APPENDIX 26

SCADA and automation strategic plan 2015-20

Energex

SCADA and Automation Strategic Plan 2015-20

Asset Management Division

energex

positive energy

Version control

Version	Date	Description
1.4	22/10/2014	Final for Submission

Energex Limited (Energex) is a Queensland Government Owned Corporation that builds, owns, operates and maintains the electricity distribution network in the fast growing region of South East Queensland. Energex provides distribution services to almost 1.4 million connections, delivering electricity to 2.8 million residents and businesses across the region.

Energex's key focus is distributing safe, reliable and affordable electricity in a commercially balanced way that provides value for its customers, manages risk and builds a sustainable future.

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1 Introduction

Supervisory Control And Data Acquisition and Automation (SCADA and Automation) systems are used to monitor and control the distribution network and are therefore important for the efficient and effective management of Energex's electrical network assets.

SCADA and Automation systems:

- Provide real-time remote presence at locations throughout the network system;
- Automate key processes such as voltage regulation, supply restoration and plant overload protection; and
- Provide historical data for use by capacity, reliability and maintenance planners and asset managers.

Energex has historically developed its SCADA and Automation systems in-house. The reason for this approach is that historically Energex maintained the expertise to develop tailor-made solutions for its business which, at the time, were more economically and technically efficient than purchasing off-the-shelf alternatives.

However, off-the-shelf SCADA solutions have advanced significantly in terms of both cost effectiveness and technical capability. This contrasts with the fact that to build and maintain SCADA product capability has become increasingly specialised and resource intensive.

In addition, the operational demands on Energex's SCADA and Automation systems are progressively becoming more demanding due to increased penetration of solar PV generation, the introduction of new technologies and the drive to lower whole of system costs through achieving more with less staff.

Energex considers that, as part of the SCADA and Automation Strategy 2015-20 (the Strategy), it is prudent to test whether the existing system remains the most practicable and economically efficient or whether alternative solutions such as external off the shelf products would deliver better outcomes for both Energex and its customers.

For this reason, this Strategy sets out the strategic objectives and operational requirements of Energex with respect to SCADA and Automation services and undertakes an evaluation to determine the most appropriate model to deliver these services over the 2015-20 regulatory period.

While this Strategy establishes the future program of work, the Network Asset Management Policy (RED 00807 / BMS 3595) provides the processes and practises that form the key inputs into this decision making process.

This Strategy is to be read with the following associated documents:

[1] Joint Network Vision (Outlook to 2030) (Energex Form 8093 [Appendix D9 of RED 00775])

[2] Joint Network Technology Strategy (Energex RED 00776 / BMS 03551)

Other supporting documents which may assist with deeper understanding are:

[3] Business and Information Blueprinting Program - 2015 Future State Blueprint – (14 November 2011 Version 1.5 – Endorsed)

[4] Office of the CIO 2020 Architecture Vision Network Asset Management and Operations

[5] Maintenance Standard for Substation Control Systems (Energex STD 00945/ BMS 04173)

[6] CSIRO report "Enabling Australia's Digital Future: Cyber Security Threats and Implications" (http://www.csiro.au/Organisation-Structure/Flagships/Digital-Productivity-and-Services-Flagship/Smart-secure-infrastructure/Enabling-Australias-digital-future.aspx)

[7] Energex Distribution Annual Planning Report 2014/15 – 2018/19

[8] Energex Telecommunications Strategy 2015-2020

2 Purpose and Structure

2.1 Purpose

The purpose of this Strategy is to identify:

- The strategic objectives and operational requirements of the business over the next regulatory period;
- The existing and ongoing capability of SCADA and Automation assets;
- Any shortfalls between current capability and future operational requirements; and
- The most cost effective way of delivering SCADA and Automation services to meet future operational requirements.
- This Strategy is prepared in compliance with Energex's Corporate Strategy.

2.2 Structure

To achieve its purpose, the Strategy is structured according to the following sections:

1) Strategic Objectives – provides an overview of the strategic planning process and explains how the corporate strategic objectives are translated into operational initiatives and outcomes to be delivered by this Strategy;

2) Existing Capability – details the current operational capability of current SCADA and Automation services;

3) Operational Requirements – specifies Energex's future operational and service requirements;

4) Options Assessment – describes the assessment process to determine what is the most appropriate service delivery model going forward;

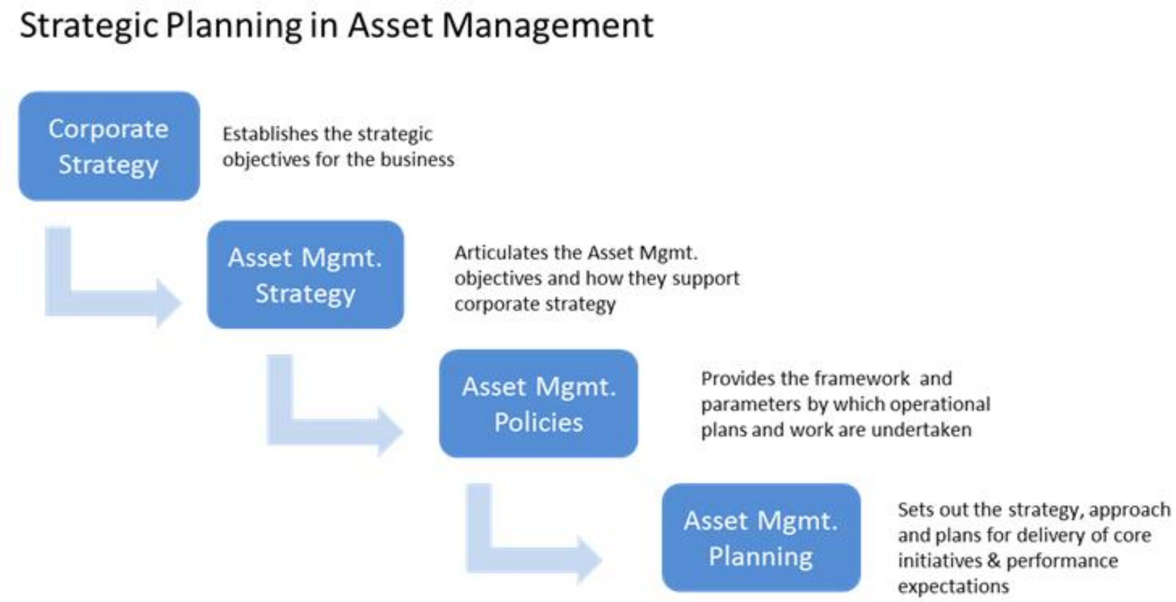
5) Costed Solution – provides detailed costs of the preferred service delivery model;

6) Governance – sets out the governance arrangements associated with this Strategy.

3 Strategic Objectives

This Strategy is part of an overall strategic planning process that ensures that the corporate strategic objectives are operationalised within the business. This framework is characterised by the inter-linkages detailed in Figure 3.1.

Figure 3.1: Energex's Strategic Planning Process



3.1 Network Asset Management Strategy

Energex's network asset management strategy aims to achieve the following objectives:

- Compliance with statutory obligations including safety, environment, and regulation and Energex Distribution Authority policies and standards
- Business outcomes achieved and customer and stakeholder expectations met including acceptable levels of network reliability
- Investment principles and optimised asset investment plans that balance network risk, cost and performance (service) outcomes
- A focus on asset life-cycle management including asset data and information and communication technology (ICT) initiatives (data adequacy and quality)
- Modernisation of the network to meet required business and customer outcomes
- Further development of Energex's asset management system (practice).

The asset management strategy is supported by a suite of policies, plans and guidelines. The delivery and application of the overall strategy will ensure that Energex continues to meet network challenges, deliver its asset management objectives and provide balanced results to customers and shareholders. How SCADA and Automation directly contributes to these outcomes is detailed in section 3.2.

3.2 SCADA Strategy

The role of SCADA and Automation systems is to optimise power system performance and minimise operating costs.

Consequently, SCADA and Automation is directly relevant in the delivery of operational excellence as part of the Business Performance operational strategy and achieving a network delivering customer value and choice as part of the Transformation Performance operational strategy.

The SCADA and Automation activities necessary to ensure these outcomes are achieved are summarised in sections 3.3.1 and 3.3.2 respectively.

3.2.1 Business performance

SCADA and Automation systems target improved business performance in the following areas:

- safety;
- compliance;
- reliability;
- productivity and efficiency.

