Appendix 5E

SPI PowerNet Pty Ltd

Transmission Revenue Reset (TRR) 2014/15 – 2016/17

Proposed Opex Step Changes 2014-17

28 February 2013

SP AusNet
A member of Singapore Power Group

ISSUE/AMENDMENT STATUS

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Table of Contents

1 Introduction and Overview

This paper provides information about the proposed step changes in operating expenditure presented in the Revenue Proposal for 2014/15 to 2016/17.

Incremental operating expenditure above that incurred in the 2011/12 base year required to achieve the operating objectives during the forthcoming regulatory control period and meet the requirements of the Submission Guidelines consists of a number of 'step changes'.

The step changes have been divided into the following categories, based on their drivers:

- Ageing asset profile;
- Changed compliance obligations;
- Regulatory changes and Government policy initiatives;
- Recurrent operating expenditure not reflected in base year;
- IT capital works; and
- Enhanced efficiency through technology improvements.

The majority of the proposed step changes represent additional recurrent expenditure, while one is non-recurrent[1]. Annual opex required for the proposed step changes is provided in the table below.

Table 1.1: Summary of Opex Step Changes ($m, real 2013-14)

Category	Project	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total ($m)
Ageing asset profile	Overhead Lines Condition Assessment Program*	1.28	1.33	1.34	**3.94**
	Corrosion Risk Mitigation	3.17	3.17	3.17	**9.50**
Changed compliance obligations	AEMO Outage Planning Requirements*	0.20	0.20	0.20	**0.61**
	Security of Critical Infrastructure (Terminal Stations)	1.60	1.60	1.60	**4.79**
Regulatory changes and Government policy initiatives	Impact of a Carbon Price on SF6 Top Ups	0.82	0.82	0.82	**2.45**
	Transitional Arrangements for the Economic Regulation of NSPs Rule Change	0	1.39	1.39	**2.78**
Recurrent operating expenditure not reflected in base year	Communications Infrastructure	0.85	0.85	0.85	**2.55**
ICT capital works	Enable Market Reporting and Operations	0.15	0.15	0.15	**0.46**

[1] Only the 'Transitional Arrangements for the Economic Regulation of NSPs Rule Change' step change for is non-recurrent

	IT Network Security	0.27	0.27	0.27	**0.81**
	Controller Training Simulator	0.31	0.31	0.31	**0.92**
	SCADA Security	0.20	0.20	0.20	**0.61**
Enhanced efficiency through technology improvements	Innovation Program	0.41	0.66	0.66	**1.74**
	Total	**9.26**	**10.95**	**10.96**	**31.17**

Notes:

- * Expenditure will be incurred for the Overhead Lines Condition Assessment Program and the AEMO Outage Planning Requirements step changes in the 2013-14 regulatory year. As the base year for the operating expenditure proposal is 2011-12, this is incremental to the base year expenditure, and so is also classified as a step change for the purposes of this submission.
- The costs provided here do not include the impact of escalators that have been applied to these step changes in the overall opex forecast.
- Throughout this document numbers in tables may not add due to rounding.

1.1 Rule and Guideline Requirements

Under NER 6A.6.6, TNSPs are required to submit the total forecast operating expenditure that is required to achieve each of the following (the operating expenditure objectives):

(1) Meet or manage the expected demand for prescribed transmission services over that period;

(2) Comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services;

(3) Maintain the quality, reliability and security of supply of prescribed transmission services; and

(4) Maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

In addition, the Submission Guidelines require that:

> *'the operating expenditure forecast must include any necessary adjustments for changes in responsibilities that result from compliance with a new or amended law or licence, or other statutory or regulatory requirement, including a requirement that can be demonstrated to arise directly from a recognised policy, practice or policy generally applicable to similar firms participating in the National Electricity Market'.*

The categories of step change satisfy the NER and STPIS Guidelines for the reasons outlined in Table 1.2 below.

Table 1.2: Justification for Opex Step Changes

Category	Relevant NER Clause	Justification
Ageing asset profile	NER 6A.6.6(a)(4) sets out the following operating expenditure objective: 'Maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services'.	The transmission system is comprised of many transmission assets, and the reliability, safety and security of the transmission system depends on the condition of these assets. The age profile of SP AusNet's assets will require changes to operational practices to maintain asset condition and a constant level of reliability, safety and security of the transmission system.
Changed compliance obligations	NER 6A.6.6(a)(2) sets out the following operating expenditure objective: 'Comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services'. In addition, the Submission Guidelines require that *'the operating expenditure forecast must include any necessary adjustments for changes in responsibilities that result from compliance with a new or amended law or licence, or other statutory or regulatory requirement, including a requirement that can be demonstrated to arise directly from a recognised policy, practice or policy generally applicable to similar firms participating in the National Electricity Market'.*	This category of step changes relates to expenditure that SP AusNet must incur to comply with additional operational requirements or practices applicable to similar firms participating in the NEM, as required by NER 6A.6.6(a)(2) and the Submission Guidelines. This expenditure is not included in base year opex.
Regulatory changes and Government policy initiatives	NER 6A.6.6(a)(2) sets out the following operating expenditure objective: 'Comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services'. In addition, the Submission Guidelines require that *'the operating expenditure forecast must include any necessary adjustments for changes in responsibilities that result from compliance with a new or amended law or licence, or other statutory or regulatory requirement, including a requirement that can be demonstrated to arise directly from a recognised policy, practice or policy generally applicable to similar firms participating in the National Electricity Market'.*	Step changes are proposed under this category to meet NER 6A.6.6(a)(2) and comply with the Submission Guidelines as follows: • Introduction of a carbon price – a legislative requirement SP AusNet must comply with; • Transitional arrangements on the Economic Regulation of Network Service Providers Rule Change – a regulatory requirement SP AusNet must comply with; and • Pending policy decision on the Transmission Frameworks Review – this may result in SP AusNet assuming responsibility for planning the Victorian transmission system, which would constitute a change in responsibilities under a new statutory requirement.
Recurrent operating expenditure not reflected in base year	Operating expenditure objectives – expenditure satisfies these. Particularly (which): '(2) comply with all applicable regulatory obligations or requirements associated with the provision of	This step change would not change the aggregate level of operating expenditure, but re-classifies efficient on-going expenditure as base year opex, consistent with its

	prescribed transmission services' and to '(4) maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.'	recurrent nature. This expenditure contributes to achieving the opex objectives as it is driven by compliance with external health and safety obligations.
IT capital works	NER 6A.6.6(a)(3) and (4) state the following opex objectives: '(3) Maintain the quality, reliability and security of supply of prescribed transmission services; and (4) Maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.'	This category of step change covers opex to support the implementation of the IT capital works program. This program contributes to the achievement of the opex objectives through ensuring the security and quality of transmission services (see Appendix 4E – IT Strategy).
Enhanced efficiency through technology improvements	The National Electricity Objective, as set out in the National Electricity Law, is 'to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to – 1. price, quality, safety, reliability, and security of supply of electricity; and 2. the reliability, safety and security of the national electricity system.'	The National Electricity Objective requires the AER to 'promote efficient investment in' the electricity system. Investment should be undertaken where the benefits to society of the investment outweigh the costs. Investment in the proposed innovation program is efficient as the long-term benefits to society in the form of the lower-cost provision of transmission services are expected to outweigh the initial cost. The focus on both long term interests and price is codified in the NEO.

