

Asset Management, Risk and Optimisation Strategy 2020-25

January 2019



Part of the Energy Queensland Group

Executive Summary

The purpose of this document is to provide an overview of the common frameworks Energex and Ergon Energy (Ergon) have put in place to effectively manage investment, risk, optimisation and governance of the Network Program of Work (PoW).

Energex and Ergon now have a common approach to network investment planning, risk management and program optimisation. Using these frameworks the proposed Capital and Operating Expenditure programs will deliver ongoing sustainable performance through to 2025 and in the longer term.

The program of work investment approval framework is designed to ensure prudent and efficient investment to safely deliver customer requirements, satisfy financial and non-financial governance requirements, ensure compliance with relevant regulatory instruments such as the Regulatory Investment Test – Distribution (RIT-D), and deliver a sustainable program based on the risk appetite of the organisation to meet community expectations.

The priority in the development of the common network investment planning approach was to adopt a common framework for risk management. The methodology chosen was to utilise Energex's network risk framework which has been in use for some years. This mature process has been applied across both Energex and Ergon in a consistent manner and maintains an integrated risk-based approach to the management of all network assets. This approach is aligned with ISO 55000: Asset Management.

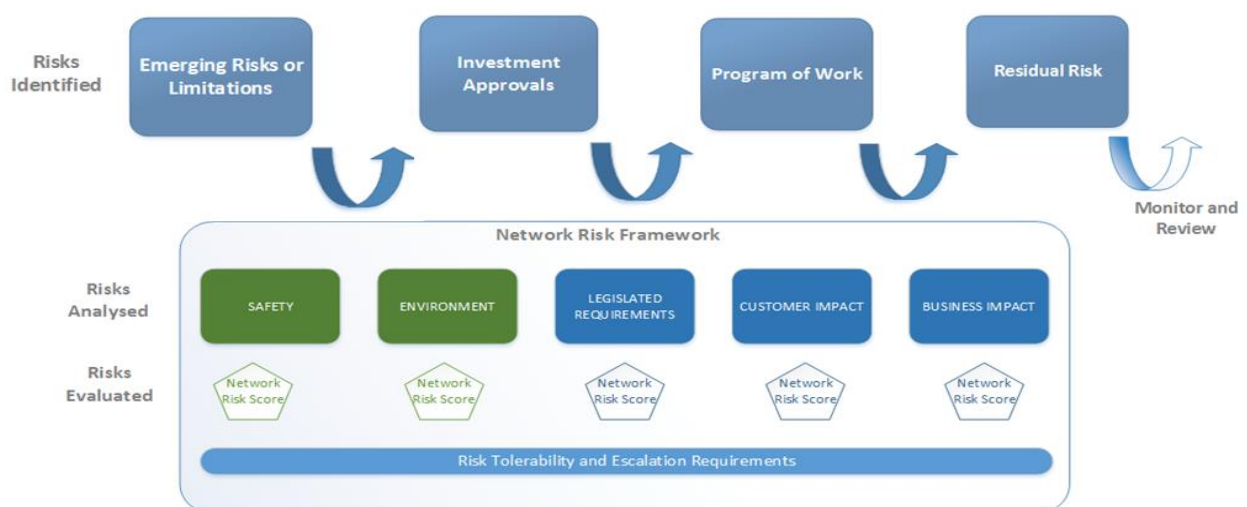


Figure 1 Energy Queensland Network Risk Framework

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Document Tracking Details

Network and Non-Network Document Hierarchy Reference Number	Regulatory Proposal Chapter Reference	Document	File Name
NET RISK – 001	7.026	Asset Management Overview, Risk & Optimisation Strategy	EGX ERG 7.026 Asset Management Overview, Risk and Optimisation Strategy JAN19 PUBLIC

1. Overview

In the past, Energex and Ergon have operated under separate frameworks and governance in the management of their networks. Ergon operates a geographically dispersed network covering an area of 1,698,100 square kilometres and experiences severe weather events such as cyclones and extremes in rainfall and temperature with the hottest average temperatures in the country. Both Energex and Ergon are subjected to some of Australia's highest incidents of lightning strikes. Although Energex has a smaller geographic area (25,264 square kilometres), it has significantly higher customer density resulting in greater numbers of customers impacted by severe weather events.

In 2004 the Queensland Government appointed an independent panel to undertake the Electricity Distribution and Service Delivery (EDSD) Review. This had a significant impact on the Network spend in both Energex and Ergon summarised below.

Pre EDSD (2000 to 2004)

- Investment below Queensland Competition Authority approved program resulted in poor service
- Summer peak driven by air conditioning (e.g. 36% increase in the Energex Network)
- 65,000 kilometres of Single Wire Earth Return (SWER) network in Ergon with a high percentage of voltage constraints particularly in Capricornia and South West Regions

Post EDSD (2004 to 2010)

- Significant augmentation investment to meet mandated N-1 security standards
- EDSD also mandated minimum service standards reliability targets and a range of specific capital programs; e.g. replacing under-sized conductors
- Continuing period of high demand and energy growth

Post 2010 AER Determination

- Reduced demand and energy growth
- Changed security and service standards based on the Electricity Network Costs Review in 2011
- A clear focus on continuing to transition to sustainable investment and contemporary data driven asset management
- Improved load forecasting, integration of Demand Management (DM) into investment planning and adoption of new technology

Following the merger of Energex and Ergon in 2016, Energy Queensland (EQL) has taken a common approach to Network planning with new frameworks and governance processes developed. The program has been optimised, based on risk, across both networks and aligns to merger targets. A rigorous process of business cases, risk assessments and strategic estimates supports the program build which in turn assists the delivery of customer expectations and sustainable business outcomes. These business cases continue to be reviewed and the bottom-up build of the programs optimised, particularly with consideration for customer feedback and emerging asset related safety risks.

2. Program Investment Governance

EQL have adopted a 4-tier approach to Program of Work Governance for Energex and Ergon investment. (Figure)

1. **Asset Management Policy & Strategy:** Alignment of future network development and operational management with EQL strategic direction and policy frameworks to deliver best practice asset management;
2. **Network Investment Portfolio:** Development of seven year rolling expenditure programs and a 12-month detailed program of work which is established through the annual planning review process. The Governing entities oversee:
 - fulfilment of compliance commitments;
 - ensure the network risk profile is managed and aligned to the corporate risk appetite;
 - approval of the annual network Programs of Work and forward expenditure forecasts;
3. **PoW Performance Reporting:** EQL has specific corporate Key Result Areas (KRA) to ensure the PoW is being effectively delivered and ensures performance standards and customer commitments are being met. Program assurance checks including review of operational and financial program performance is overseen by senior management through the monthly Network Operations Committee to ensure optimal outcomes with appropriate balance between governance, variation impact risks, emerging risks and efficiency of delivery. A comprehensive program of work scorecard is prepared monthly and key metrics are included in the Program of Work Delivery Index which is a corporate key performance indicator (KPI) that, with monthly performance reporting for key projects, informs the Executive and Board. Quarterly Program of Work updates are provided to the Board; and
4. **Project and Program Approval:** Network projects and programs are overseen by senior management and subject to an investment approval process, requiring business cases to be approved by an appropriate financial delegate.



