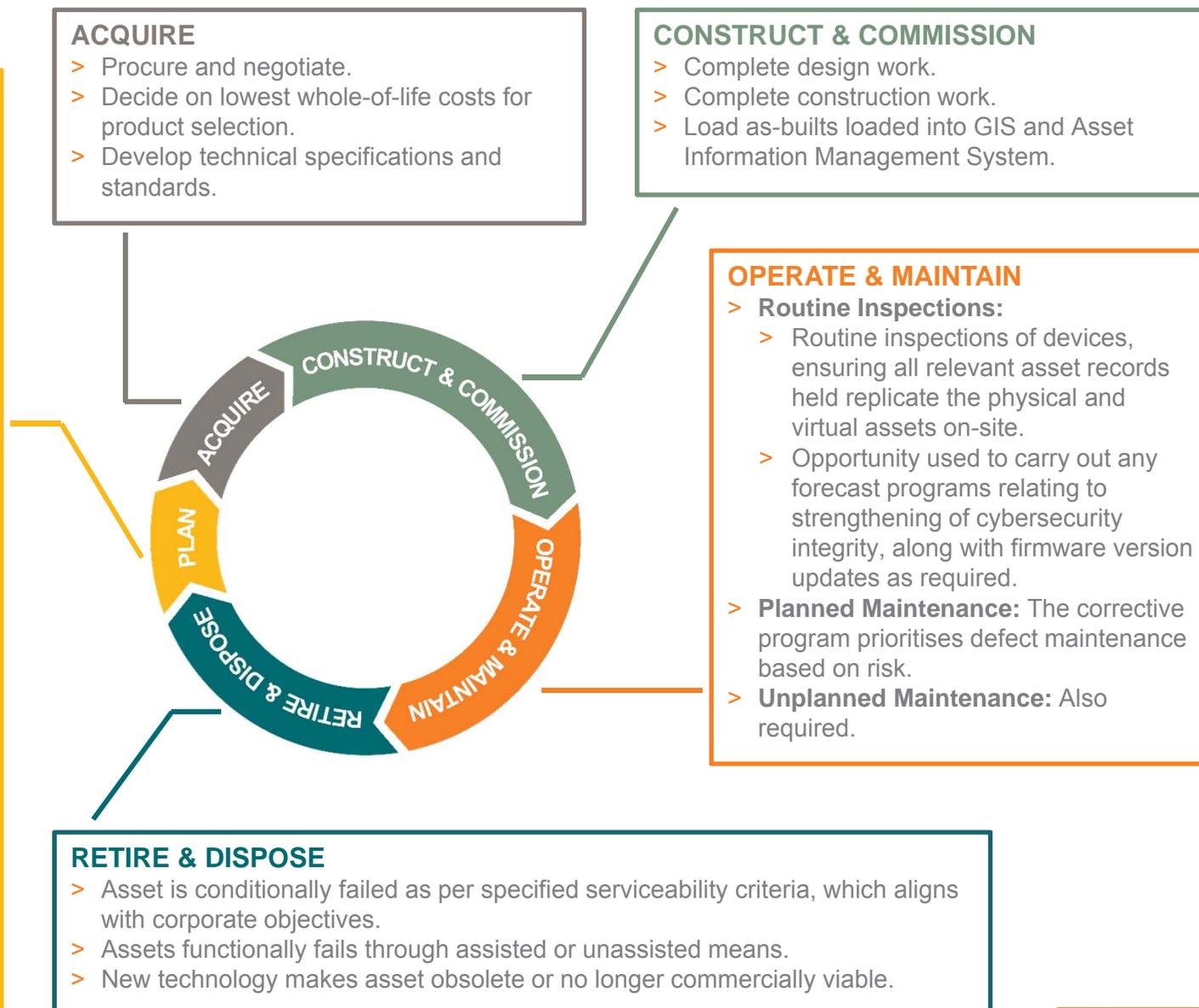
- > Complete design work.
- > Complete construction work.
- > Load as-builts loaded into GIS and Asset Information Management System.