3.2.1.1 Safety

The SCADA and Automation systems improve safety by providing network visibility and control which allows hands-off operation of plant, and reducing the need for crew travel (with its associated hazards) to remote destinations.

Improvements in crew safety are targeted by implementing remote live line sequence control to reduce fault clearing times when live line work is being performed.

Furthermore, SCADA and Automation systems target improved community safety by implementing remote setting group selection to allow the application of alternative protection and auto-reclose settings at times of elevated risk (e.g. high bushfire risk, flood or abnormal power system configuration).

3.2.1.2 Compliance

The risk of non-compliance of power system voltage with statutory requirements is increasing as a result of a number of external influences such as the increasing penetration of distributed energy resources such as solar PV.

SCADA and Automation systems mitigate the risk of non-compliance through the implementation of automated, wide-area volt/var optimisation.

These systems also mitigate the risk of non-compliance with the Energex Distribution Authority, supporting achievement of the Reliability Limits and Service Safety Net Targets.

3.2.1.3 Adequacy and reliability

Adoption of the Customer Outcome Standards (COS) are contingent on the use of substation automation software (Plant Overload Protection Software) to minimise the customer impacts of protecting plant from severe overloads.

SCADA and Automation systems reduce the risks to power system adequacy and reliability through the implementation of automated load transfer and restoration schemes.

3.2.1.4 Productivity & efficiency

SCADA and Automation systems target improvements to productivity through automation, remote monitoring and control, and the provision of historical data for use by asset managers, capacity planners, reliability planners and maintenance planners.

Improvements to productivity are targeted by increasing the breadth (number of endpoints) and depth (type and amount of data retrieved from endpoints) of the system's reach, and by automating the flow of data from SCADA and Automation systems to the Distribution Monitoring and Analytics (DM&A) system (refer [4]).

3.2.2 Transformation performance

Creating a network delivering customer value and choice requires the business to respond effectively to changing technology to allow for the efficient integration of new energy generation and delivery technologies and customer end-use technologies.

The technological changes that are expected to have the most significant impact to improving SCADA and Automation capability and cost are:

- Embedded processing;
- OT/IT Technology convergence; and
- OT/IT integration.

3.2.2.1 Embedded processing

The expression of equipment functions through software not hardware enables rapid improvements in the number, type and sophistication of functions. It allows design errors to be fixed and new and improved functions to be added during the lifetime of the equipment.

The effects of "Mores law" (the doubling of transistor density every two years) and low power computing (driven by mobile phones and tablets) also enable the adoption of IT technologies requiring higher levels of processing power (originally impractical to deploy in harsh environments).

3.2.2.2 OT/IT technology convergence

SCADA and Automation, Protection and Telecommunication systems (Operational Technologies or OT) benefit from the adoption of international standards originally developed for IT and telecommunications equipment and systems.

3.2.2.3 OT/IT integration

Data which was previously stranded on the OT side of the OT/IT divide can now be channelled efficiently into enterprise application systems, to improve both understanding and management of the power system and its associated secondary systems.

3.3 Strategic Challenges

The ongoing successful delivery of SCADA and Automation services in the 2015-2020 period is subject to both externally and internally derived challenges.

3.3.1 External challenges

3.3.1.1 Performance pressures

Energex will rely on SCADA and Automation systems to maintain and improve supply reliability and quality in the presence of conflicting demands such as increased asset utilisation and increased penetration of distributed energy resources. “Smart grid” applications will have to integrate a greater variety of endpoints and subsystems in order to achieve these goals. As such, the SCADA and Automation systems will become more complex and more mission-critical. Current levels of SCADA and Automation service availability may be rendered inadequate – the organisation may face significant commercial risks in the event of system failures.

3.3.1.2 Cost pressures

Energex will demand improvements in the lifecycle costs of SCADA and Automation services, in response to cost pressures on the business as a whole. Lifecycle costs reflect such factors as initial purchase/installation price, product lifetime and workforce productivity. Productivity pressures will increase due to a proliferation of “intelligent” devices all of which will have to be monitored and managed.

3.3.1.3 Cybersecurity pressures

Threats to the availability of SCADA and Automation services will increase due to the increased extent and exposure of SCADA and Automation systems. The extent will increase in physical (e.g. geographical) and logical (e.g. number of subsystems) dimensions. The exposure will increase through connectivity with external (potentially hostile) systems and through the use of commercial “off the shelf” (COTS) components having well publicised vulnerabilities.

3.3.2 Internal challenges

3.3.2.1 Legacy fleet

The legacy fleet has a long tail of unsupported and obsolescent equipment which requires upkeep in terms of both skills and spare parts.

3.3.2.2 Systems integration

The convergence of technologies across the whole OT domain (protection, SCADA, automation and condition monitoring) and OT’s increasing integration with IT, raises serious questions about how to organise equipment, systems, processes and skills for maximum business benefit.

3.3.2.3 Workforce capability

Resource effort is currently required for the upkeep of Energex’s in-house SCADA and Automaton standard building blocks. Fluency with the detail of the building blocks has its advantages, but the question arises as to whether better outcomes would be achieved by focusing on business needs and not on the technology.

The next few years will see the beginning of a revolution in power system automation technology with the introduction of IEC 61850, the rollout of high-performance communications technologies and the integration of diverse systems to form the “Smart Grid”.

In addition to enabling the adoption of new standards, maintaining sufficient capability with expertise in existing systems and standards will be essential to a cost effective transition.

Energex will have to decide the manner in which the necessary support skills will be accessed, and put in place suitable training and change management programmes.

3.3.3 Summary

A turning point is being reached with respect to the choice of technologies and the deployment of resources to fulfil Energex’s ongoing SCADA and Automation needs. The decisions made will affect not only SCADA and Automation but also areas such as protection, condition monitoring and even business computing (through the provision of OT data to IT applications such as business analytics).

At the lowest level, Energex must decide how source its SCADA and Automation technologies: A managed transition from in-house to COTS-based building blocks is indicated.

The ongoing escalation of performance, cost and cybersecurity demands provides an underlying set of strategic objectives which must be addressed.

For these reasons, the most critical strategic decision to be addressed is if maintaining an in-house system is the most operationally effective and cost efficient approach for the future or whether both the business and customers would benefit more over the medium to long term form a transition to an off-the-shelf RTU platform.

4 Existing Systems and Capability

A key input into the determination of resources necessary for the delivery of SCADA and Automation services for inclusion into Energex's Regulatory Proposal is an understanding of the capability of the existing system and whether enhancements are required to meet future operational needs.

This chapter details the current operational capabilities of the Energex SCADA and Automation system.

4.1 Overview of the Current SCADA System

Energex has historically developed its own SCADA and Automation systems.

Through this development, it has developed its own Substation Automatic Control System (SACS) and Serial Interface Control Module (SICM) and associated software.

Energex's current SCADA and Automation system can be divided into five main subsystems:

- substation SCADA and Automation;
- distribution System SCADA;
- SCADA and Automation component of the Distribution Management System (DMS);
- interconnecting Telecommunications Network; and
- engineering toolset.

4.1.1 Substation SCADA and Automation

The Substation Automation System (SAS) architecture has been developed in-house and comprises:

- an intelligent Remote Terminal Unit (RTU);
- distributed Intelligent Electronic Devices (IEDs) for interfacing to substation equipment;
- a data communications "field bus" based on IEEE Standard 1815 (DNP3) for interconnecting the RTU and IEDs;
- a wide-area (inter-site) communications link via an in-house protocol (RDCCOM).
- a Human-Machine Interface (HMI) for displaying information to and accepting commands from a local operator; and

- control/automation software.

Critical protection functions are excluded from this architecture: These are performed by protection equipment comprising Current Transformers (CTs), Voltage Transformers (VTs), protection relays and discrete electrical wiring.

Substation SCADA and Automation enables Energex to:

- Remotely monitor and control the substation primary plant (transformers, circuit breakers, etc.)
- Remotely monitor operation of protection systems and identify equipment at risk from fault conditions
- Control curtailable load through operation of the AFLC system
- Automatically manage overload conditions via the Plant Overload Protection (POPs) in local substation automation applications
- Automatically manage volt/var regulation to keep supply voltage within the statutory limits via the VVR automation application
- Reduce operator workload with auto-changeover schemes
- Remotely manage automation applications such as auto-restore
- Remotely monitor miscellaneous alarms from substation equipment

4.1.2 Distribution system SCADA

The Distribution System SCADA (DSS) system implements SCADA for pole-top equipment and distribution substations.