Figure 2 EQL four tier approach to POW governance

3. Investment Approach

Energex and Ergon now have a common approach to network investment planning. The proposed Capital and Operating Expenditure programs will deliver ongoing sustainable performance through to 2025 and in the longer term. We are seeking to avoid the boom and bust investment cycles of the past and manage risk to ensure that the program is sustainable while meeting our customer requirements for reduced network prices and appropriate network performance. The longer-term view shown in our strategies (out to 2030 and beyond) is also critical to ensure that the impacts and opportunities provided by new technologies are considered in the development of the program. This longer-term view also informs the expected demand for certain scarce materials, required skills changes, as well as other logistical support requirements for the longer term.

The priority in the development of the common network investment planning approach was to adopt a common framework for risk management. The methodology chosen was to utilise Energex's network risk framework which has been in use for some years. This mature process has been applied across both Energex and Ergon in a consistent manner. While this methodology does not yet reflect some of the latest developments in risk management (e.g. full monetisation of risk), we believe that the maturity of the framework and its consistent application provides confidence that the developed programs demonstrate prudence and efficiency. We are also committed to the ongoing enhancement of this methodology over time.

The following sections outline the investment approach for various programs. A diagram of the approach is shown Figure 5, in Appendix 1. A similar diagram referencing detailed explanatory documents is shown in Figure 6..

3.1 Network Safety Underpins the Approach

Asset safety is paramount, and the renewal and maintenance of the network is the largest part of both our capital investment and operating programs. EQL has a very low risk appetite for risks that negatively affect the safety of our people and the community, resulting from the way our electricity distribution network is designed, operated or maintained. Mitigating risk so far as is reasonably practicable (SFAIRP) is a key objective focusing on a no compromise approach to community and staff safety, leveraging innovative solutions that enable continued improvements in the safe operation of our networks.

EQL is committed to continuing to embrace the implementation of new technologies, to ensure the effective facilitation and safe operation of its network. We also need to continue to manage the resilience of our networks, bearing in mind increasing risks around cyber security and data privacy, to deliver safe, reliable services to our communities.

3.2 Bottom Up Build

There has been considerable work undertaken to build the bottom up program and investment forecast to 2025. The bottom up build of the Energex and Ergon Opex program is robust and in line with previous forecasts and merger expectations.

A risk-based approach has been used to develop individual bottom-up capital programs in the Energex and Ergon areas. The drivers of the programs include safety and legislative compliance,

growth in demand for embedded generation in regional areas, customer growth, and risks associated with ageing infrastructure.

The resultant programs depend on the historical investment cycles, age profiles, failure rates, the condition of various assets (and resultant risk of failure), and customer demand. As seen in Figure 3 below from November 2017, Energex programs for augmentation and replacement capital were in decline whereas the Ergon programs, particularly Repex, are increasing from a risk-based bottom-up approach. Details behind the programs are described below, as are the steps taken to optimise these programs to ensure long-term sustainability and provision of a program that appropriately manages risks and fits within top-down constraints. Details of the programs are contained in the individual justification documents that reference the over-arching asset management plans and other strategy documents.

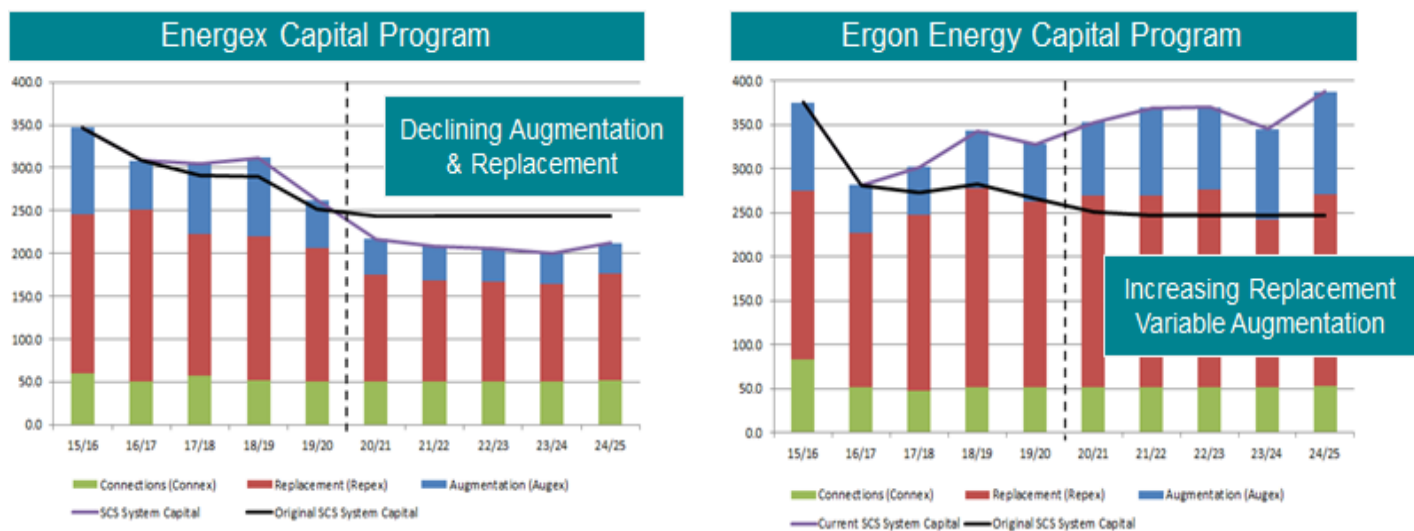


Figure 3 Energex and Ergon Bottom Up Build Capital Program – November 2017

3.3 Replacement Capex

Asset failures can result in significant risks in terms of community and staff safety, network security and reliability of supply. Hence the replacement capital (Repex) program development is a critical balance of risk-based assessments with the need to contain expenditure at sustainable levels, avoiding boom and bust investment cycles. Many network assets have lives of 45 years or more and hence a long-term lifecycle view is necessary to ensure that short term decisions do not result in poor outcomes in the longer term.

The approach to developing the proposed Repex program is a combination of techniques, fundamentally designed to manage risks and develop sustainable programs. Key features include:

- **Individual Asset Assessments** – for larger individual assets such as power transformers, circuit breakers and underground cables, an individual asset Condition Based Risk Management (CBRM)¹ review is conducted to assess the failure risk of an asset. Risk scores are assigned to these assets which indicate the likelihood of failure, and replacement proposals are then made based on the risk score. Once these assessments are made the planning and delivery of the work is coordinated and possibly combined with other works e.g. augmentation projects, to enable efficient and timely delivery.
- **Distribution Programs** – where large asset populations exist, it is not feasible to conduct individual asset assessments and plans. Programs are developed based on a risk-based approach which considers aggregated condition assessments, failure information, age profiles, emerging trends and specific asset risks. Each class of distribution asset e.g. overhead conductors, is individually examined and a bottom-up proposal is developed. This is primarily based on the relevant Asset Management Plan (AMP), one of which exists for each major asset class. The AMPs provide all relevant information regarding the population including quantities, age profiles, common failure mechanisms, failure rate trends and detailed risk assessments.