Further details on each proposed step change including the driver, description and costs are presented below.

2 Ageing Asset Profile

2.1 Introduction

NER 6A.6.6(a)(3) sets out an opex objective to 'maintain the quality, reliability and security of supply of prescribed transmission services'. Due to its ageing asset profile, alterations to condition monitoring and maintenance practices are required to achieve this objective. It is infeasible to expect the reliability and security of transmission services will be maintained through employing the same condition monitoring and maintenance practices as during the current period given the deterioration in asset condition as a result of age.

The following opex step changes driven by SP AusNet's ageing asset profile have been identified:

- Overhead lines condition assessment program; and
- Corrosion risk management

2.2 Overhead Line Condition Assessment Program

2.2.1 Driver

Prudent asset management of aged transmission line assets in Victoria is becoming increasingly dependent on the quality of condition information available. Accurate condition data supports the

development of practical and economical risk-based asset management plans. SP AusNet manages an ageing transmission network; the earliest transmission lines were constructed 59 years ago in 1954. The older assets have an increasing probability of failure due to poor condition.

Enhanced condition monitoring of transmission lines and associated data collection improve the objectivity of formal safety assessments required as part of the ESV accepted Electricity Safety Management Scheme (ESMS) under both the Electricity Safety and the Occupational Health and Safety Acts. SP AusNet's ESMS has been submitted as a supporting document to the Revenue Proposal.

These technologies are more effective in fault finding, and therefore provide more efficient condition monitoring and subsequently enable more economic asset renewal programs. This will significantly reduce the likelihood of functional failures of deteriorating transmission line assets, and help ensure that existing levels of network reliability and safety are maintained into the future, counteracting rising risks associated with ageing transmission line assets.

2.2.2 Description

Embed the following four new condition monitoring activities into the existing transmission line maintenance program:

- Smart Aerial Image Processing (SAIP) – this includes image capture using high resolution camera technology mounted in a helicopter and image processing to identify spans which register non-conformances consistent with defects and potential imminent asset failure. SAIP will be employed to inspect conductor and ground wire spans on a two year cycle.
- Overhead Line Corrosion Detector (OHLCD) inspection and conductor sampling – used to assess the condition of the steel core on Aluminium Conductor Steel Reinforced (ACSR). SP AusNet intends on collecting test samples from spans assessed using the OHLCD unit, and inspecting these samples strand by strand to validate OHLCD results obtained.
- Intrusive inspection of structure foundations – eleven transmission line structure foundations will be intrusively inspected in the forthcoming regulatory control period. This involves digging in the proximity of foundations at targeted structures so that foundation condition can be assessed. Findings will inform asset managers on requirements relating to reinforcement or foundation replacement works. This is essential to reducing uncertainty surrounding these foundation conditions reducing the likelihood of foundation failures.
- Conductor joint testing and replacement – this will measure the resistance of mid-span joints from a helicopter to assess condition. Those identified as having a high resistance consistent with deteriorating condition will be replaced to reduce the risk of failure and maintain circuit availability. Testing and replacing joints on ten different spans of conductors will be required in the next regulatory control period.

In addition, the following two maintenance activities will be bolstered:

- Bolted connection replacements – this targets connections exhibiting advanced corrosion as identified via infra-red inspections conducted during climbing inspections on transmission line and station rack structures every three years. SP AusNet forecasts and increase in the volume of replacements by 8% in the next regulatory control period, reflecting the age profile of transmission line assets.
- Corrosion quantity surveying – this involves tower climbing by a qualified assessor to identify and measure section losses on steel structural members due to corrosion. Quantity surveying is more precise than regular climbing inspections requiring the measurement of selected members, section loss measurements, detailed engineering

records of deterioration and at-risk member labelling. This survey work is essential for the development of member replacement programs, structure strength modelling, confirmation of remaining service potential for different condition phases, quantification of rates of deterioration and targeting of protective coating application. Corrosion quantity surveying will be performed on approximately 500 structures in the forthcoming regulatory control period.

2.2.3 Costs

A detailed cost breakdown is provided in Table 2.1.

Table 2.1: Overhead Line Condition Assessment Program ($m, real 2013-14)

Program	Y0 (13/14)	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Aerial Photography conductor inspection (SAIP)	0.41	0.46	0.46	0.46	**1.38**
Cormon inspection and conductor sampling	0.17	0.17	0.17	0.17	**0.51**
Intrusive inspection of structure footings	0.18	0.20	0.20	0.20	**0.61**
Conductor joint replacement & testing	0.14	0.14	0.14	0.14	**0.43**
Bolted connection repairs	0.02	0.02	0.02	0.02	**0.06**
Corrosion quantity surveying of structures	0.27	0.28	0.33	0.34	**0.95**
Total	**1.20**	**1.28**	**1.33**	**1.34**	**3.94**

2.3 Corrosion Risk Management

2.3.1 Driver

The corrosion risk management program is required to extend the life of seventeen structures on the radial ROTS-SVTS 220kV and SVTS-HTS 220kV lines which would be impractical and costly to replace. This is driven by the current condition of the structures on the lines, which suggests it is timely to undertake corrosion risk management activities in order to fully realise the benefits of these.

An options analysis has shown that corrosion management activities are more economic than replacing these structures as they reach the end of their economic lives. The results of the Present Value (PV) analysis for a single structure are presented in the table below.