OPERATE & MAINTAIN

- > **Routine Inspections:**
 - > Routine inspections of devices, ensuring all relevant asset records held replicate the physical and virtual assets on-site.
 - > Opportunity used to carry out any forecast programs relating to strengthening of cybersecurity integrity, along with firmware version updates as required.
- > **Planned Maintenance:** The corrective program prioritises defect maintenance based on risk.
- > **Unplanned Maintenance:** Also required.

RETIRE & DISPOSE

- > Asset is conditionally failed as per specified serviceability criteria, which aligns with corporate objectives.
- > Assets functionally fails through assisted or unassisted means.
- > New technology makes asset obsolete or no longer commercially viable.



Performance Monitoring, Continual Improvement and Supporting Initiatives

Continual Improvement & Support Initiatives:	Performance Monitoring		
	Initiative	Recurrence	Measure of Success
<p>Initiatives aim to leverage new technologies, increase investment program efficiency and effectively manage risk profiles. Measures include:</p> <ul style="list-style-type: none"> > Reviewing and continuing to develop the Risk Management and Value Framework. > Exploring new inspection technologies > Implementing systems to capture and analyse asset data. > Installing condition monitoring technology. > Further developing asset indexing tools to enhance the assessment of asset health and criticality (including C55 asset models). > Improving scheduling processes to reduce unit rates. > Initiatives to prepare for future grid. 	> Update and assess historical spend at the end of each financial year	Annual	Document updated annually
	> Review and assess REPEX model outputs	5-yearly and as required	Updated 5-yearly
	> Assess asset expenditure annually to ensure final portfolio aligns with network and asset strategies	Annual	Documents completed annually and critically analysed
	> Monitor network key performance indicators such as SAIDI, SAIFI and HPIs	As required	Performance aligns with targets

Supporting Documents

Key challenge documents

Key Challenge	Relevant Document	Relevance to the AMP
Metering requirement changes	IC ESS_90 Minor Zone Substation Monitoring Power Quality Strategy	Provides further discussion and outlines the response in relation to the key challenges for the asset class.
Generator with type faults	IC ESS_65 & 68 Broken Hill asset refurbishment, and Legal and Safety	
Legacy communication and SCADA assets	IC ESS_61 to 64 SCADA Field Assets IC ESS_2007 IP Data Network Equipment IC ESS_3000 RF Linking Equipment IC ESS_49 ZS RF Linking Equipment	

OPEX Plan documents

Document	Relevance to the AMP
OPEX Plan – Routine Inspections	Details the planned activities for executing the maintenance approach as outlined in this AMP.
OPEX Plan – Planned Maintenance	
OPEX Plan - Unplanned Maintenance	

CAPEX Investment Case documents

Documents				Relevance to the AMP
IC ESS_61 to 64 SCADA Field Assets	IC ESS_2007 IP Data Network Equipment	IC ESS_53, 55 and 56 Load Control	ESS_54 Controlled Load Demand Management	Details the fundamental need, options evaluation, and preferred option to be delivered to manage these specific assets.
IC ESS_49 ZS RF Linking Equipment	IC ESS_3000 RF Linking Equipment	IC ESS_65 & 68 Broken Hill asset refurbishment, and Legal and Safety		
IC ESS_50 Telecommunication into brownfield ZS	IC ESS_48 RF Infrastructure Refurbishment	IC ESS_90 Minor Zone Substation Monitoring		

Relevant Legislation and Policies

Legislation

Document	Relevance to the AMP
National Electricity Rules	Directs the development of capital expenditure forecasts and compliance with relevant obligations
Work Health and Safety Act 2011	
Electricity Supply Act 1995 and supporting Licence Conditions	Used to set Asset Management Objective Targets
Electricity Supply (Safety and Network Management) Regulation 2014 (NSW)	

Policies

Document	Relevance to the AMP
Bushfire Management Plan (CEOP8022)	Used to set Asset Management Objective Targets
ISO 55000:2014 - Asset Management	Used to develop Asset Management System

Essential Energy

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