From this information a specific bottom-up program is developed and detailed in a program justification document for the asset class. Each bottom-up program is tested for sustainability by examination of likely failure risks in the future and various replacement scenarios are examined. The program is also compared to the relevant Repex model to test the validity of the bottom-up approach. This population-based risk approach produces sustainable, prudent and efficient programs. In some instances, however, currently proposed programs show a short-fall in replacement volumes when compared to age based predictions. This could potentially lead to unacceptable failure rates within and beyond the current program horizon. In these cases, other risk mitigation approaches will need to be employed to reduce the overall network risk consistent with SFAIRP and as low as reasonably practicable (ALARP) principles. These techniques might include for example, accelerated programs for some known failure modes, improved condition assessments, and careful monitoring of asset failures. Further to this EQL proposes to develop better tools to mitigate the consequences of asset failures through technology solutions such as LV fault detection proposed as part of the LV Network Safety proposal. This proposal is included in the Repex program due to its strong interactions with other Repex programs, especially the services replacement program.

In some instances where programs have been constrained due to cost, such as conductor replacement and service replacements in Ergon, the risks will need to be monitored closely to ensure they remain within tolerable levels. To this end, assessment of performance indicators including asset failures and customer shocks and tingles will be carried out continuously. If risks trend towards unacceptable levels, further expenditure may be required for accelerated and targeted replacement programs to augment the programs included in the 2020-2025 proposal. Funding for this could be derived through a combination of transfers from other programs based on risk prioritisation.

¹ The CBRM methodology is described in greater detail in the Energex DAPR

3.4 Augmentation Capex

The augmentation program includes several different elements, namely:

- **Individual projects** that are developed to address a specific network limitation. These projects are described in detail in individual project business cases.
- **Programs to Address Worst Performing Feeders** – these programs have been identified to address specific poor reliability performance areas. The programs are described in detail in Worst Performing Feeder Strategic Proposals.
- **Programs to Address Power Quality** – these programs are targeted to address power quality issues arising from the increased penetration of solar PV plus other network power quality issues. These programs are described in detail in the Power Quality and Solar Strategic Proposal.
- **Programs to Enable the Intelligent Grid of the future** – these programs are described in detail in the Intelligent Grid Roadmap, the Intelligent Grid Technology Plan, the Intelligent Grid Enablement Strategic Proposal and a range of detailed Strategic Scope documents.
- **Demand Management Programs** - these programs are described in detail in the Demand Management Strategy, the Demand Management plan and related Strategic Scope documents.
- **Programs to enable network communications and control systems to support key network functions** - these programs are detailed in several individual business case documents.

An important point in relation to the total Energy Queensland capital programs is that they are now relatively insensitive to changes in demand forecasts. Peak demand and energy forecast increases are quite modest and peak demand is no longer a key driver of the capital programs. Rather, a significant portion of the augmentation expenditure now relates to worst performing feeders, power quality initiatives, intelligent grid development, communication and control systems. The demand related augmentation is about 7-8% of the overall total capital program. Hence, demand changes outside of forecast levels are no longer critical to the total capital program or to customer prices.

3.5 Other Capex

Other capital programs include Customer Connections Capex and Non-system Capex and these programs are dealt with in separate strategy documents.

4. Network Program Review and Optimisation

4.1 Background

The program of work investment approval framework is designed to ensure prudent and efficient investment to safely deliver customer requirements, satisfy financial and non-financial governance requirements, ensure compliance with relevant regulatory instruments such as the Regulatory Investment Test – Distribution (RIT-D), and deliver a sustainable program based on the risk appetite of the organisation to meet community expectations.

Furthermore, annual approval of the Standard Control Service (SCS) Program of Work is subject to baseline approvals and governance aligned with Statement of Corporate Intent (SCI) and Corporate Plan (CP) timing requirements and aligned to the Distribution Annual Planning Report (DAPR).

The program of work investment process considers the portfolio of projects and programs proposed for inclusion in the future program of work on a consistent basis and guides investment decisions based on several critical considerations including:

- the need to optimise the program subject to management-initiated constraints including long term sustainability, resource availability, and customer price. This includes comparison and optimisation across sub-programs that are different in nature and that have fundamentally different drivers;
- bundling planned works to obtain synergies across projects and programs, for delivery of the total program in the most efficient manner and least cost;
- the need to balance short-term imperatives with longer term sustainability and the incorporation of strategic technology solutions to address short-term issues in new and innovative ways. i.e. avoid the boom and bust cycles;
- the review of identified risks including significant industry changes; and
- mitigation options for risks including technology developments such as LV safety monitoring.

The investment optimisation process uses a risk-based approach to enable comparisons of different bottom-up programs. This avoids issues of “picking winners” as it provides an objective comparison of diverse projects and programs and allows top-down constraints to be applied to risk-based bottom-up programs. It also allows a thorough understanding of the resultant risk profile of the program and ensures sustainability of approach. EQL acknowledges that other approaches to solve the program optimisation challenge are possible and we are committed to the ongoing development and refinement of optimisation techniques. However, at this point we have elected to optimise our program using the mature Network Risk Framework.

4.2 Network Risk Framework

Energex and Ergon Energy maintain an integrated risk-based approach to the management of all network assets. This approach is aligned with ISO 55000: Asset Management.

The Network Risk Framework enables risks to be considered and addressed systematically. The framework provides a consistent approach to the risk identification, analysis and evaluation and has been developed in accordance with AS/NZS ISO 31000:2009 ‘Risk Management - Principles & Guidelines’ (ISO31000)². The Network Risk Framework is aligned to and exists as a subset of Energy Queensland’s Enterprise Risk Management architecture. This architecture includes a set of Risk Appetite Statements (RAS) that describe the risk appetite of the Energy Queensland Board.

The Network Risk Framework applies to any requirement to assess a risk or limitation associated with the network. It prescribes the assessment of risk consequences and likelihoods across five risk categories: safety, environment, legislated requirements, customer impact and business impact. It provides a mechanism to evaluate the tolerability of outcomes and facilitates the prioritisation of investments that will control or mitigate the identified risks. The Network Risk Evaluation Tables are provided in Appendix 2. Assessment of risk occurs throughout the risk lifecycle from emergence to monitoring of residual (treated) risk, as illustrated in Figure 4.