Table 2.2: PV Options Analysis ($m, real 2012)

Option	PV
Tower Replacement	34.6
Corrosion Management	0.6

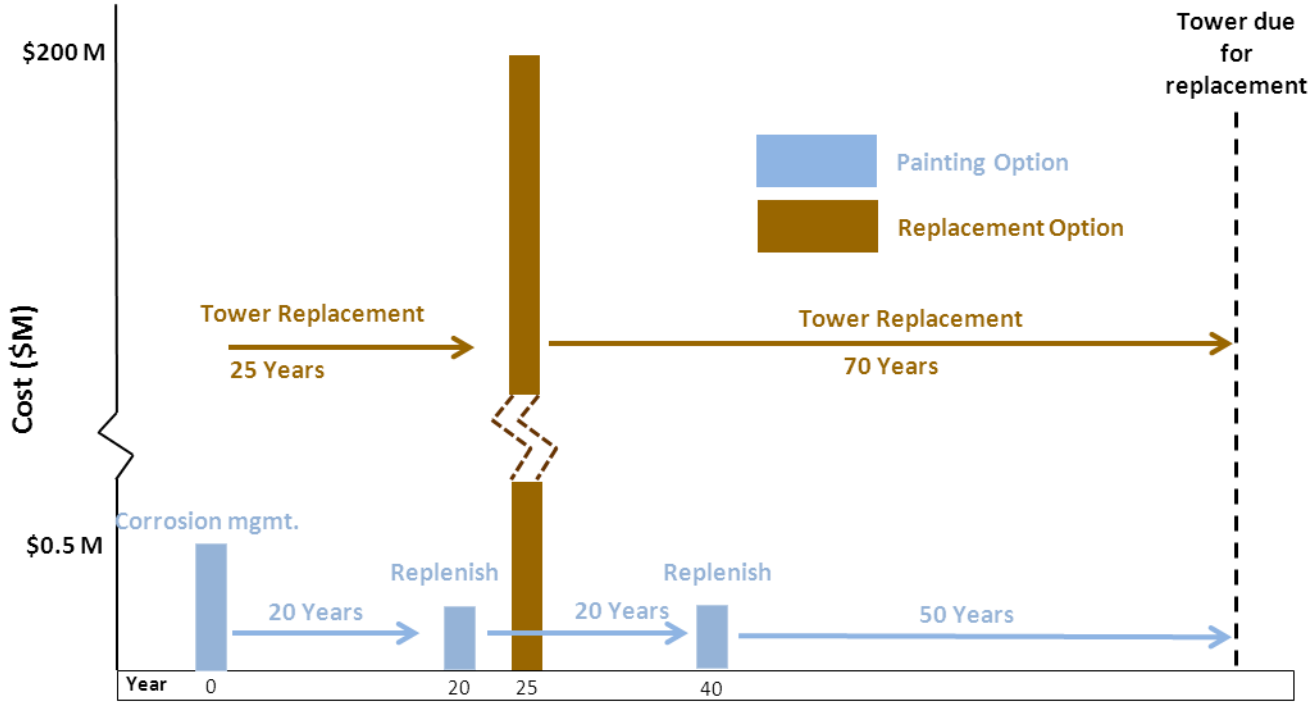
This shows that the corrosion management option is the most economic option. This result is driven by the extensive outages that would be required to replace the towers, and the resulting cost to consumers of unserved energy. Therefore, consumers will benefit from the corrosion management option rather than tower replacement.

2.3.2 Description

This step change involves corrosion management activities on seventeen structures in the forthcoming regulatory control period. Corrosion management activities allow replacements and all the costs associated with replacement to be deferred at a comparatively minor cost. In order for corrosion management activities to be effective they need to be carried out before the structure suffers from corrosion-related metal loss. The condition grades of the targeted structures on the ROTS-SVTS 220 kV and the SVTS-HTS 220 kV lines indicate that effective corrosion management can be achieved by undertaking corrosion management activities during the forthcoming regulatory period. Minor replenishment of protective coating is required every 20 years after the initial application. The figure below illustrates the timing and magnitude of expenditure under each option,

in a scenario where the structure is needed for the next 85 years. Based on current condition grades of structure identified SP AusNet forecasts that replacements will be required within 25 years.

Figure 2.1: Timing of Structure Replacement and Corrosion Management Options[2]



Two key criteria have been employed for selecting structures for corrosion management activities. These are the cost of replacement and the impact of replacement on network availability.

1. Cost of Replacement

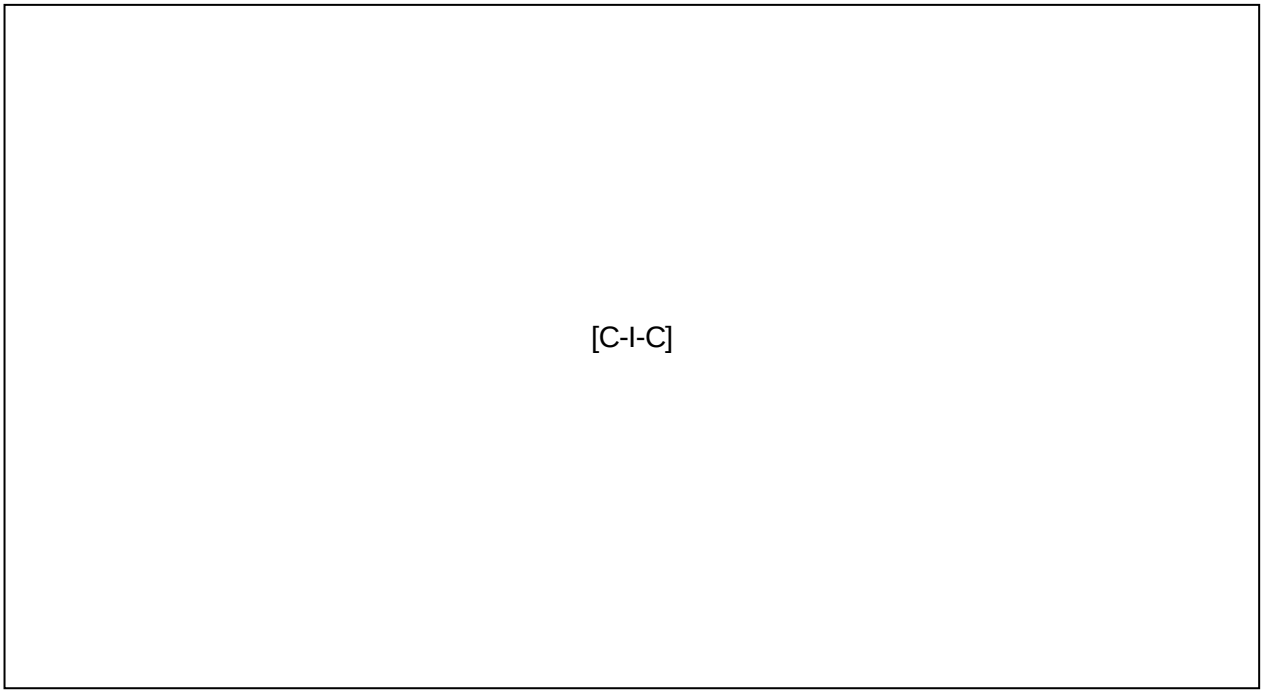
The cost of replacement is predominantly driven by the easement conditions upon which structures are located. Some easements on the Victorian transmission network are subject to significant space restrictions. This is especially true for easements which traverse densely populated areas of Melbourne where properties have been constructed on, or next to, the easements. Replacing structures on these easements pose project development issues as by-pass structures cannot be constructed. In most cases the alternative to building a temporary by-pass structure is to acquire new land upon which a new replacement structure can be build. This approach is largely impractical and would require the demolition of residential properties in a lot cases.