It provides remote presence at reclosers, sectionalisers, load break switches and step voltage regulators via a mesh radio network. The standard building blocks for the system are predominantly composed of COTS equipment. Only the communications gateways used for interfacing to the DMS contain in-house software. SCADA communication with the COTS plant controllers is via industry standard DNP3 protocol.

The DSS enables Energex to:

- Remotely monitor and control small sections of the network enabling faster restoration of supply to the majority of customers in the event of faults. This directly impacts on Energex's ability to meet the reliability of supply requirements and contributes to meeting STPIS obligations
- Remotely monitor operation of protection systems and identify equipment at risk from fault conditions
- Remotely manage the operation of step voltage regulators to keep supply voltage within the statutory limits

- Remotely monitor miscellaneous alarms from pole-top equipment

There is a small and rapidly shrinking legacy of bespoke installations and point-to-point radio links from previous generation distribution SCADA systems. These are being migrated to (or replaced with) the new DSS standard.

4.1.3 SCADA and Automation component of the DMS

Energex's PowerOn Fusion DMS currently hosts a SCADA master station, which includes communication processing, analogue limit processing, calculations, alarm and event logging, and a Human-Machine Interface (HMI).

A facility for script-based automation exists but is not in use. GE offers a DMS-hosted application for distribution automation called Advanced Power Restoration System (APRS). The SCADA and Automation Strategy includes a project to trial APRS after the DMS is fully commissioned and stable.

The business benefit being pursued with this capability is to maintain supply to the maximum number of customers in the presence of network faults, through FDIR (Fault Detection, Isolation and Restoration) and Load Transfer operations.

Fundamentally the goal of this capability is to support the maintenance of acceptable levels of reliability of supply with less redundancy in more expensive primary plant.

4.1.4 Telecommunications network

The control of the power network by the DMS is dependent on communications with remote sites.

Project Matrix is rolling out an enterprise-grade, high-speed data communications network based on Multi-Protocol Label Switching (MPLS) technology to all zone substations and offices. The project includes the design and implementation of contemporary cyber security features. Matrix-based communication services will be an essential enabler for a 21st century SCADA and Automation system, and improves what can be achieved through the potential transition to COTS RTUs.

This upgrade provides the business the following key benefits in relation to SCADA and Automation:

- Improved security and availability
- The ability to gather much more information from remote sites
- The ability to cost-effectively gather supplementary data (e.g. condition monitoring) independently of SCADA, enabling appropriately reduced procedural and verification costs (less configuration churn)
- Improved remote engineering diagnostic access (more chance of being able to resolve problems without driving to a remote site)

4.1.5 Engineering toolset

The purpose of the engineering toolset is to facilitate the translation of project requirements to working systems (configured hardware and software) with maximum integrity and productivity.

The SCADA and Automation system is a complex multi-vendor ecosystem – the automated generation of device and application configuration data from a common source of truth is essential to the achievement of end-to-end (substation-to-DMS) integrity. This is currently achieved with SCADABase, an in-house developed IT application. Final testing is carried out on test racks in the SCADA and Telecommunications Services workshop.

4.2 Existing Capability and Performance

The current core capability of Energex's SCADA and Automation system is sufficient to operate the network now, but it is evident that additional capability and performance will be required as the industry develops and Energex evolves to respond to the needs of its customers and the community.

Energex has maintained its capability to deliver substation SCADA services and Automation applications in a manner that presents consistency to network operators across multiple generations of underlying hardware platforms, with a progressively increasing percentage of off-the-shelf elements.

5 Future Requirements

To establish the most appropriate level of SCADA and Automation capability it is necessary to identify future business requirements.

Once these requirements are established then an objective assessment of the ability of the existing system to meet these obligations can be made and, where there are service gaps, an appropriate response can be developed.

This chapter sets out the operational requirements of the business.

5.1 Operational Requirements

Energex's basic operational requirement of SCADA and Automation systems is that they provide the following capabilities:

- remote monitoring and control of plant and ancillary systems in substations (substation SCADA);
- remote monitoring and control of plant and ancillary systems at key distribution network locations (DSS);
- power-system-aware automation;
- enterprise integration; and
- remote engineering access/management.

5.1.1 Remote monitoring and control (substation & Distribution SCADA)

Remote monitoring and control (SCADA) have been embedded in the business for decades; however operational performance can be further improved by increasing the breadth (number of endpoints) and depth (type and amount of data retrieved from endpoints) of the system's reach.

5.1.2 Power-system-aware automation

Energex's existing power system automation applications were developed to improve network performance and reduce impact on customers when faults occur.

Maintaining the capability provided by these applications is necessary to maintain network performance.

The autonomy, speed and effectiveness of power system automation applications can be improved by making them "power system aware", i.e. driven by accurate knowledge of the network – sources (both external and embedded), customer loads, connectivity, limitations and associated real-time measurements.

5.1.3 Enterprise integration

The strategy for Energex IT systems is driving towards a multilayer service bus architecture, making information more readily accessible to support operations and management across the business.

Given the significant changes already planned in the IT systems (refer *Office of the CIO 2020 Architecture Vision [4]*), attempting any major changes for SCADA systems in this area in the near term is considered unwise.

The focus for this strategy with respect to enterprise integration is to first work on the foundations that we already know will be required to deliver on the longer term business strategy for enterprise integration.

As the other Energex IT system changes develop, and the underlying technologies and standards 'mature', we expect to identify other practical works to help deliver on the business vision.

5.1.4 Remote engineering access/management

As improved communications become available to sites via the IP-MPLS network, secure remote access to more detailed primary and secondary system performance data will become feasible. Safety and productivity will improve as a result of a reduction in the need for site visits.

Business benefits will result from improved access to fault-related diagnostic data from protection relays – detailed event logs and oscillography.

Within the SCADA and Automation systems, business benefits will be achieved through the ability to remotely monitor secondary system health, diagnose and resolve problems and deploy configuration changes.

5.2 Elements

Future SCADA and Automation systems will comprise the following elements:

- endpoints;
- gateways;
- automation servers;
- DMS-hosted master station;
- data communications network;
- shared/synchronised configuration data including power system and secondary system models;
- engineering and asset management toolsets.

5.3 **Non-Functional Attributes**

Future SCADA and Automation systems will have to possess the following attributes:

- sufficiently reliable and available;
- sufficiently cyber-secure;
- trustworthy;
- flexible and adaptable to accommodate future needs;
- economically maintainable.

5.3.1 Sufficiently reliable and available

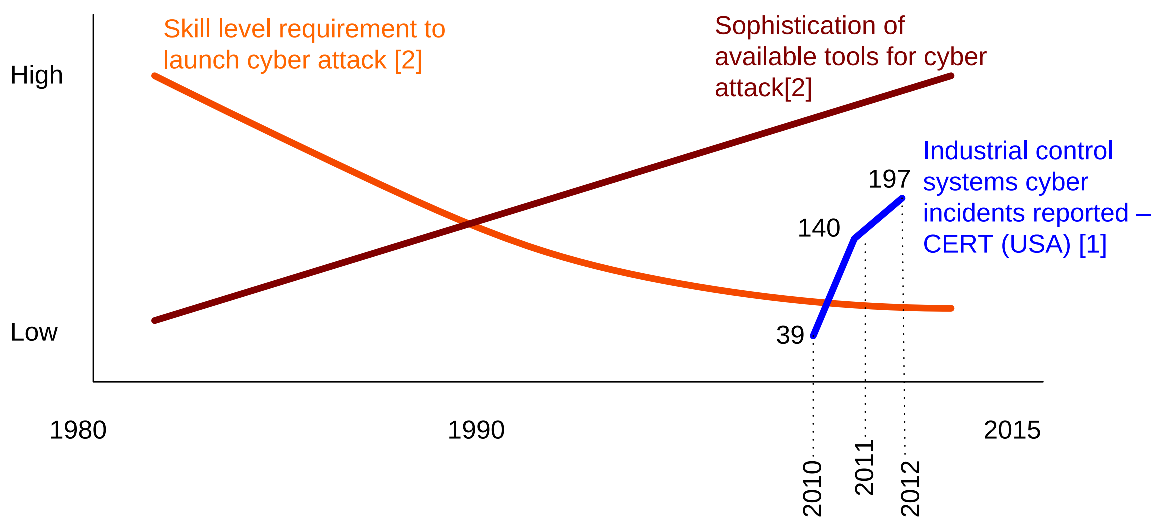
As Energex's reliance on SCADA and Automation systems increases, due attention will have to be given to architectural features (e.g. redundancy/duplication) and component attributes (e.g. MTBF and maintainability) that contribute to reliability and availability.