² Note that the Network Risk Framework is also consistent with the newly released ISO 31000: 2018 however this has not yet been adopted as an Australian Standard

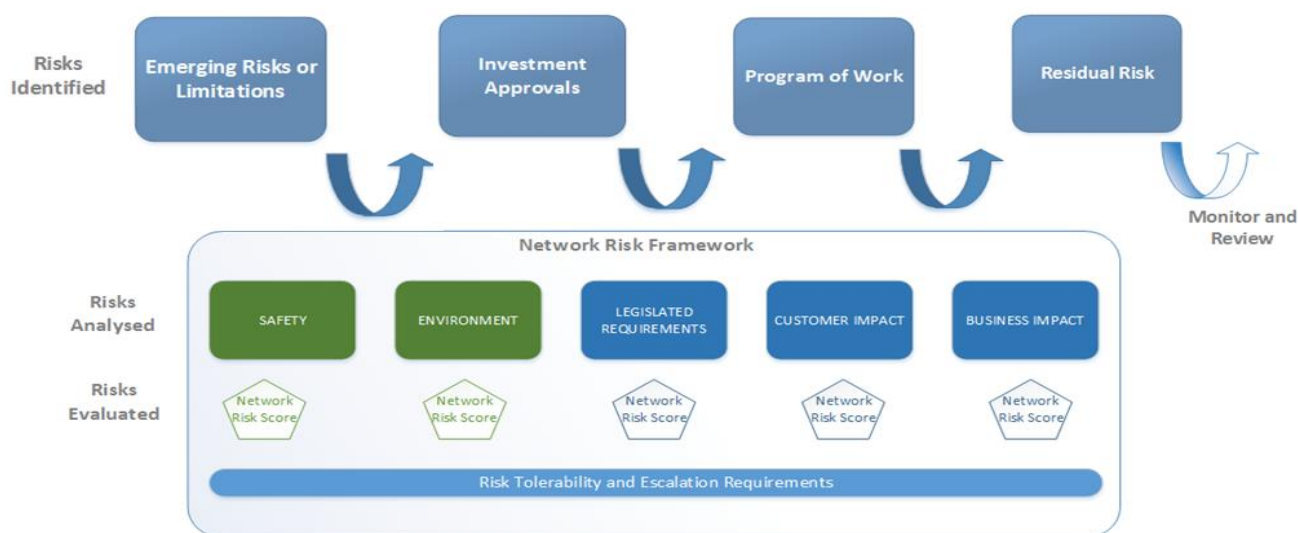


Figure 4 Energy Queensland Network Risk Framework

4.3 Steps in the Optimisation Process

The steps below describe the process followed by EQL in the development and approval of the programs for this submission. The scope of this optimisation process is limited to replacement and augmentation capex.

Step 1 – Bottom-Up Project and Program Build

As described above, individual programs and projects are built based on a range of drivers and inputs. These include asset strategies and policies, regulatory provisions, asset life-cycle information, failure information, risk assessments, benchmarking / top-down sub-program modelling e.g. Repex model, customer demand and forecasts. Program bundling is also considered at this point through for example, the combination of Repex work in a major substation with an Augex project in the same substation. Another example is the bundling of distribution works such as pole-top and conductor programs to achieve efficient overall delivery packages. These resultant programs are used as an input to the optimisation process.

Step 2 – Risk Assessment

Individual major projects plus program elements are then subject to a risk assessment process at a significant level of detail based on the Network Risk Framework. For example, within the Repex program, a category exists for ageing conductor replacement. Within this conductor replacement, the bottom-up program development produces individual conductor type programs e.g. LV 7/064 Copper conductor replacement. The risk scores (Consequence * Likelihood for each relevant category of risk) are assigned at a work request level to each of the projects based on the Network Risk Criticality Scales which can be found in Appendix 2. This level of granularity is critical in the process to ensure that scores reflect real network risks for specific asset locations, conditions and functions within the program.

Step 3 – Risk Score Review

The assigned risk scores and associated assessments are periodically reviewed and audited by the Asset Portfolio Optimisation team for consistency and objectivity. The periodic review frequency is calculated and set according to foreseeable frequency of changes of significant risk factors.

Step 4 – Application of Top-Down Constraints

The optimisation process then applies a range of management-initiated constraints that have been derived through the organisation's Program Investment Governance process. This includes constraints such as:

- **Customer price** – the organisation may assign a top-down network price constraint that limits the overall investment program;
- **Investment Constraint** – the organisation may assign an overall investment limit to enable longer term management of debt and / or RAB escalation;
- **Resources** – certain resource types may be scarce and limit the amount of investment possible for a certain work type or in specific geographic areas;
- **Emerging Trends** – certain asset groups may be facing increasing failure risk due to age or usage, hence a strategic approach to ramp up investment may be made to avoid longer term sustainability issues; and
- **Technology and Other Investment Alternatives** – the bottom-up program risk mitigation may be alternatively delivered through other approaches. For example, rather than continuing to upgrade and replace some ageing overhead conductors, an alternative investment strategy in developing local renewable generation and storage combined with aged asset retirement may be more prudent and efficient. Similarly, where risks of asset failure are increasing, the safety risks may be mitigated through enhanced safety monitoring programs³ rather than through higher replacement programs.

Step 5 – Develop Consolidated Risk-Optimised Program

All projects and programs are then assembled to provide an overall view of the risk-prioritised program based on a combination of the bottom-up program and the top-down constraints. This consolidated view is provided at both an individual year as well as a 5-year program level. Project and program bundling is again considered at this level to ensure that program efficiencies can be achieved.

Step 6 – Adjustment of Programs and Projects

This step is somewhat iterative with steps 4 and 5 and involves the adjustment (typically the reduction) of work in some programs. This is not simply the removal of complete programs but more often the adjustment of timing and quantities in a particular year to enable delivery of the highest risk work and deferral of the lower risk elements of some programs. This work is complex and involves significant interaction with program owners to ensure that risks are understood, and the programs remain sustainable. This includes consideration of high consequence low likelihood projects and programs, as if considered purely on a risk score basis these may be optimised out of the program entirely. Again, this step has been taken using the existing mature Network Risk Framework optimisation approach.

Step 7 – Program Approvals

In line with the Program Governance process, program approval is obtained on the optimised program. This approval includes an overview of the program and the risks and mitigation considered to optimise the program. The optimised programs and projects are submitted annually to the Risk and Compliance Committee for endorsement prior to seeking the approval of the EQL Board. This Committee oversees prudent and efficient expenditure to ensure service performance outcomes

³ See EQL's LV Network Safety Strategic Proposal

meet the reasonable expectations of the community and comply with Energex and Ergon Energy Network's legal and regulatory obligations and the Risk Appetite set by the Board through its Risk Appetite Statements.

5. Performance Monitoring

The monitoring and reporting of the network program of work forms part of the asset management system and focuses on three key areas:

1. Measuring and reporting of actual performance against annual targets for defined key result areas;
2. Evaluating current and emerging risks and issues associated with delivery of the program of work; and
3. Instigating actions to mitigate risks that are impairing performance.

Operational and portfolio levels committees have accountability for ensuring that the annual program of work performance targets and overarching corporate goals are met. Energy Queensland has Key Performance Indicators (KPIs) to ensure the Program of Work is being effectively delivered while maintaining performance standards and customer commitments.

The **PoW Delivery Index** measures the delivery of the planned program of work and optimised programs of work to meet customer and business requirements.

PoW Category	Routine Capex	Routine Opex	Capex Projects	Capex Project Designs	Customer Initiated Service Orders	Customer Projects
Measure	Physicals to Program	Physicals to Program	Commissioned to Program	Completed to Program	Completed on Time	Completed on Time

The **PoW Compliance Index** measures Energex and Ergons response to identified defects ensuring management of asset safety risk to the public and staff via defect policy compliance.