In rural and industrial settings, an easement can normally be acquired at a relatively low cost and work will have only a minor impact on the property owner. However, in residential or commercial settings, the cost will be significantly higher and the impact on the owner will be extreme. In these cases, land will typically need to be purchased.

Figure 2.2 illustrates space restrictions on the easement surrounded structure 18 on the ROTS-SVTS 220kV line. To allow sufficient space to replace the tower, one to two residential properties would need to be purchased. In other cases, the replacement structure would need to be located on commercial property or in the middle of a road.

[2] This cost includes the cost of disruption to customers.

Figure 2.2: Availability of Easements for Metro Structure Replacement



All seventeen structures for which corrosion management activities represent the most economic option available will require access to at least one residential property, commercial property or road way. In some cases, two properties will be required. Based on a median property price, in this area, of close to $442k, and taking multiple property purchases into account, the average cost for access to land is expected to be $519k per structure replacement[3].

2. Network Availability

SP AusNet manages approximately 3,400 structures which support these two circuits. In the absence of a temporary by-pass, both circuits must be de-energised in order to replace these structures. This presents significant issues for radial lines supplied by two circuits supported by double circuit structures. Replacement of these structures requires full outages on the downstream terminal station taking all the associated zone substations and customers off supply.

[3] Median price of property in Springvale. Retrieved from http://www.realestateview.com.au/propertydata/median-prices/victoria/springvale/ on 13 Feb 2013

Figure 2.3: Rowville-Springvale-Heatherton Radial Line

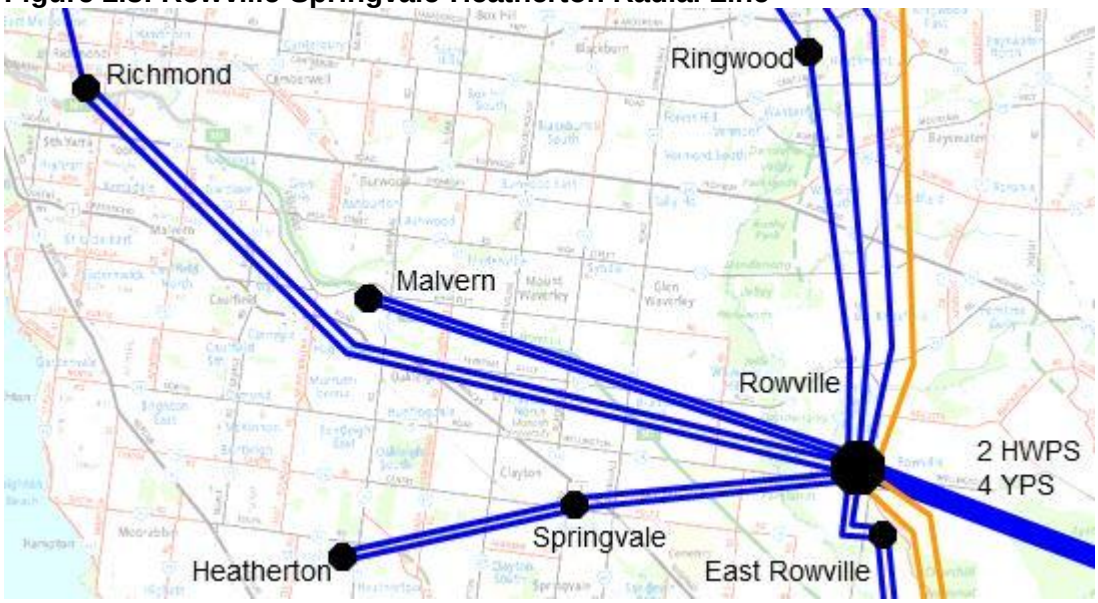


Table 2.3 below shows which terminal stations which would be affected by replacing the seventeen structures and an estimate of the total amount of unserved energy which would result. On average each structure replacement would result in 2,463 MWh of unserved energy. AEMO has estimated the cost of unserved energy to customers in Victoria at $57,290 per MWh[4]. Based on this, the average cost to customers resulting from outages caused by structure replacement would be around $206m per structure.

Table 2.3: Unserved Energy from Structure Replacement on Radial Lines

Line	Terminal Station	Structures	Energy at Risk (MWh)[5]	Outages (hr)	Unserved Energy (MWh)
ROTS-SVTS	SVTS	15,18,19, 21, 23, 24	73	549	40,080
SVTS-HTS	HTS	6, 7, 9, 11, 12, 13, 14, 16, 26, 27, 29	20	1007	20,130

The majority of the proposed corrosion management activities can be performed under live line conditions requiring no circuit outages. Short planned outages of single circuits are required when performing activities such as sand blasting and application of protective coating to cross arm tips where Safe Approach Distances (SAD) must be breached. These outages will have minimal impact on network availability as under normal operating conditions circuits operate well below rating meaning that the majority of demand load can be supplied via one circuit especially during off peak times.

2.3.3 Costs

The total forecast costs for the corrosion risk management step change are presented in the table below.

Table 2.4: Corrosion Risk Management ($m, real 2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Corrosion Management	3.17	3.17	3.17	9.50
Total	**3.17**	**3.17**	**3.17**	**9.50**

[4] AEMO's estimate of the Value of Customer Reliability (VCR) retrieved from http://www.aemo.com.au/Electricity/Policies-and-Procedures/Planning/National-Value-of-Customer-Reliability-VCR on 13 February 2013

[5] This is conservatively based on the 2021/22 forecast.