5.3.2 Sufficiently cyber-secure

A subset of the overall system distribution network security, but worthy of specific attention given international events, risk mitigation against cybersecurity threats is essential.

Figure 5.1 below shows a rise in industrial cybersecurity incidents consequent on the increasing availability of sophisticated hacking tools. Securing systems against cyber-attack requires the design, implementation, ongoing enhancement and testing of defences in compliance with a cybersecurity architecture. For more background refer to the CSIRO report [6].

Figure 5.1: Cybersecurity trends



[1] http://ics-cert.us-cert.gov/sites/default/files/documents/Year_in_Review_FY2012_Final.pdf; Table 2, pg 13
[2] Barbara Laswell, Ph.D. September 2003 CERT / Carnegie Mellon University

5.3.3 Trustworthy

Energex's future SCADA and Automation systems will have to exhibit predicable behaviour from an operator's perspective; as with any system requiring a high level of assurance, this will depend on the installation of well designed, thoroughly tested hardware and software, and on the provision of high-quality configuration data from the associated engineering toolsets.

5.3.4 Flexible and adaptable to accommodate future needs

Energex's smart grid directions will develop in response to as-yet-unseen developments in technology and energy policy. Energex's future SCADA and Automation systems should be capable of enhancement beyond their initial capability levels through the ability to accept new software, upgrade capability/performance and exchange data with other systems.

5.3.5 Economically maintainable

The massive rates of change and obsolescence typical of consumer electronics can have negative effects on industrial equipment, e.g. unavailability of spare parts due to "early" component obsolescence. This must be countered through attention to architectural features (e.g. Standards compliance) and component attributes (compliance with a product line architecture and roadmap) that contribute to long-term maintainability. It also requires the availability of means to maintain sufficient technical support and application engineering expertise with the products.

6 Options Assessment

Having established the current capability and future operational requirements, the purpose of this chapter is to identify gaps between current capability and future requirements and to identify an appropriate solution.

6.1 Assessment of Current System

Goal: To provide cost-effective SCADA and Automation products and services meeting business requirements

Operational Requirement	Current State	Key Gaps
Best practice primary system event diagnostics	Limited primary system event diagnostics	• Limitations in time synchronisation of event data
Best practice enterprise integration	Limited integration, e.g. distribution transformer monitoring data not usable for network operation	• Data integration between functional silos (Refer to [3] and [4])
Best practice secondary system asset management. Functions to be coordinated include asset tracking, condition assessment, operation and maintenance	Little or no formal record of secondary system assets, key attributes or history leading to inability to attribute a financial value, ascertain condition, or plan maintenance and replacement	• Secondary systems asset management systems • Remote management of secondary systems • Remote monitoring of secondary systems
Ability to produce and maintain accurate, consistent design artefacts for secondary systems pursuant to provisioning requests	Diverse systems (some obsolescent, some proprietary) with little or no data sharing or cross referencing, e.g. Ellipse, NFM, Bentley, IPS, SCADABase, CBMD, AutoCAD, Alcatel Element Manager	• Secondary systems design integration

Operational Requirement	Current State	Key Gaps
Systems deployed in accordance with Matrix architecture to optimise capacity, reliability, security and economic efficiency	Systems in various states of transition from legacy infrastructure	• Migrate systems to new infrastructure
SCADA and Automation systems operating on a common IP-MPLS network to optimise reliability, security, economic efficiency and functional integration	Systems in various states of transition from legacy infrastructure	• Migrate substations and field equipment to IP-MPLS network • Transition to IP-based wireless platform
Best practice integration of standards-based commercial products to optimise total cost of ownership consistent with requirements	History of in-house development and/or integration History of incorporation of SCADA enabled primary plant via industry standard protocol (DNPs). History of development to industry standards for integration of COTS substation IEDs.	• Integrate relays and other IEDs and rationalise functions (replacing SICM2B where beneficial) • Transition to commercial substation platform (replacing SACS) • Transition to IEC 61850 station bus (replacing DNP3 field bus) • Transition to IEC 61850 process bus (minimising field wiring) • Simulation and test environment
Optimal fleet taking into account spare parts and support costs	Fleet overburdened with obsolete products: PC-SACS V2, PC-SACS V3, SICM1, SICM2, CB Microcontrollers, RDCCOM, RDCs	• Upgrade systems to current standard • Transition from RDCCOM to DNP3 and/or IEC 61850-90-2

Operational Requirement	Current State	Key Gaps
Current products and services evolved to accommodate new requirements (as appropriate)	Current products and services were developed or acquired before the new requirements emerged	• POPS enhancements • VVR enhancements • Remote live line sequence selection • Remote setting group selection • Network metrology improvements
New products and services developed and old ones retired as required to support business strategy	Current products and services reflect the business strategy at the time of development	• This strategy
Bugs, limitations and usability problems systematically managed; continuous improvement has predictable funding and resourcing	Management and funding of continuous improvement is ad hoc and limits speed of response	• Continuous improvement policy and budget • Issue management process and toolset • Improvements, e.g. SCADABase, VVR, DSS gateway architecture • Field-modifiable analogue scale factors
Building blocks available as required	Component obsolescence issues Product dependency issues	• PC-SACS CPU refresh • PC-SACS operating system refresh • SICM2B refresh • Product-specific software builds

The number, nature and magnitude of the gaps to be addressed requires a progressive approach, targeting areas of highest risk and expected benefits.

6.2 Summary of Required Changes in Capability and Performance

6.2.1 System core operational capability enhancements needed

- Improved accuracy and availability of power system measurements used in maintaining customer supply voltage within statutory limits
- The measurement of power flow direction, particularly in areas with a substantial penetration of distributed generation
- Improved time synchronisation for aligning records of events between SCADA and protection

6.2.2 Platform product supply maintenance concerns

- Hardware – current platform requires comparatively frequent refresh of the circuit boards used as result of short product life spans. This has knock-on effect of requiring software changes and consequential regression testing.
- Software – with the multitude of generations of in-service RTUs, changes to software need to be regression tested across a number of platforms

6.2.3 Deployment / modification responsiveness capability

- Reduced requirements and less barriers to bringing additional resources to bear on deployment of SCADA system modifications – training currently lengthy due to the number of platform variants in service and little training collateral (manuals, training courses, etc.) available

6.2.4 Core architectural changes to prepare for future needs

- Transition to an industry standard data model capable of self-description and increased levels of configuration automation (IEC 61850, CIM)

6.3 **Options Assessment**

In the Energex secondary systems ecosystem, there many inter-related aspects that could be altered in a various ways, and many different permutations of timing, but from a fundamental approach, the basic business asset investment choices for Energex SCADA and Automation for each of the primary areas are:

6.3.1 SCADA and Automation base platform

a. Replace on failure – cut spending to a minimum and accept an accelerating decline in current capability and performance relative to requirements.

b. “BAU” – no significant platform changes; no investment beyond maintaining current capability and resolving any significant issues

c. Invest in Energex’s in-house platform to bring it up to current industry standards and continue the investment to maintain the design.

d. Invest in a transition to a COTS RTU platform

6.3.2 Substation SCADA and Automation capability

a. Replace on failure – cut spending to a minimum and accept an accelerating decline in current capability and performance

b. “BAU” – no significant building block changes; no investment beyond maintaining current capability and resolving any significant issues

c. Integration of SCADA and Protection via DNP3 – make better use of protection relay capabilities and enable use of relay-based functions such as auto-reclose, remote live line sequence control and remote setting group selection

d. Invest in IEC-61850 based standard building blocks for SCADA, Automation and Protection

6.3.3 Distribution SCADA and Automation capability

a. Replace on failure – cut spending to a minimum and accept an accelerating decline in current capability and performance.

b. “BAU” – no significant platform changes; no investment beyond maintaining current capability and resolving any significant issues

c. Invest in integration of advanced distributed distribution system automation schemes, e.g. IntelliRupter/IntelliTeam, Yukon Automation

d. Invest in integration of centrally managed (e.g. DMS hosted) distribution system automation schemes, e.g. APRS

6.3.4 Substation SCADA and Automation deployment

a. Replace on failure – cut spending to a minimum and accept a progressive decline in performance and increasing risk

b. "BAU" – no investment beyond maintaining current capability, migration to current standard on major site-works only and resolving any significant issues

c. Invest in achieving a common base platform across the SCADA fleet, removing the obsolete plant that is still in service but presenting progressively higher risk

6.3.5 Distribution SCADA and Automation deployment

a. Replace on failure – cut spending to a minimum and accept a progressive decline in performance and increasing risk

b. "BAU" – no investment beyond maintaining current capability and resolving any significant issues

c. Invest in additional deployments targeted at deferring investment in poles and wires while maintaining acceptable network reliability performance

Tabular summary:

Core Capability Area	Planned Strategic Direction	
	2015-20	**2020-25**
SCADA and Automation base platform	d. Transition to a COTS RTU platform	b. BAU
Substation SCADA and Automation capability	c. DNP3-based integration of SCADA and Protection	d. Invest in IEC-61850 based standard building blocks for SCADA, Automation and Protection
Distribution SCADA and Automation capability	d. DMS hosted distribution system automation	b. BAU
Substation SCADA and Automation deployment	c. Fleet rationalisation	b. BAU
Distribution SCADA and Automation deployment	c. Targeted at capital deferral	b. BAU

6.4 Conclusion

Based on the analysis undertaken, Energex considers that the most efficient operation and economic efficient solution is to rationalise the existing fleet, integrate protection and SCADA where beneficial, and migrate to a commercial RTU core platform in the short term.