Defect Type	P1			P2		
Category	All (Excluding Cross Arm)	Tails (Excluding Cross Arms)	Cross Arms	Unserviceable Pole	Other	Tail
Measure	Completed within Cycle Time 30 Days	Completed within Cycle Time 60 Days	Completed within Cycle Time 90 Days	Completed within Cycle Time 26 Weeks	Completed within Cycle Time 39 Weeks	Completed within Cycle Time 43 Weeks

Appendix 1 – Development and Optimisation of Capex Programs

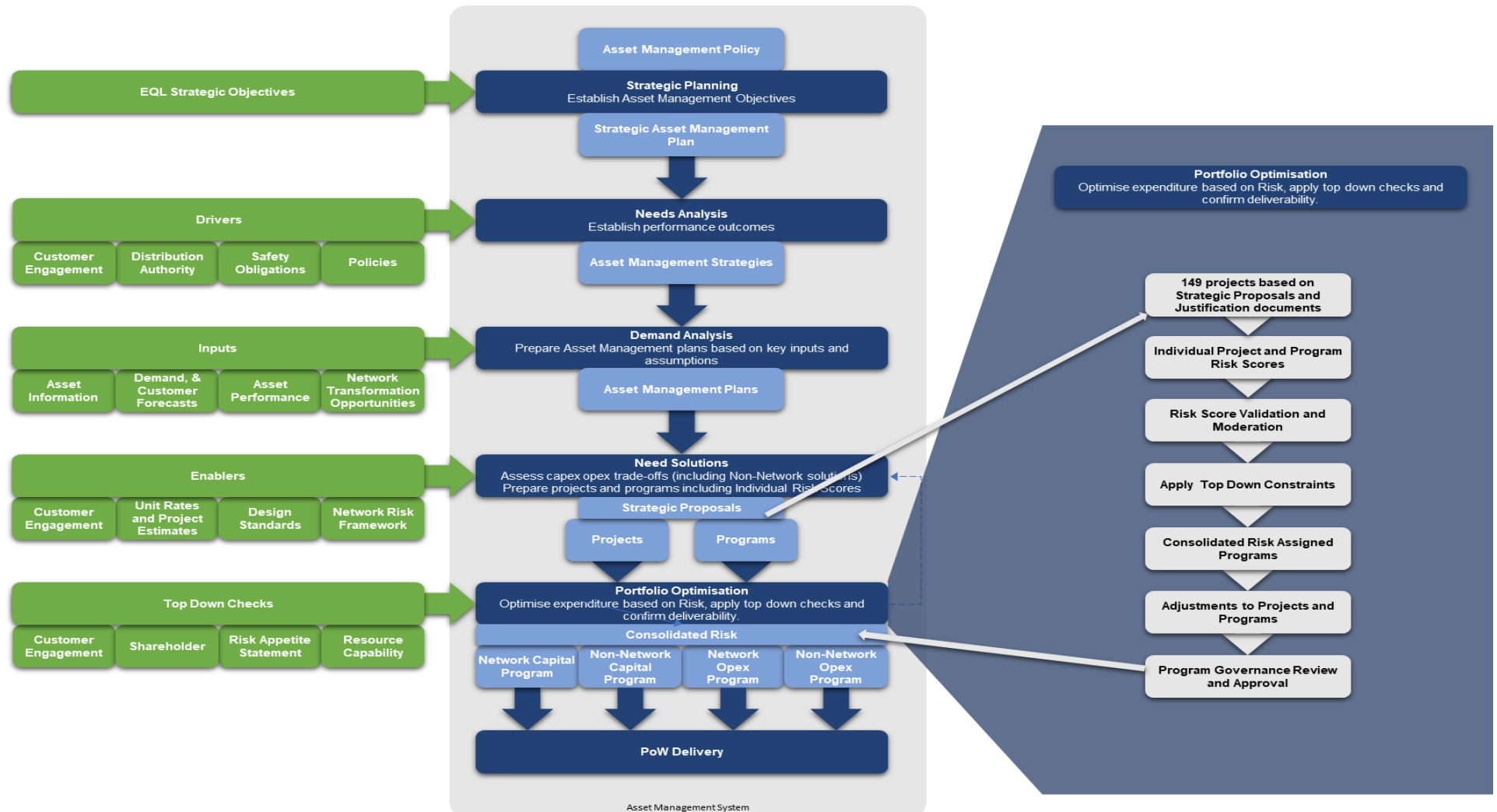


Figure 5 Development and Optimisation of Capex Programs

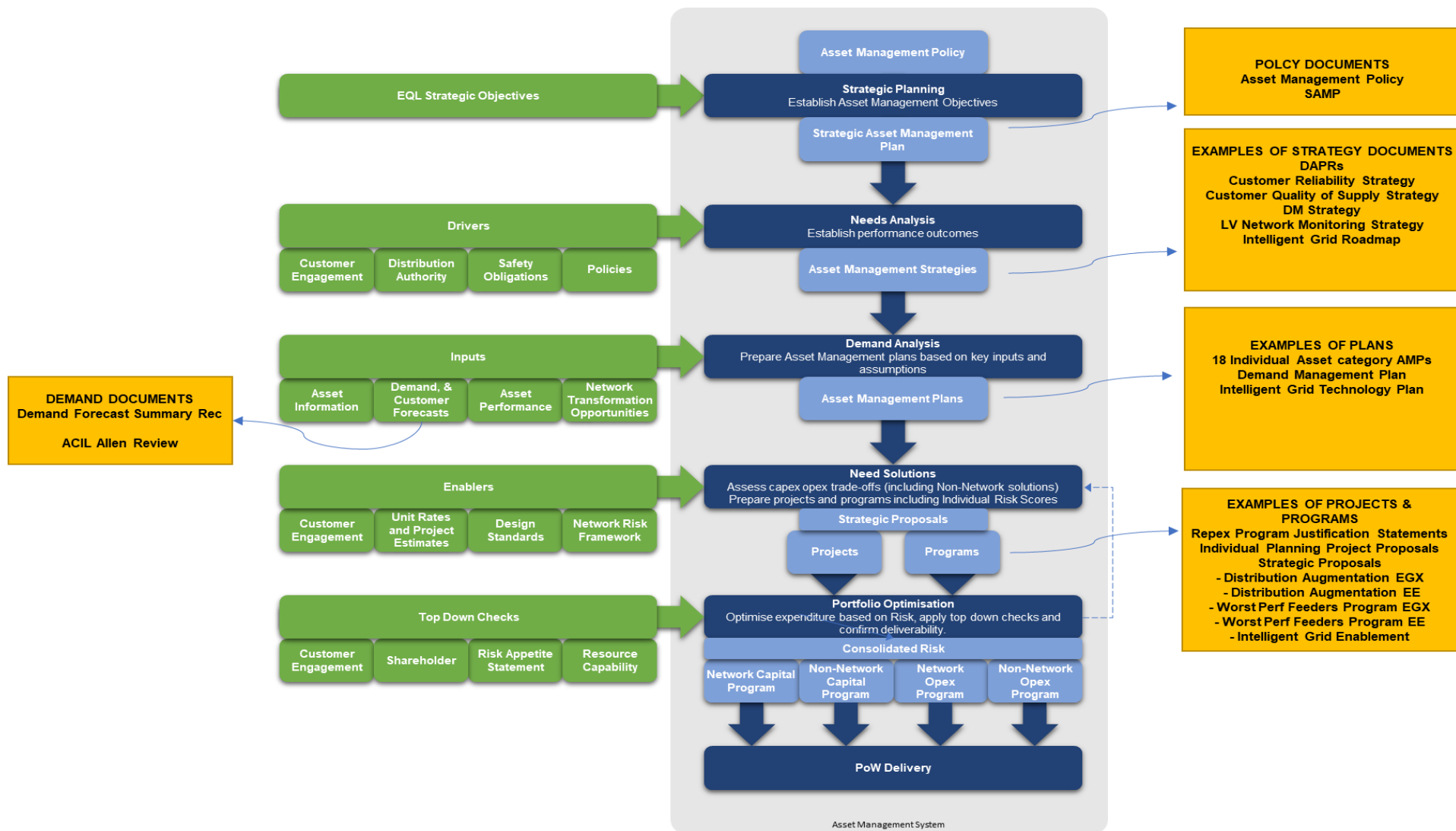


Figure 6 Capex programs showing key document linkages

Appendix 2 – Network Risk Evaluation Tables

SAFETY CONSEQUENCE SCALE

SAFETY CONSEQUENCE SCALE

Consequence Scale	Degree of Personal Harm	Examples of Types of Harm	Degree of Non-Fatal Harmful Effects Incapacity Disability Impairment	Duration of Non Fatal Harmful Effects Discomfort / Pain / Disability / Impairment	Duration of Business Effects Disabling / Reduced Productivity / Alternate Work / Lost time	Treatment Required	Required Administrative / Regulatory Response
6	Multiple Fatalities / Incurable Fatal Illnesses						
5	Single Fatality / Incurable Fatal Illness		Irreversible Total				
4	Multiple Serious Injuries / Illnesses	Quadriplegia / complete loss of vision / hearing / mobility	Irreversible partial >30%	Permanent / Indefinite / Years	Permanent / Enduring approx months	Hospitalisation - Inpatient / long term / months extensive rehabilitation	
3	Single Serious Injury / Illness	Amputation / paralysis of a limb / severe burns / loss of vision / hearing / mobility	Irreversible partial <30%	Long term / Enduring / Days	Long term / >1 day < 1 week	Hospitalisation - Inpatient / short term / days some rehabilitation	External Record & Report Required
2	Minor Injury / Illness	Cuts / burns / strains / sprains	Reversible partial >30%	Short term / approx hours	Short term <1 day	Medical / Outpatient (Doctor) / limited rehabilitation	
1	Low Level Injury / Illness	Scratches / bruises	Reversible partial <30%	Temporary / approx minutes	Approx minutes	First Aid or less	Internal Record & Report Required

SAFETY LIKELIHOOD SCALE

SAFETY LIKELIHOOD SCALE

Likelihood Scale	Verbal Descriptors - Defined sequence of events and risk factors / circumstances required to lead to the chosen Consequence	Past History / Experience (refer to databases and risk registers)	Exposure to Risk Factors measured in their effects and exposure time period - job duration or task time or operational time or lifetime	Likelihood Estimate can be expressed as a FREQUENCY per year / per climb / per hour / per km The whole scenario including the chosen consequence could occur.....	Likelihood Estimate can be expressed as a PROBABILITY 1 in 100 / 0.01 / 1% / 1E-02 The whole scenario including the chosen consequence could occur.....
6	ALMOST CERTAIN the defined sequence or scenario can and does happen because ALL risk events / risk factors are almost certain to occur or be present	Whole scenario including consequence has been occurring Almost all the time in ours or similar organisations / industries	Extreme EXPOSURE because ALL Risk factors are poorly controlled throughout the whole of the time period	at least daily - or more often ~ 500 times per year	Approx 1 chance in 1 Or very close to everytime 100%
5	VERY LIKELY the defined sequence or scenario can and does happen because most risk events / risk factors are very likely to occur or be present	Whole scenario including consequence has been occurring very regularly in ours or similar organisations / industries	Very high EXPOSURE because most Risk factors present and not well controlled during most of the time period	as often as weekly ~ 50 times per year	Approx 1 chance in 10 10% of the time