3 Changes in Compliance Obligations

3.1 Introduction

SP AusNet will be subject to several new requirements or obligations during the next regulatory period, which will not be captured in base year opex. NER 6A.6.6(a)(2) requires that forecast opex should achieve the opex objectives, including to 'comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services'.

The following proposed step changes relate to changed compliance obligations for next regulatory period compared to the current regulatory period:

- AEMO outage planning requirements
- Security of critical infrastructure (terminal stations)

These are discussed below.

3.2 AEMO Outage Planning Requirements

3.2.1 Driver

NER 11.30.2 requires that '*each month, each TNSP must provide to AEMO a list of network outages planned for the subsequent thirteen months that, in the reasonable opinion of the relevant TNSP, will have or are likely to have a material effect on transfer capabilities*'.

Currently SP AusNet provides outage information to AEMO via the Network Outage Schedule (NOS) three to four weeks before a project commences, and provides longer term outage data via ad-hoc spreadsheets. AEMO now requires the use of NOS as the primary form of providing outage information, which will require SP AusNet to optimise planned outages thirteen months in advance. The IT strategy submitted with this proposal includes establishing enhanced B2B functionality which integrates SP AusNet's asset management systems with NOS to enable outage information to be provided. However, with current outage planning resources SP AusNet will be unable to provide the required data or plan outages to meet these requirements.

Specific incompatibilities are:

- The current outage and work plan is very reactive and does not optimise any further than 6 months ahead.
- The notification time for capital outages is very short and not integrated into our capital plan.

Attached is a briefing note for an agenda item from a National Electricity Market Operations Committee (NEMOC) meeting held on 31 May 2012. This outlines the requirement for TNSPs to move to NOS (Attachment 1). An extract is provided below:

> *'Considering the increasing focus on published network outage information, and the benefits that can be realised by moving to a more efficient way of providing planned outage information to the market, AEMO is seeking agreement with those TNSPs that do not currently have B2B systems to commit to a process for installing B2B that will:*
> - *facilitate the provision of all planned network outage information through the NOS; and*
> - *allow a more efficient and accurate method for providing rating information.'*

3.2.2 Description

An additional outage planner is required to undertake long-term outage planning and coordination, to meet the AEMO's requirement to use the Network Outage Schedule (NOS) system to plan outages thirteen months in advance.

3.2.3 Costs

The cost is provided in Table 3.1. This expenditure commences from 2013-14. Although the link won't be delivered until 2014-15, the additional outage planner is required beforehand to optimise the outage program for the forthcoming 13 months, to enable the program to be entered into NOS once the link is established.

Table 3.1: AEMO Outage Planning Requirements ($m, real 2013-14)

Item	Y0 (13/14)	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour (1 FTE)	0.20	0.20	0.20	0.20	**0.82**
Total	**0.20**	**0.20**	**0.20**	**0.20**	**0.82**

3.3 Security of Critical Infrastructure (Terminal Stations)

3.3.1 Driver

SP AusNet has sophisticated policies and procedures which provide clear instruction on the prevention of, response to and recovery from security events. However, recent internal assessment shows have identified that a step up in existing security systems applied to critical infrastructure is needed to meet required standards.

In particular, SP AusNet must comply with Part 6 of the Terrorism Community Protection Act (2003) which requires owners of essential services take appropriate steps to secure their assets against foreseeable risks. This legislation has been enacted to counteract the threat of terrorism or sabotage to critical infrastructure. SP AusNet has developed a long term plan to become compliant with this Act, which includes upgrading the existing security arrangements at key sites.

In addition, industry standards for security have been published to reduce the risk of injury to intruders, or asset damage caused by vandals, following unauthorised access.

To meet these standards, both capital and operating expenditure is required. Capital expenditure is required to improve fencing, replace access systems, additional lighting, and new and additional security cameras. The additional operating expenditure proposed here would enable SP AusNet to maximise the effectiveness of these security equipment upgrades.

The legislation, standards and advisory documents referred to are provided in Attachment 2.

3.3.2 Description

Assessment of SP AusNet's physical security of transmission stations has identified five operational improvements to the current program which are required to meet industry good practice. The following new actions are required in addition to those already undertaken by SP AusNet in accordance with its responsibilities:

1. Security patrols of Terminal Stations and high-priority comms sites. This includes responses to alarms.
2. Weekly perimeter inspections of all Terminal Stations to ensure fence has not been breached.
3. Monitoring of security systems by an external security monitoring company (security is currently monitored by the Customer and Energy Operations Team (CEOT)).

4. Annual security assessments at every transmission site and biannual security assessments of comms sites.
5. Internal responsibility to be taken for annual statutory counter terrorism exercise.

3.3.3 Costs

The costs associated with achieving this vast improvement in our security posture have been researched internally and externally. The nominated efficient costs will achieve our objectives of meeting, but not exceeding, industry comparable standards.

The costs provided are based on all services being provided by an external contractor. Therefore, they cover labour and associated costs but SP AusNet is not privy to the exact breakdown of costs for, for example, vehicles, equipment and fuel associated with mobile patrols. Costs are provided on a per minute basis accounting for all these embedded costs.

Table 3.2: Security of Critical Infrastructure (Terminal Stations) ($m, real 2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Mobile Security Patrols	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Terminal Stations Perimeter Inspections	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Remote Monitoring of Security Systems	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Security Risk Assessments	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Counter Terrorism Exercises	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	**1.60**	**1.60**	**1.60**	**4.79**

4 Regulatory Changes and Government Policy Initiatives

4.1 Introduction

For the 2014-16 regulatory period, SP AusNet has identified the following step changes that are driven by regulatory changes or Government policy decisions:

- Impact of the carbon pricing mechanism on the import levy charged on SF_6 top-ups
- Transitional arrangements for the economic regulation of NSPs rule change
- Potential transfer of planning responsibilities (placeholder only)

Due to these factors, incremental opex is required to achieve the opex objectives (NER 6A.6.6) during the forthcoming regulatory control period.

4.2 Impact of a Carbon Price on SF_6 Top Ups

4.2.1 Driver

SP AusNet must purchase sulphur hexafluoride (SF_6) to replace leakages in gas insulated switchgear (GIS) and circuit breaker applications. As a synthetic greenhouse gas, SF_6 imports have been subject to a levy worth $23 per tonne CO_2 e- since the introduction of the carbon price on 1 July 2012. When the carbon price is no longer fixed (from 1 July 2015), the benchmark average carbon price for the previous financial year will be used to calculate the import levy.