These steps are taken in preparation for migration to IEC-61850 centric secondary system building blocks, once the risks to achieving the potential benefits on offer through the migration have reached an acceptable level.

7 Proposed Solution

This chapter identifies the financial requirements to deliver the proposed SCADA and Automation services for each year of the next regulatory period.

7.1 Proposed Solution

A number of projects have been identified as part of the preferred solution model. These projects are provided in detail at Attachment 1.

The long-term implementation of this solution will extend beyond the 2015-20 regulatory period. Figure 7.1 provides a road map for the implementation of this program of work.

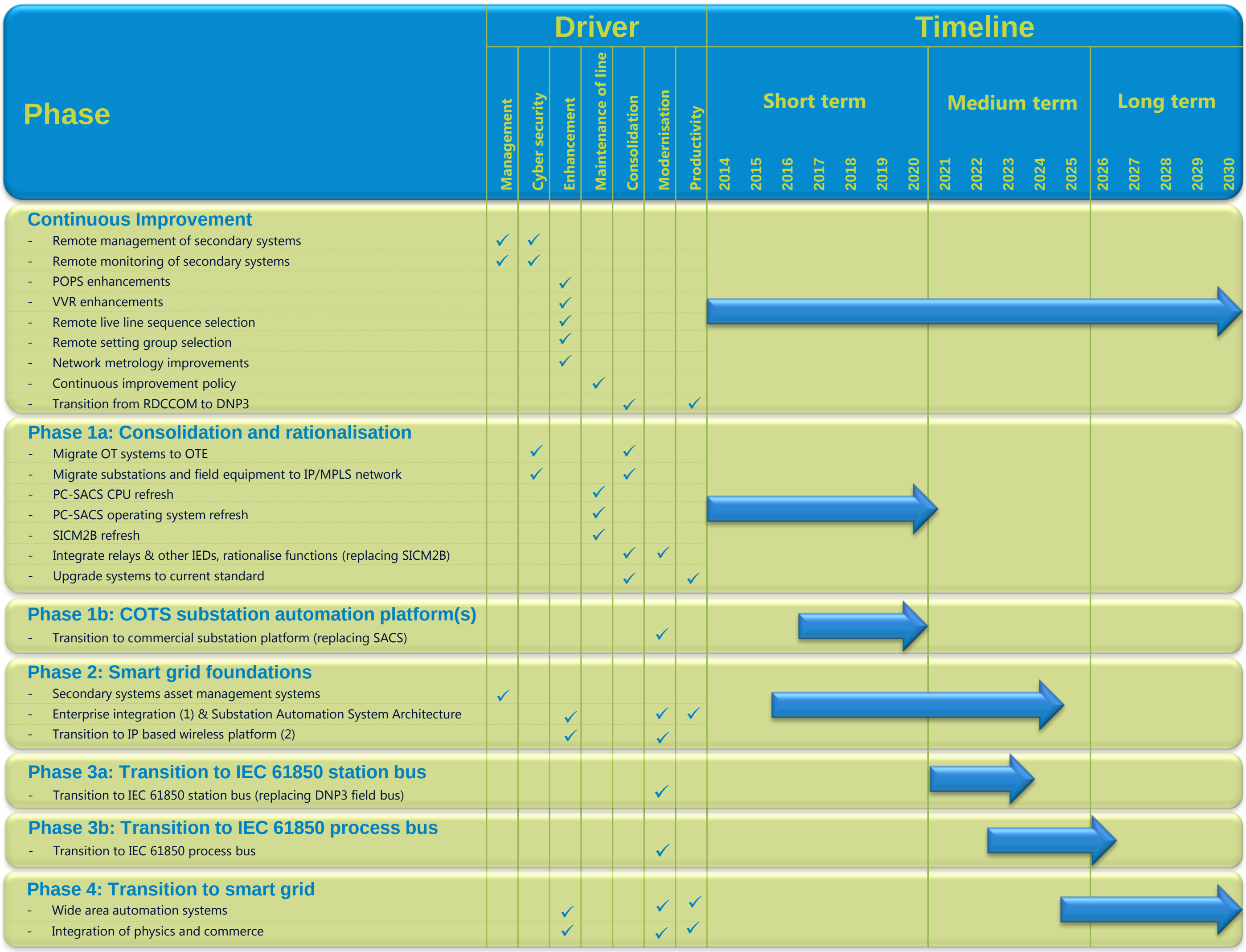


Figure 7.1 – Programme Roadmap

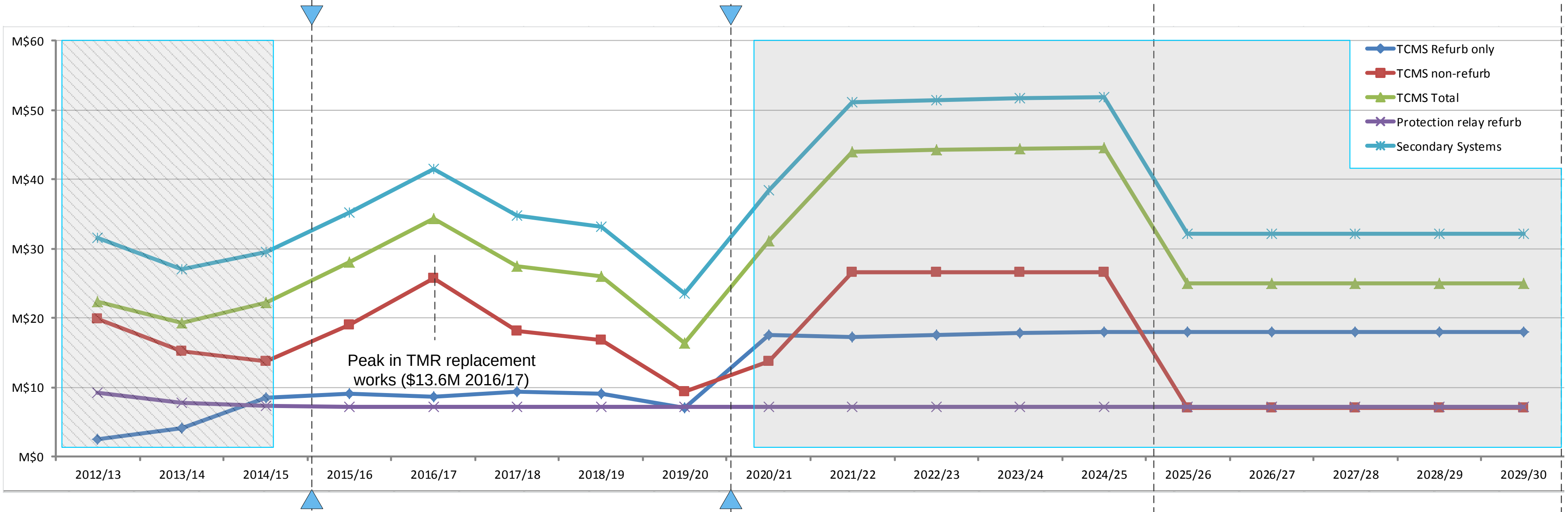
ROAD MAP – Secondary Systems Directs (Protection/SCADA& Automation/Telecommunications)

Safety:
Improvements with removal of at risk relays
Network Performance:
STIPIS risk minimisation - Deployment of Distribution System SCADA
Obsolete technology risk reduction
Foundations for next 20+ years for telecomms
Cyber security improved

Capital Expenditure deferral -
Substation protection schemes will withstand increased loading under N-1 outage condition (no Secondary Systems constraint).
Resource Demand reduced - Relay setting standardisation , less need for Protection Permits, simpler circuitry, lower dependency on internal development, faster project implementation.
Cyber security improved
Maintenance Cost reduced

Network Management improved - Capability to implement Smart Grid function
Longer term resource demands reduced - SCADA/ COMMS/Protection - Sustainable deployment, operation and maintenance costs.