4	LIKELY the defined sequence or scenario can and does happen because many risk events / risk factors are likely to occur or be present	Whole scenario including consequence has been occurring regularly in ours or similar organisations / industries	High EXPOSURE because many Risk factors present but are only partly controlled during much of the time period	at least monthly ~ 10 times per year	Approx 1 chance in 100 1% of the time
3	UNLIKELY the defined sequence or scenario can and does happen because many risk events / risk factors are unlikely to occur or be present	Whole scenario including consequence has been occurring occasionally in ours or similar organisations / industries	Moderate EXPOSURE because many Risk factors are not present and are well controlled during many parts of the time period	as infrequently as once per year	Approx 1 chance in 1000
2	VERY UNLIKELY the defined sequence or scenario can and does happen because most risk events / risk factors are very unlikely to occur or be present	Whole scenario including consequence has been occurring rarely in ours or similar organisations / industries	Low EXPOSURE because most Risk factors are not present or are well controlled during most parts of the time period	as infrequently as once in 10 years	Approx 1 chance in 10,000
1	ALMOST NO LIKELIHOOD the defined sequence or scenario can and does happen because almost ALL risk events / risk factors only occur or be present in exceptional and rare circumstances	Whole scenario including consequence has been occurring almost never in ours or similar organisations / industries	Very Low EXPOSURE because ALL Risk factors are not present or ALL are well controlled during ALL of the time period	as infrequently as once in 100 years or even less	Approx 1 chance in 100,000 or even less

ENVIRONMENT CONSEQUENCE SCALE

ENVIRONMENT CONSEQUENCE SCALE PART 1 OF 2

Consequence Scale	Release / Spill / Contaminate / Pollutant Material					Biodiversity (losing)			Biosecurity (preventing)	
	Quantity	Extent	Resources Required	Degree of Toxicity	Degree of contamination	Nature of Fauna effected	Nature of Flora effected	Duration of Disruption to Ecosystem	Nature of Fauna effects	Nature of Flora effects
6	> 20,000 litres	Widespread area of contamination beyond Ergon property / worksite boundary	Emergency situation declaration	Note 1	Irreversible continuation of the environment	Species extinction	Species extinction	Total Loss	Introduction of new exotic species	Introduction of new species
5	> 10,000 < 20,000 litres	Off-site - Beyond Ergon property / worksite and enters water course	Emergency Services assistance required	Highly toxic	Long-term contamination of the environment	Endangered species affected	Highly sensitive and endangered vegetation harmed	Long-term	Introduce, spread or supply Class 1 pest	Introduce, spread or supply Class 1 pest
4	> 5,000 < 10,000 litres	Off-site - Beyond Ergon property / worksite but prevented from entering water course	Contained but with outside assistance required	Seriously toxic	Short-term contamination of the environment	Vulnerable species affected	Highly sensitive and of concern vegetation harmed	Medium term	Introduce, spread or supply Class 2 pest	Introduce, spread or supply Class 2 pest
3	> 1,000 < 5,000 litres	NOT beyond Ergon property / worksite alignment border but threatens to cross boundary	Can be internally managed and internal resources capable of clean-up	Moderately toxic	High level of nuisance	Threatened species affected	Not of concern remnant vegetation harmed	Short-term	Introduce, spread or supply Class 3 pest	Introduce, spread or supply Class 3 pest
2	> 200 < 1,000 litres	NOT beyond Ergon property / worksite alignment border	Can be internally managed and on-site resources capable of clean-up	Slightly toxic	Some nuisance	Least concern species harmed	Low sensitivity and vulnerable environment harmed	Note 1	Note 1	Note 1
1	< 200 litres	Very localised - close to activity zone or within spill containment structure / building	Can be internally managed and very little clean-up required	Not particularly toxic	Low or no nuisance	Least concern species threatened	Least concern species threatened			