Prior to the introduction of the carbon price SP AusNet had enough SF_6 to meet requirements until 1 April 2014. Therefore, the cost impact of the carbon price is not captured in base year opex.

4.2.2 Description

This opex step change covers the increased cost of replacing SF_6 leakages from the existing network.

4.2.3 Costs

Costs are calculated using the most recent Treasury modelling[6] of the expected carbon price. The medium case scenario has been used which predicts a carbon price of around A$29/t CO_2-e[7].

Internal data on SF_6 leakages has also been used. Leakages of 27,246 tonnes CO_2-e were realised in 2009-10. While GIS and circuit breaker refurbishments in the asset works program aim to mitigate increased SF_6 leakages due to ageing assets, any net reduction in SF_6 leakages achieved by these programs is likely to be offset by GIS installations which will be undertaken. Therefore network-wide SF_6 leakages are expected to remain relatively flat throughout the period.

Table 4.1: Impact of a Carbon Price on SF6 Top Ups ($m, real 2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Increased price of SF_6	0.82	0.82	0.82	**2.45**
Total	**0.82**	**0.82**	**0.82**	**2.45**

4.3 Transitional Arrangements

4.3.1 Driver

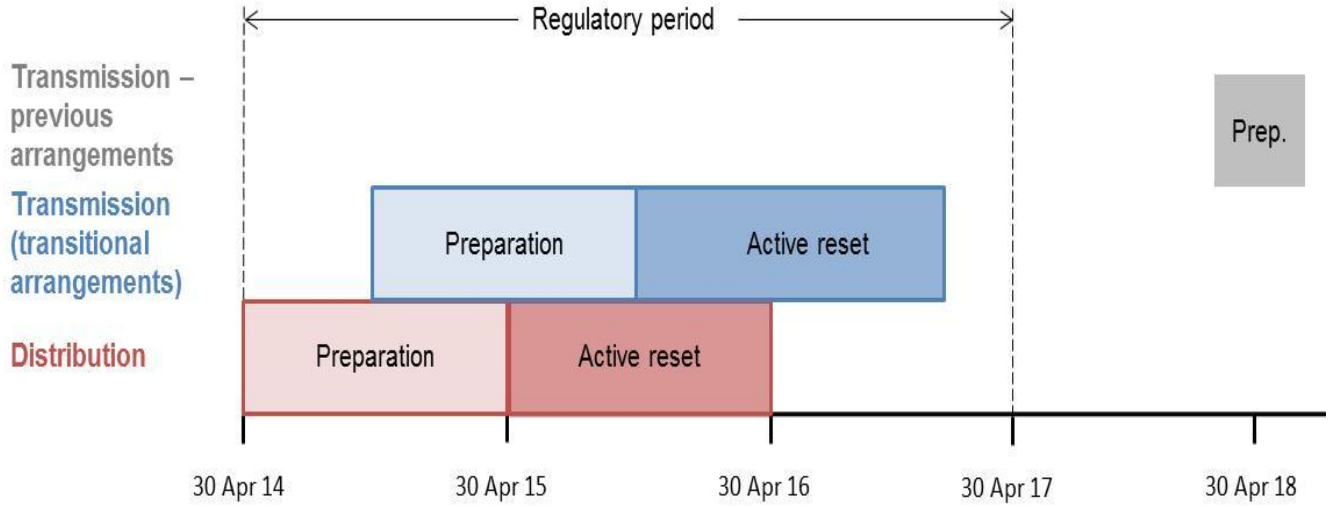
SP AusNet has realised efficiencies through staggering the timelines of price reviews across each of its three networks. Under the transitional arrangements associated with the Economic Regulation of Network Service Providers Rule Change (NER (v. 54) 11.59.3) SP AusNet is required to submit the next revenue proposals for electricity distribution in April 2015, and for electricity transmission in October 2015.

The preparation and active review periods for SP AusNet's transmission and distribution networks will substantially overlap. This will require an augmentation of regulatory and engineering resources as currently SP AusNet's resources only support these resets when they are staggered. The timelines for these resets are set out in the figure below.

[6] *Strong Growth, Low Pollution: Modelling a Carbon Price* – Update 21st Sept 2011

[7] Assumes a world with a 550 ppm stabilisation target and an Australian emission target of a 5 per cent cut on 2000 levels by 2020. Assumes a nominal domestic starting price of A$23/t CO2-e in 2012-13, rising 5 per cent per year, plus inflation, before moving to a flexible world price in 2015-16, projected to be around A$29/t CO2-e.

Figure 4.1: Timing of SP AusNet's Forthcoming Revenue Resets (Transmission and Distribution)



4.3.2 Description

As a result of this overlap, two additional regulatory staff and five additional electrical power planning engineers will be required to work full-time on the next transmission revenue reset. This step change is non-recurrent as SP AusNet intends to adopt a six year transmission regulatory period in the 2015 revenue reset which would remove the overlap.

If the one-off cost increase associated with the transitional arrangements is not recognised, this would effectively penalise SP AusNet's past efforts to realise efficiency gains through staggered resets.

Although preparation for the next Gas Access Arrangements Review (GAAR) will overlap with the active reset period for the transmission network, the planning engineer resources required will not overlap. Therefore, no step change is requested to manage the overlap with the GAAR.

4.3.3 Costs

The total costs of the additional resources required are presented below.

Table 4.2: Transitional Arrangements ($m, real 2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour (Regulation)	0	0.37	0.37	**0.74**
Labour (Engineering)	0	1.02	1.02	**2.04**
Total	**0**	**1.39**	**1.39**	**2.78**

4.4 Outcome of the AEMC's Transmission Framework Review

4.4.1 Driver

In April 2010 the AEMC were asked by the Ministerial Council of Energy (now the Standing Council on Energy and Resources (SCER)) to review the arrangements for the provision and utilisation of electricity transmission services in the NEM.

The AEMC published their second interim report on 15 August 2012 which recommended significant changes to the planning arrangements in Victoria, whereby the investment decision making functions move from AEMO to SP AusNet, consistent with planning responsibilities of other TNSPs across the NEM.

This would be subject to the agreement of SCER, once the AEMC's final report has been released. This is due by 31 March 2013.

This placeholder is included to account for the possibility that:

- The AEMC's Transmission Framework Review recommends changes to Victoria's transmission planning arrangements which have financial implications for SP AusNet; and
- These recommendations are accepted by the Standing Council of Energy and Resources (SCER).