TCMS= Telecommunications, SCADA and Automation works



Telecommunications Core Rebuild
DSS system development & deployment
Enabling DMS
Operational Data Centre environment rebuild
Critical obsolescence works (VGDL, Microcontrollers, SICM1 etc)
Smart Grid Trials
Critical Relay replacements
Protection Engineering tool-suite

Capitalising on existing assets & integration of Secondary Systems
Transition to new standards:
- Use protection relays in place of SICM
- More asset management data from comms enabled field devices
- Commercial RTU
- Migration to new telecom core

Continued Telecom infrastructure deployment
Strategic obsolete plant replacements
Preparation for IEC-61850 introduction

Adopt IEC-61850 Station Bus for substation secondary systems standard
- Massive organisational change impact
- Complete change to way primary & secondary circuitry design is performed
- Need to support existing and new processes & tools until existing systems migrated
- Assumes main project spend of ~$80M over 3 years + ongoing $17M/yr for remainder of systems works
- Timing subject to suitable product availability

Preparation for Processes Bus (IEC-61850)

IEC-61850 based communications for substation to DMS communication
Process Bus (IEC-61850) introduction
DMS Network model based wide-area automation
Ongoing deployment of IEC-61850 Station bus as sites are refurbished

7.2 **Transition Risks and Issues**

Considering the SCADA and Automation strategic programme overall, the main risks to delivery are:

- Disruptive technology impact
- Disruptive government policy change
- Increased exposure to key suppliers
- Further deferral of IEC 61850 adoption
- Conflicting resource demands
- Typical development project risks

Each of these is briefly discussed in the following sections.

7.2.1 Disruptive technology impact

Probability of occurrence assessment: Low

Impact on strategy assessment: Moderate impact on timing

While there is no clear threat on the horizon in terms of pending disruptive technology that may impact this strategy, widespread uptake of technologies such as electric vehicles, low cost battery storage, etc. could result in the need to re-allocate resources to respond to altered distribution network needs.

7.2.2 Increased exposure to key suppliers

Probability of occurrence assessment: High

Impact on strategy assessment: Low

Migration to a COTS RTU and increased integration of protection with SCADA increases the exposure of Energex's substation works delivery capability to the commercial health of suppliers. In particular, migration to a COTS RTU would involve a significant element of vendor lock-in.

7.2.3 Further deferral of IEC61850 adoption

Probability of occurrence assessment: High

Impact on strategy assessment: Moderate impact on timing

Many of the benefits of IEC 61850 are contingent on (a) the availability of toolsets which can support the use of IEC 61850 in the context of Energex's design and deployment processes, and can integrate with Energex's other enterprise systems; (b) the successful application of IEC 61850 information modelling principles to communications between substations and the DMS; and (c) the appearance in the marketplace of suitably priced products targeting the electricity distribution sector. At present the tools (a) are still early in their evolution; the IEC

61850-based protocol (b) for substation to DMS communications is still being developed; and vendors are still settling on (c) competitive feature sets and prices for their products. Given the observed progress of IEC 61850 in the marketplace, the probability of further delay is considered high.

7.2.4 Conflicting resource demands

Probability of occurrence assessment: High

Impact on strategy assessment: High

Unplanned events such as key suppliers going into liquidation, product end-of-life announcements, internal department restructuring/downsizing and the need for support from other areas of the business to resolve high priority concerns currently have direct impacts on availability of staff to work on strategic projects. With reduced staff levels and significant disruptive events likely, risk to delay of strategic works is considered to be high.

7.2.5 Typical development project risks

Probability of occurrence assessment: High

Impact on strategy assessment: Low-Moderate

Since much of the work involves substantial change to established process, tools and techniques as well as significant technology integration works, it carries with it the project risks typical of development projects.

8 Governance and Review

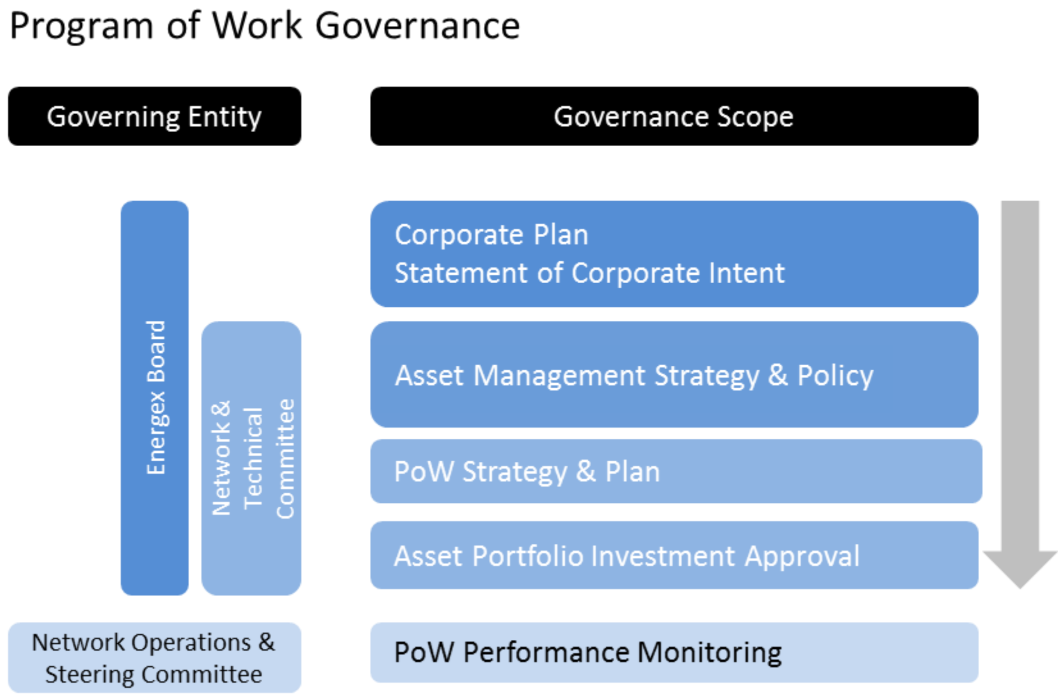
This chapter sets out the governance arrangements that will apply to SCADA and Automation.

8.1 Ownership

This strategy is owned by Group Manager Engineering Standards and Technology within the Asset Management Division.

8.2 Governance

Energex Program of Work Governance ensures strategy & policy development and resulting portfolio investment approvals align to achieve the strategic objectives of the business. Monitoring and review of the program of work performance against annual targets and performance standards is undertaken by the Network Operations & Steering Committee.



8.2.1 Performance Monitoring and Reporting

Monitoring of performance achieved compared to the approved program investment is to be presented on a quarterly basis to the Network Operations and Steering Committee or earlier if as requested.

Reporting about this strategy/program is facilitated through the following form/methods:

- SCADA and Automation Strategy Progress Report

Reporting occurs at quarterly intervals and is produced by Engineering Standards and Technology Group.

8.3 Review

This Strategy is to be reviewed annually as part of Energex's annual business planning process. Review details can be referenced in the Version Control section at the start of this document.

8.4 Publication

The current version of this Strategy is available on the Energex Intranet. All other electronic and printed versions of this document are to be deemed as non-current and uncontrolled unless specifically authorised by the owning Group Manager.

9 Glossary

Term	Definition
AER	Australian Energy Regulator
APRS	Advanced Power Restoration System DMS-hosted application for distribution automation
Automation	Autonomous control of power system functions, closely associated with (typically embedded in) the SCADA system and/or the DMS
CIM	Common Information Model The UCAIug CIM is a standard information model for power systems and related secondary systems and computer applications
COTS	Commercial-Off-The-Shelf A product that is designed to meet the requirements of a market segment, not an individual customer, is manufactured to a common specification and is sold/purchased "as-is" off the shelf
COS	Customer Outcome Standard – The power supply security standard adopted in place of the previous more conservative "N-1" based standard (Schedule 3 of the Energex Distribution Authority No. D07/98, amended 30th June 2014).
CT	Current Transformer A type of instrument transformer.
DAPR	Distribution Asset Planning Report
DER	Distributed Energy Resources
DM	Demand Management
DMS	Distribution Management System
DNP3	Distributed Network Protocol version 3 Industry standard SCADA data communication protocol used by SACS, SICM2B and many other products. Has been adopted as a key "smart grid interoperability" protocol by NIST through its codification as IEEE standard 1815
DSS	Distribution System SCADA SCADA for the power system outside bulk supply and zone substations, especially the 11kV primary distribution network
GPS	Global Positioning System Global system for precise determination of position and time.
HMI	Human-Machine Interface Operator console.