Note 1: No applicable measure for this dimension

ENVIRONMENT CONSEQUENCE SCALE (continued)

ENVIRONMENT CONSEQUENCE SCALE PART 2 OF 2

Consequence Scale	Statutory approval required	Regulatory Descriptors	Rectification Remediation / Clean up Costs	Indigenous Cultural Heritage	Non-Indigenous Cultural Heritage	Carbon Cost	Public Health Effects	Public Relations Impact
6	Activities are conducted without statutory approval/s	Note 1	Unknown & / or on-going costs of clean-up & / or management	Destruction of human remains	Note 1	Extreme	Exposure to chronic health effects	Extensive public outrage, call for replacement of Directors and / or Executive management
5	Note 1	Extensive serious environmental harm	<\$5,000,000 and >\$500,000	Disturbing human remains etc.	Destruction of registered State heritage place	Very high	Exposure to acute health effects	Public Outrage, call for enquiry, substantial negative media campaign. Brand damage
4		Serious environmental harm	<\$500,000 and >\$50,000	Destruction of artefacts, medicine or scar trees etc.	Disturbance of registered State heritage place	High	Short-term public health impact	Adverse national media attention (e.g. disruption to large public events). Loss of public trust
3		Material environmental harm	<\$50,000 and >\$5,000	Disturbance of artefacts, medicine or scar trees etc.	Disturbance of a place that may be eligible to be registered State heritage place	Medium	Minimal public health impact	Adverse regional media attention. Loss of customer trust / action groups formed
2		Lawful environmental harm	<\$5,000 and >\$500	Note 1	Note 1	Low	Some nuisance	Adverse local media attention or negative external publicity. Multiple customer complaints
1		Unregulated matters and environmental nuisance (complaint)	<\$500	Lack of consultation with EPA / DNR or indigenous group/s		Very Low	Low or no nuisance	Few customer complaints and or external criticism

Note 1: No applicable measure for this dimension

ENVIRONMENT LIKELIHOOD SCALE

ENVIRONMENT LIKELIHOOD SCALE - use columns 2 and 3 as a minimum and all other columns when required / necessary

Likelihood Scale	Verbal Descriptors Defined sequence or scenario is the credible combination of events and risk factors / circumstances required to lead to the chosen Consequence. (Likelihood estimate must consider the whole scenario including the chosen Consequence).	Past History / Experience refer to databases and risk registers)	Exposure to Risk Factors Measured in their effects and exposure time period Job duration or task time or operational time or lifetime	Likelihood Estimate can be expressed as a FREQUENCY The whole scenario including the chosen Consequence could occur	Likelihood Estimate can be expressed as a PROBABILITY The whole scenario including the chosen Consequence could occur
6	Virtually certain the defined sequence can and will happen because ALL risk events / risk factors are almost likely to be present	It has been a common / very Frequent Occurrence in our organisation / industry (It = whole scenario including the Consequence)	Extreme EXPOSURE because ALL risk factors are poorly controlled throughout the whole of the time period	At least daily - or more often than 300 times per year	At least as often as 1 chance in 10 times or even more often (at least 10% of the times) or up to every time (1:1)
5	Very likely that the defined sequence can and will happen because most risk events / risk factors are very likely to occur or be present	It is known to have frequently occurred / happened in our organisation / industry (It = whole scenario including the Consequence)	Very high EXPOSURE because most risk factors present and not well controlled during most parts of the time period	As often as weekly - 50 times per year	Between 1 chance in 10 times and 1 chance in 100 times . Between 10% and 1% of the times.
4	Possible and likely that the defined sequence can and will happen because many risk events / risk factors are likely to occur or be present	Have heard of it happening regularly before in our organisation / industry (It = whole scenario including the Consequence)	High EXPOSURE because many risk factors present but are only partly controlled during much of the time period	As often as monthly - 10 times per year	Between 1 chance in 100 times and 1 chance in 1,000 times .
3	Possible but unlikely that the defined sequence can and will happen because many risk events / risk factors are unlikely to occur or be present	Have heard of it happening occasionally before in ours or similar organisations / industries (It = whole scenario including the Consequence)	Moderate EXPOSURE because many risk factors are not present and are well controlled during many parts of the time period	As infrequently as once per year	Between 1 chance in 1,000 times and 1 chance in 100,000 times .
2	Very unlikely that the defined sequence can and will happen because most of the risk events / risk factors are very unlikely to occur or be present	Rarely heard of in ours or similar organisations / industries (It = whole scenario including the Consequence)	Low EXPOSURE because most risk factors are not present or are well controlled during most parts of the time period	As infrequently as once in 10 years	Between 1 chance in 100,000 times and 1 chance in 1,000,000 times .
1	Extremely unlikely that the defined sequence can and will happen because almost ALL of the risk events / risk factors only occur or would be present in exceptional and rare circumstances	Unheard of in ours or similar organisations / industries (It = whole scenario including the Consequence)	Very Low EXPOSURE because ALL risk factors are not present or ALL are well controlled during ALL of the time period	As infrequently as once in each 100 years or even less	As little as 1 chance in 1,000,000 times or even less.

LEGISLATED REQUIREMENTS CONSEQUENCE SCALE

LEGISLATED REQUIREMENTS

Consequence Scale	Legislated Requirements, Regulatory Involvement
6	Administration appointed / entire or partial loss of operating works or functions
5	Legislated requirement issue with Acts, Regulations, Codes, Rules. Regulator involved / Enforceable undertaking
4	Energex/Ergon identified issue requiring regulator to be notified Improvement notice issued
3	Note 1
2	
1	

Note 1: No applicable measure for this dimension

CUSTOMER IMPACT CONSEQUENCE SCALE

Consequence Scale	CUSTOMER IMPACT Interruption (>1 min)			Customer & Political Sensitivity	
	Customer No's	Duration / Time to Restore	Repeat Frequency		
6	70,000	> 1 week	Note 1	Note 1	Call for replacement of Directors and / or Executive management, Extensive public outrage
5	50,000	> 3 days			Call for enquiry, public outrage, and substantial negative media campaign. Brand damage. Multiple ministerial / cabinet involvement
4	15,000	> 1 day	every day in one week	Inability to meet agreed target date, or disruption to multiple large scale businesses or essential services (e.g. Hospitals, sewage)	Adverse national media attention (e.g. Disruption to large public events). Loss of public trust
3	5,000	> 12 hours	three times in one week	Disruption to single large scale business or essential service, or inability to meet agreed target for increased supply	Adverse regional media attention. Loss of customer trust / action groups formed. Ministerial direction / approval
2	1,000	> 3 hours	twice in one month	Disruption to small to medium business, or inability to meet agreed target for increased supply to small to medium customers / businesses	Adverse local media attention or other negative external publicity. Multiple customer complaints. State MP concern / Ministerial request / concern.
1	100	< 3 hours	once only p.a.	Customer inconvenience	Few customer complaints and or external criticism. Local government concern.