We note that the Productivity Commission's draft 'Electricity Network Regulation' report, and the Senate Committee's 'Reducing Energy Bills and Improving Efficiency' Inquiry made different recommendations regarding transmission planning arrangements, but consider that there is sufficient uncertainty over which, if any, recommendations will be adopted to include this step change placeholder.

4.4.2 Description

Transferring responsibility for transmission planning from AEMO to SP AusNet would require funding for a team of planners, as well as funding for any augmentation capex projects that may be required. This will be offset by reductions in AEMO's operating expenditure of an equivalent value.

4.4.3 Costs

To be estimated in the event that transmission planning responsibilities are transferred to SP AusNet before the end of the current period.

5 Recurrent Opex Not Reflected in Base Year

5.1 Introduction

Currently some recurrent communications opex is classified as asset works, whereas due to its recurrent nature, it should be treated as base opex. This expenditure is required on an ongoing basis to achieve the opex objectives set out in NER 6A.6.6.

5.2 Communications Infrastructure

5.2.1 Driver

Operating expenditure on communications asset replacement programs are currently classified as asset works. This should be treated as base opex as it occurs on an annual basis as it is associated with essential hazard assessment and maintenance programs that are required to meet health and safety obligations. These include:

- Maintaining radiation hazard documentation for each site as required under the Occupational Health and Safety Act 2004;
- Complying with radiation hazard standards published by the Australian Radiation Protection and Nuclear Safety Agency[8] (ARPANSA) and referred to in SP AusNet's licences from the Australian Communications and Media Authority (ACMA); and

[8] "Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields — 3 kHz to 300 GHz(2002)" http://www.arpansa.gov.au/Publications/codes/rps3.cfm

- Meeting obligations set out in NER 4.2.6 which requires that 'To the extent practicable, the power system should be operated such that it is and will remain in a secure operating state'. The communications network and related documentation and databases are used for critical protection links, which are essential for power system security.

5.2.2 Description

This covers communication asset replacement programs in the control centre system, the operational telephone network and the digital network.

Specific programs include:

- Radiation hazard assessment and documentation – to reduce the risk of radio frequency exposure to staff and the public;
- Digital communications support contracts;
- Maintenance on optic cables – testing and maintenance of fibres enables life extension without increasing the risk of failure; and
- Operational telephony maintenance and support.

5.2.3 Costs

Table 5.1 presents the costs associated with this step change. These have been calculated based on average annual expenditure on these items over the years 2008-2012.

Table 5.1: Communications Infrastructure ($m, real 2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Radiation hazard assessment	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Digital comms support contracts	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Optic cables maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Operational telephony maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Operational telephone support contract	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Security equipment maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Database maintenance	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Other	[C-I-C]	[C-I-C]	[C-I-C]	[C-I-C]
Total	**0.85**	**0.85**	**0.85**	**2.55**

6 IT

6.1 Introduction

Several IT projects have been proposed as part of the capex forecast which will require additional opex to proceed. The drivers for these projects relate to network growth and increasing the efficiency of the IT systems, and therefore are consistent with the opex objectives set out in NER 6A.6.6.

When assessing these costs, SP AusNet has considered whether these are consistent with those that a prudent operator in identical circumstances would require to achieve the opex objectives, as required by NER 6A.6.6(c).

SP AusNet has identified the following opex step changes that are linked to IT capital works:

- Controller Simulator Training
- SCADA Security – Software QA/QC Environment

- IT Network Security
- Enabling Market Reporting and Operations

Further details about these IT capital works projects are contained in Appendix 4E – ICT strategy.

6.2 Controller Simulator Training

6.2.1 Driver

New and existing Network Controllers are currently trained using the live operational network under supervised controls. The deployment of a Controller Training Simulator will reduce the risks associated with this method of training, and improve the quality and effectiveness of training as different scenarios can be developed, tested and operated in a controlled training environment. This training method is consistent with the industry standard as other TNSPs use simulators as part of controller training programs.

Investment in a controller training simulator forms part of the IT capex proposal (SCADA Enhancements – Controller Training Simulator). This opex step change represents the additional opex required to support the effective operation of the simulator and supporting training program.

6.2.2 Description

This step change covers application support for the new training system and the provision of training resource to deliver this training method. The total resource required is an additional 1.5 FTE. This consists of 0.5 FTE to provide Information Technology Infrastructure Library (ITIL) compliant application support, and one FTE to develop, build and test scenarios and deliver training programs.

6.2.3 Costs

The total cost is provided in Table 6.1.

Table 6.1: Controller Training Simulator ($m, real $2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour (1.5 FTE)	0.31	0.31	0.31	**0.92**
Total	**0.31**	**0.31**	**0.31**	**0.92**

6.3 SCADA Security

6.3.1 Driver

Security reviews in 2009 and 2011 identified that the SCADA Energy Management System (EMS) is vulnerable to external attack due to insufficient software patching. Therefore a patching regime and review process is required to reduce the security threat.

Investment in enhancing the existing patching regime and review process forms part of the IT capex proposal (SCADA Security – Software Quality Assurance and Quality Control (QA/QC) Environment). This opex step change represents the additional expenditure required to provide necessary support to the SCADA EMS systems.

6.3.2 Description

This step change covers an additional 1 FTE to support the SCADA EMS systems. The additional FTE will:

- Review security patches based on Microsoft and SCADA Vendor advice
- Create patch bundles

- Deploy and test patches in the test environments
- Deploy and test patches to pre-production environments
- Manage the deployment of patches to production machines
- Regularly review firewall rules
- Regularly review logs

6.3.3 Costs

The total cost associated with this step change is provided in Table 6.2.

Table 6.2: SCADA Security ($'000, real $2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour (1 FTE)	0.20	0.20	0.20	**0.61**
Total	**0.20**	**0.20**	**0.20**	**0.61**

6.4 IT Infrastructure & Operations – IT Network Security

6.4.1 Driver

The IT capex proposal includes a program to ensure corporate and IT network security through implementing identity access management to comply with regulatory obligations and governance, risk and compliance (GRC) tools (referred to as IT Infrastructure and Operations – Security Infrastructure).

This program is critical to maintain the integrity of the transmission network, ensure data security and prevent confidentiality breaches.