Term	Definition
IEC 61850	A suite of international standards published by the International Electrotechnical Commission (http://www.iec.ch/) for secondary systems which has the potential to improve capability and reduce labour costs
IEC 61850 Process Bus	Means the use of data (not electrical signals) to convey primary system measurements. Highly challenging transition from existing systems
IEC 61850 Station Bus	Means the use of data (not electrical signals) to convey control and automation quantities. Moderately challenging transition from existing systems
IED	Intelligent Electronic Device A multi-function electronic device suitable for integration into a wider system via one or more communication ports. An IED can serve any or all of the following needs – protection; automation; SCADA; condition monitoring; event recording; oscillography; HMI
IP-MPLS	Internet Protocol/Multi-Protocol Label Switching Technologies for high performance data networking
ISCS	Interim Secondary Control System An adjunct to Energex's DMS, which provides ancillary control and support services
IT	Information Technologies
Matrix	The project under which Energex is rolling out its IP-MPLS-based data network
MDC	Master Data Concentrator A high-level node in Energex's SCADA data communication hierarchy.
NPV	Net Present Value
NTC	Network Technical Committee
OPS-WAN	OPerationS Wide Area Network A pastiche of legacy technologies which currently provides data communication services to Energex's SCADA and Automation system.
OT	Operational Technologies
OTE	Operational Technology Environment A secure (logical) zone within Energex's IP-MPLS network containing (amongst other key systems) SCADA and Automation support (monitoring and management) subsystems.
Oscillography	The capture and display of pre- and post- fault voltage and current waveforms
PC-SACS	The current incarnation of SACS. PC-SACS versions 2 and 3 are obsolescent; PC-SACS version 5 is current (there was no version 4).

Term	Definition
Platform	Loosely, the infrastructure supporting an IT-based system, e.g. the hardware is a platform for the operating system; the hardware and operating system together form a platform for applications.
POPS	Plant Overload Protection Software SACS-based substation automation software
PoW	Program of Work
QNX	The real-time software operating system used by SACS (a commercial product)
RDC	Remote Data Concentrator A mid-level node in Energex's SCADA data communication hierarchy.
RDCCOM	RDC COMmunications protocol Proprietary SCADA data communication protocol used by SACS units, RDCs and MDCs
RTU	Remote Terminal Unit Historically, a (dumb) remote endpoint of a SCADA system. More recently, a (smart) remote platform for SCADA and Automation functions
SAS	Substation Automation System Loosely, a system comprising an RTU, IEDs and support (monitoring and management) subsystems. An SAS can serve any or all of the following needs – protection; automation; SCADA; condition monitoring; event recording; oscillography; HMI
SCADA	Supervisory Control and Data Acquisition Remote eyes and hands for power system operators.
SCADABase	A proprietary tool used to design and build configuration data for Energex's SCADA and Automation systems. The decision to develop SCADABase was taken after a market scan failed to find any suitable COTS offering
SCADA HMI	The HMI component of SACS
SICM2B	Serial Interface Control Module, model 2B An Energex proprietary IED used for interfacing with substation plant
SNMP	Simple Network Management Protocol Standard protocol widely used in mainstream IT systems for remote monitoring of platforms and infrastructure
UCAIug	The UCA International Users Group The UCAIug is a not-for-profit corporation consisting of utility user and supplier companies that is dedicated to promoting the integration and interoperability of electric/gas/water utility systems
UtiliNet	Wireless data communications network used by Energex for DSS

Term	Definition
VT	Voltage Transformer A type of instrument transformer.
VVR	Volt-Var Regulation A SACS-based substation automation application

Appendix A – Explanatory notes

Energex SCADA and Automation obsolescent technology challenge

Energex's in-house technology has been successful in (a) minimising the capital costs of augmentation; (b) minimising the operating costs of maintaining the deployed fleet and (c) introducing new capability by building on the already deployed equipment.

The challenge this has created however is a "long tail" of installations dependent on older platforms. This means that instead of supporting a single core platform, multiple generations need to be supported. This presents a range of challenges for Energex both in maintaining the fleet and implementing changes to capability.

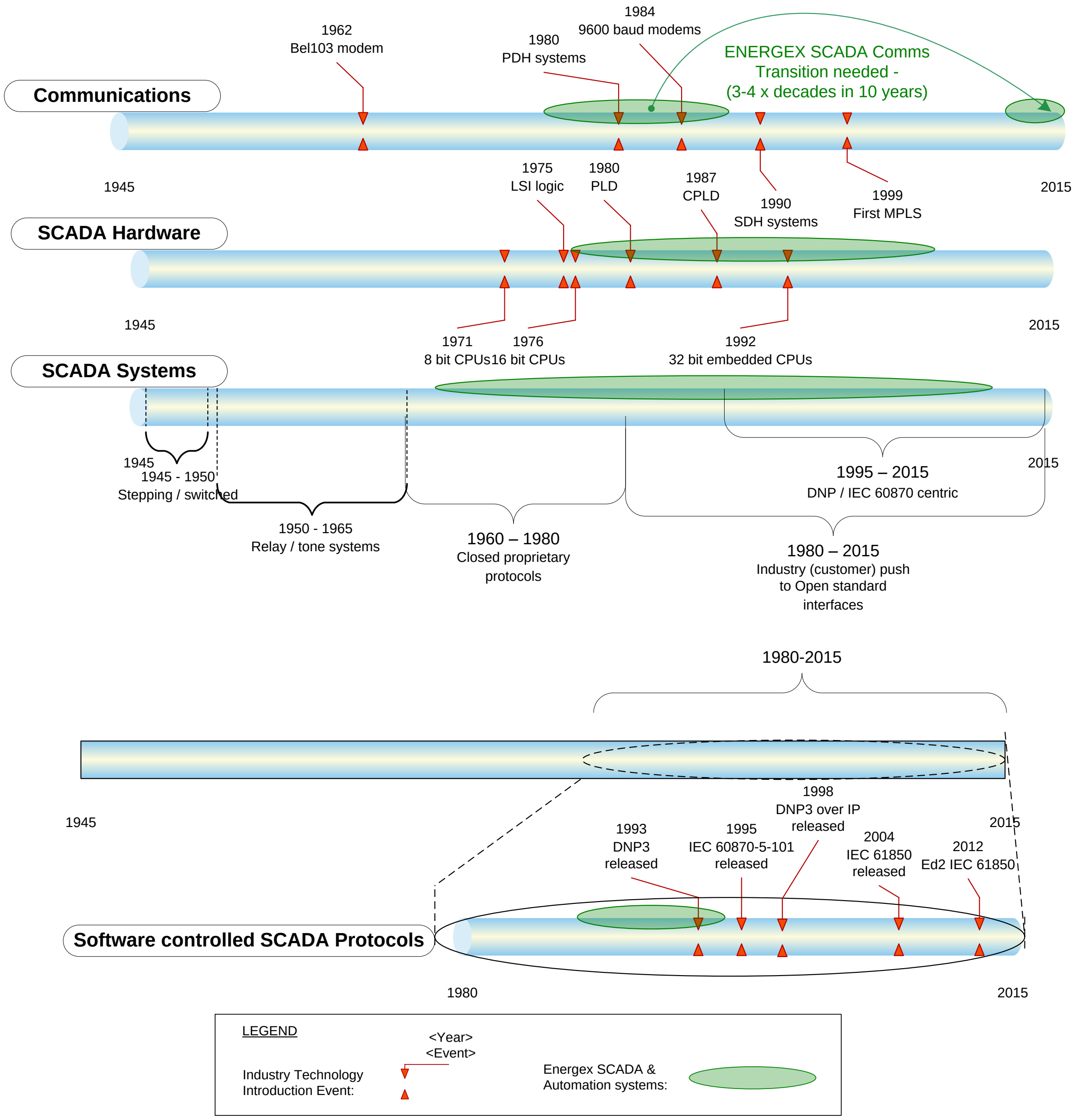


Figure 9.1 – Energex SCADA and Automation System Technology Spread

IEC 61850 and the UCAIug Common Information Model

SCADA development has been historically heavily influenced by the comparative paucity of the available data communications capacity.