Note 1: No applicable measure for this dimension

BUSINESS IMPACT CONSEQUENCE SCALE

BUSINESS IMPACT

Consequence Scale	Business Rules, Data management & security	Restricted network operation / loss of control, indication, protection	Strategic Direction	Asset Impact (including Obsolescence)
6	Note 1	Inability to remotely control majority of Energex/Ergon network, or plant operated above rating	SAS&P is unable to deliver on its agreed strategic initiatives resulting in additional costs to the business or lost opportunity \$>20 million	Significant impact on any restoration or planned works equating to business impact of >\$20million or equivalent - for example; cost premium on project, labour 200 000hr, reliability impact or opportunity lost
5		Inability to remotely control half of Energex/Ergon network	SAS&P is unable to deliver more than half its agreed strategic initiatives, resulting in additional costs to the business or lost opportunity \$>5 million	Significant impact on any restoration or planned works equating to business impact of >\$5million or equivalent - for example labour 50 000hr, reliability impact, inability to meet strategic initiatives or opportunity lost
4	Release of non-public / sensitive information	Inability to remotely control > = 2 bulk supply substations supply area	SAS&P is unable to deliver an agreed strategic initiative, resulting in additional costs to the business or lost opportunity \$>1 million	Significant impact on any restoration or planned works equating to business cost of >\$1million or equivalent - for example; cost premium for project, labour 10 000hr, reliability, opportunity lost
3	Compliance breach with Energex/Ergon policies Compliance breach with external standards	Inability to remotely control an Energex/Ergon substation, or abnormal network configuration	There is a significant cost premium (>50% of estimates) required to deliver agreed strategic initiative/s for which SAS&P is the lead	Significant impact on any restoration or planned works equating to business impact of >\$500,000 or equivalent - for example; cost premium on project, labour 5000hr, reliability impact or opportunity lost
2	Corrupting / loss of data, release of asset / plant data, intellectual property issue	Note 1	There is a cost premium (>25% of estimates) required to deliver agreed strategic initiative/s for which SAS&P is the lead	Significant impact on any restoration or planned works equating to business cost of >\$100,000 or equivalent - for example cost premium for project, reliability, opportunity lost
1	Compliance breach with internal guidelines or standards		There is a cost premium (>10% of estimates) required to deliver the agreed strategic initiatives for which SAS&P is the lead	Significant impact on any restoration or planned works equating to business cost of >\$50,000 or equivalent - for example cost premium for project, reliability, opportunity lost

Note 1: No applicable measure for this dimension

NETWORK RELIABILITY LIKELIHOOD SCALE – Used to assess legislated, customer and business impacts

LEGISLATED, CUSTOMER IMPACT & BUSINESS IMPACT LIKELIHOOD SCALE						
Likelihood Scale	Verbal Descriptors Defined Sequence or scenario is the credible combination of evens and risk factors / circumstances required to lead to the chosen Consequence		Single Specific Item e.g. Likelihood of this specific transformer failing in the way described and leading to the chosen Consequence - here and now with the existing risk factors	Past History / Experience (refer to corporate databases and risk registers)	Probability estimate Whole scenario including the chosen Consequence could occur..... (used in converting Reliability Assessment Planning to a semi quantitative likelihood)	Generic failure of a chosen asset type for a large population e.g. Likelihood of any RMU of this type failing? Also see pas history
6	Almost certain to occur	Almost certain the defined sequence can and does happen because ALL risk events / risk factors are almost likely to occur or be present	Extreme exposure because All risk factors are poorly controlled throughout the whole lifetime of this asset	Whole scenario including Consequence has been occurring Almost all of the time within the EQL Group or in similar organisations / industries	Approx. 1 chance in 1 or very close to eve time 100%	Could occur daily or more often Approx. 300 times per year
5	Very likely to occur	Very likely the defined sequence can and does happen because most risk events / risk factors are very likely to occur or be present	Very high exposure because most risk factors are present and are not well controlled during most of the lifetime of this asset	Whole scenario including Consequence has been occurring very regularly within the EQL Group or in similar organisations / industries	Approx. 1 chance in 10 10% of the time	Could occur as often as weekly Approx. 50 times per year
4	Likely to occur	Likely the defined sequence can and does happen because many risk events / risk factors are likely to occur or be present	High exposure because many risk factors are present and are only partly controlled during much of the lifetime of this asset	Whole scenario including Consequence has been occurring regularly within the EQL Group or in similar organisations / industries	Approx. 1 chance in 100 1% of the time	Could occur as often as monthly Approx. 10 times per year
3	Unlikely to occur	Unlikely the defined sequence can happen because many of the risk events / risk factors are unlikely to occur or be present	Moderate exposure because many risk factors are not present and are well controlled during many parts of the lifetime of this asset	Whole scenario including Consequence has been occurring now & then within the EQL Group or in similar organisations / industries	Approx. 1 chance in 1,000	Could occur as infrequently as once per year
2	Very unlikely to occur	Very unlikely the defined sequence can happen because most risk events / risk factors are very unlikely to occur or be present	Low exposure because most risk factors are not present or are well controlled during most parts of the lifetime of this asset	Whole scenario including Consequence has been occurring rarely within the EQL Group or in similar organisations / industries	Approx. 1 chance in 10,000	Could occur as infrequently as once in 10 years
1	Almost no likelihood to occur	Almost no likelihood that the defined sequence can and does happen because almost ALL risk events / risk factors only occur or would be present in exceptional and rare circumstances	Very low exposure because All risk factors are not present or All are well controlled during All parts of the lifetime of this asset	Whole scenario including Consequence has been occurring Almost never within the EQL Group or in similar organisations / industries	Approx. 1 chance in 100,000 or even less	Could occur as infrequently as once in 100 years or even less

Network Risk Tolerability Scale (Semi-Quantitative)

Network Risks - Risk Tolerability Criteria and Action Requirements				
Risk Score	Risk Descriptor	Risk Tolerability Criteria and Action Requirements		
30 – 36	Intolerable (stop exposure immediately)			
24 – 29	Very High Risk	*ALARP Risk in this range managed to As Low As Reasonably Practicable	Executive Approval (required for continued risk exposure at this level)	May require a full Quantitative Risk Assessment (QRA) Introduce new or changed risk treatments to reduce level of risk Periodic review of the risk and effectiveness of the existing risk treatments
18 – 23	High Risk		Divisional Manager Approval (required for continued risk exposure at this level)	Introduce new or changed risk treatments to reduce level of risk Periodic review of the risk and effectiveness of the existing risk treatments
11 – 17	Moderate Risk		Group Manager / Process Owner Approval (required for continued risk exposure at this level)	Introduce new or changed risk controls or risk treatments as justified to further reduce risk Periodic review of the risk and effectiveness of the existing risk treatments
6 – 10	Low Risk			
1 to 5	Very Low Risk		No direct approval required but evidence of ongoing monitoring and management is required	Periodic review of the risk and effectiveness of the existing risk treatments

***SOFAIRP**
 Risk in this range managed to So Far As Is Reasonably Practicable