To achieve its core purpose (trusted remote control and monitoring), the protocols used have minimised the amount of data sent between locations.

With the transition to higher capacity telecommunications, additional data can be transferred to achieve outcomes that were previously impractical or too expensive.

IEC 61850 and UCAIug Common Information Model (CIM) jointly present an opportunity to take advantage of the telecommunications improvements, e.g. for secondary systems items to become self-describing, making it easier to integrate changes and thereby improving alignment with the Network Vision, Network Technology Strategy and direction of the industry.

IEC 61850 has four core communication mechanisms of interest to Energex for our distribution substations:

- Sampled values signalling (IEC 61850-9-2 -- process bus)
- Protection signalling (Generic Object Oriented Substation Events / Station Bus)
- SCADA signalling within substation (IEC 61850-8-1 -- MMS)
- SCADA substations to DMS (IEC 61850-90-2)

The introduction of IEC 61850 has been slower than expected with a large number of evolutionary changes between the initial version and the current “Edition 2” standard. Even with the Edition 2 standard there are still interoperability challenges between different vendors’ products toolsets.

The aligned protocol standard for the SCADA signalling mechanism between substations and DMS (IEC 61850-90-2) has been under development for some time but is not yet released.

If Energex deploys the SCADA signalling mechanism of IEC 61850 within substations prior to the availability of the matching protocol to communicate between the substations and the DMS, it will introduce a significant additional configuration task into the SCADA design process for each site, to map between the SCADA signalling protocol of IEC 61850 and the SCADA signalling protocol used between the substation and the DMS.

While the benefits of IEC 61850 are considered worth pursuing in the long term, given the current state of the available standards and products, as well as the likely needs of the customers in the short term, transition to IEC 61850 centric building blocks for Substation SCADA signalling in the 2015-2020 period is not currently considered prudent for Energex. This is not to say that the protection signalling or sampled values signalling aspects of the technology (which have been the main focus of the IEC 61850 efforts) need to be delayed, since they can be introduced separately from the SCADA signalling elements provided the devices also adequately support the DNP3 protocol.

For a deeper understanding of this discussion, the following additional references are recommended:

I. IEEE P1815.1 Draft Standard for Exchanging Information Between Networks Implementing IEC 61850 and IEEE Std 1815 (Distributed Network Protocol - DNP3) and the explanatory EPRI presentation “An Introduction to IEEE P1815.1 – Mapping IEEE 1815 (DNP3) to IEC 61850”: (http://www.smartgrid.epri.com/doc/sg_info_call_pres.pdf)
II. ENSTO-E open letter regarding IEC61850 concerns (http://tinyurl.com/ENSTO-E-Statement)
III. IEC 61850, IEC 61968, IEC 61970, IEC 62357 standards and the IEC TC57 working group’s reference architecture for application of these standards.

Attachment 1 – Project Benefits & Relative Size Summary

SCADA and Automation Strategy – Project benefits and size

Legend:

Scope A measure of business impact and the need for alignment with corporate policy and strategy		Scale A measure of the extent and nature of primary and/or secondary systems impacted	
5	Enterprise	5	Large
4	…	4	…
3	…	3	…
2	…	2	…
1	Department	1	Small

Note: Size = Scope x Scale is an indication of complexity and management effort (and to some extent cost), but not of precedence or ownership:

- Some relatively small initiatives are enablers for much larger initiatives. Precedence relationships are indicated in the high-level schedule
- The largest initiatives are imported from the Corporate IT strategy in order to emphasise the need for them at this level

An example of a recent 4 (scope) x 5 (scale) = 20 (size) project is the DMS upgrade from GenE to PowerOn Fusion, at a cost of approximately $70m.

Initiative	Benefits (How)	Scope	Scale	Size
Enterprise integration	Productivity and data quality (Supports corporate data architecture and manages inter-application work flows – preferred foundation for enterprise scale systems)	5	5	25
Secondary systems design integration	Productivity and data quality (Accelerates the production of consistent design artefacts by integrating specialised design tools)	5	5	25
Secondary systems asset management systems	Productivity, data quality, and economic efficiency (Cradle-to-grave management of secondary system assets)	5	4	20
Network metrology improvements	Safety and risk management (Enables monitoring and control of power system with embedded generation)	4	4	16
Transition to IEC 61850 process bus	Productivity, economic efficiency and sustainability (Enables the provisioning and support of high-performance secondary systems via competitive sourcing)	4	4	16

Initiative	Benefits (How)	Scope	Scale	Size
Transition to IEC 61850 station bus (replacing DNP3 field bus)	Productivity, economic efficiency and sustainability (Enables the provisioning and support of high-performance secondary systems via competitive sourcing)	4	4	16
Integrate relays and other IEDs and rationalise functions (replacing SICM2B)	Productivity, economic efficiency and sustainability (Enables the provisioning and support of high-performance secondary systems via competitive sourcing)	3	4	12
POPS enhancements	Economic efficiency (Maximises asset utilisation - minimises risk of plant damage due to overload during contingency events)	4	3	12
Remote management of secondary systems	Productivity and risk management (Enables remote configuration management of thousands of field devices)	4	3	12
Remote monitoring of secondary systems	Productivity and risk management (Enables remote supervision of thousands of field devices)	4	3	12

Initiative	Benefits (How)	Scope	Scale	Size
Simulation and test environment	Productivity and risk management (Enables systematic evaluation, testing and investigation of secondary components and systems)	4	3	12
Transition from RDCCOM to DNP3	Economic efficiency (Eliminates non-standard requirements – enables the provisioning and support of secondary systems via competitive sourcing)	3	4	12
Transition to commercial substation platform (replacing SACS)	Productivity, economic efficiency and sustainability (Enables the provisioning and support of high-performance secondary systems via competitive sourcing)	3	4	12
Transition to IP-based wireless platform (replacing UtiliNet)	Functional adequacy, economic efficiency (Maximises asset utilisation - enables transition to high performance load restoration and load transfer systems)	4	3	12
VVR enhancements	Safety and risk management (Adds new measures for preventing overvoltages)	3	4	12

Initiative	Benefits (How)	Scope	Scale	Size
Upgrade systems to current standard	Productivity and risk management (Minimises diversity of equipment to be supported)	2	5	10
GPS time synchronisation	Risk management (Enables accurate time stamping of event records for technical and legal purposes)	3	3	9
Continuous improvement policy and budget	Risk management (Ensures that bugs, limitations, usability problems and new functional requirements are dealt with expeditiously)	3	3	9
Issue management process and toolset	Risk management and productivity (Enables systematic capture and evaluation of issues)	3	3	9
Migrate OT systems to OTE	Risk management and economic efficiency (Compliance with Matrix architecture optimises capacity, reliability, security and economic efficiency)	3	3	9
Migrate substations and field equipment to IP-MPLS network	Risk management and economic efficiency (Compliance with Matrix architecture optimises capacity, reliability, security and economic efficiency)	3	3	9

Initiative	Benefits (How)	Scope	Scale	Size
Product-specific software builds	Productivity (Minimises development and deployment delays due to product interdependencies)	3	3	9
Remote access to event and oscillographic data	Productivity (Enables collection of event and oscillographic data without site visits – promotes systematic and complete auditing and investigation of power system incidents)	3	3	9
Remote live line sequence selection	Risk management (Sets a new benchmark for ALARP risk management of live line operations)	3	3	9
Remote setting group selection	Risk management (Maximises protective coverage of power system)	3	3	9
Improvements, e.g. SCADABase, VVR, DSS gateway architecture	Functional adequacy, risk management (Bugs, limitations, usability problems and new functional requirements are dealt with expeditiously)	3	3	9
PC-SACS CPU refresh	Risk management – business continuity (Ensures ongoing availability of a key component)	2	4	8

Initiative	Benefits (How)	Scope	Scale	Size
PC-SACS operating system refresh	Risk management – business continuity (Ensures ongoing availability of a key component)	2	4	8
SICM2B refresh	Risk management – business continuity (Ensures ongoing availability of a key component)	2	4	8
Field-modifiable analogue scale factors	Productivity and risk management (Enables maintenance of correct analogue scaling pursuant to CT ratio changes without a retrospective SACS build and test)	2	4	8