6.4.2 Description

This step change is for 4 FTE to support the security systems on a 24x7 roster. The roles will include, but are not limited to, the following responsibilities:

- Security policy and procedure development and application
- Risk management programs
- Oversight of the security systems
- Incident and violation reporting
- Security auditing
- Contingency planning and documentation

6.4.3 Costs

The capex program will benefit all three of SP AusNet's networks. As such, only 30% of the increased opex costs have been allocated to the transmission function. These are recorded in the table below:

Table 6.3: IT Network Security ($m, real $2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour (4 FTE)	0.27	0.27	0.27	**0.81**
Total	**0.27**	**0.27**	**0.27**	**0.81**

6.5 Enable Market Reporting and Operations

6.5.1 Driver

The IT capex proposal contains a project to enhance B2B functionality for outage management that integrates SP AusNet's asset management systems with AEMO's Network Outage Schedule. This also includes a direct interface with AEMO's Electricity Wholesale Market Management System (MMS). These are required for the following reasons:

- **Connection with NOS** – to meet AEMO's requirements to provide planned outages through NOS at least thirteen months in advance (see Section 3.2 for more information).
- **Interface with MSS** – SP AusNet requires access to up-to-date, reliable market data to enable reporting against the Market Impact Component (MIC) of the AER's Service Target Performance Incentive Scheme (STPIS). Currently, SP AusNet reports against the MIC using data provided by consultants, however, the quality of this data is not assured, and SP AusNet is unable to verify the data at the source. Market data is available directly from AEMO's B2B Market Management System (MMS). This is a data model for participants operating in the wholesale electricity market. All other TNSP's currently have access to this data.

6.5.2 Description

While software licence costs are currently incurred through the consultancy fees and therefore are captured in base year opex, an additional 0.75 FTE will be needed to manage the implemented solution incorporating the MMS and NOS solutions. This person will be used to augment Outage Management planning and optimise reconciliation of all relevant data to ensure compliance to nominated schemes.

6.5.3 Costs

The forecast cost of this step change is provided in Table 6.4.

Table 6.4: Enable Market Reporting and Operations ($m, real $2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour (0.75 FTE)	0.15	0.15	0.15	**0.46**
Total	**0.15**	**0.15**	**0.15**	**0.46**

7 Enhanced Efficiency through Technological Improvements

7.1 Introduction

SP AusNet considers that the current level of expenditure on innovation in transmission limits its ability to realise efficiencies, as the breadth of emerging technologies that can be explored is too low. A step change in expenditure on the Innovation Program will yield greater gains, which is likely to lead to expenditure efficiencies in the longer-term. Any efficiency gains realised from the research and development will be passed back to customers through lower future operating or capital expenditure requirements.

The AER's Demand Management Incentive Scheme (DMIS) contains an innovation allowance to provide incentives for DNSPs to conduct research and investigation into innovative demand management techniques. However, TNSPs are not afforded the same provisions to undertake innovation that would improve the efficiency of their networks.

While the Efficiency Benefit Sharing Scheme (EBSS) provides incentives to invest in programs with the potential to yield efficiency gains, the scheme truncates returns due to its fixed carryover period. In addition, as returns from innovation are risky in nature. To compensate for this higher risk, higher potential returns are required to make this an attractive investment option. For this reason, truncated returns to investment in innovation can prevent efficient investment from going ahead, and therefore it is necessary to fund such programs through regulated revenue. These programs can create substantial long-run efficiencies, and, as such, investment in such programs is consistent with the National Electricity Objective (NEO) which promotes efficient investment for the *long-term* interests of electricity customers.

7.2 Technology Innovation

7.2.1 Driver

New technology has the potential to improve the efficiency of transmission service delivery. SP AusNet is proposing to trial a subset of these technologies that are considered most likely to lead to future capital and operating expenditure efficiencies.

SP AusNet's current innovation and research program has achieved important milestones including developing technologies which will help avoid catastrophic failures using advanced condition monitoring (CM), and inspection techniques. However the current program is limited to a few initiatives and requires an opex step change in order to take advantage of the introduction of the advanced technologies at an increasing pace.

7.2.2 Description

The proposed program includes:

- trials using existing leading edge technologies; and
- research and development (R&D) if a suitable solution does not exist.

Technologies proposed for further exploration include:

- **Wireless Sensor Network (WSN) system for substations** – reduce the risk of explosive failure
- **Line Fault Detection System** – increase the efficiency of line inspections
- **Polymer Insular Diagnostics** – enable efficient management of aging insulators
- **Nano Technology Development** – potential to increase the capacity of transformers.

These are each discussed further below.

The program will seek to leverage research funds from the Australian Research Council (ARC) or through cooperative research centres (CRCs), and involve Victorian educational and research institutions.

Any key technologies developed will be commercialised to ensure a cost effective supply of the new product or services for the benefit of all transmission network service providers (TNSPs).

7.2.3 Wireless Sensor Network (WSN) system for substations

Description: It is proposed to develop a Wireless Sensor Network (WSN) system for monitoring transmission substations. A WSN consists of a number of low-cost, easily deployable wireless sensor nodes that can detect process and transfer several physical quantities, including temperature, humidity, pressure, vibration, and pressure. These systems could result in significant efficiencies to be achieved through condition monitoring using remote sensing.

Cost: It is proposed to progress this work with a partner academic institution and through seeking Australian Research Council support. SP AusNet's expected costs are shown in Table 7.1.

Table 7.1: Wireless Sensor Network (WSN) – Costs ($m, real $2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour	0.15	0.15	0.15	**0.46**
Material	0.00	0.10	0.05	**0.15**
Total	**0.15**	**0.26**	**0.20**	**0.61**

7.2.4 Line Fault Detection System

Description: The proposed project covers the research and development of a new and accurate line fault detection system to perform the following functions:

1. Locate transient line faults with a resolution of 1-3 meters
2. Locate power arc faults with a resolution of 1-3 meters (after a flashover and before reclosing)
3. Time tag events to the nanosecond using GPS clocks
4. Identify the type of fault detected
5. Provide an optional tripping signal for power arc faults
6. Provide measurement of 50 Hz current and voltage
7. Provide Power Quality measurements
8. Provide oscillographic fault records
9. Provide a remote communication capability

***Cost*:** It is proposed to progress this work with a partner academic institution and through seeking Australian Research Council support. SP AusNet's expected costs are shown in Table 7.2.

Table 7.2: Line Fault Detection System – Costs ($m, real $2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour	0.10	0.10	0.10	**0.31**
Material	0.00	0.05	0.05	**0.10**
Total	**0.10**	**0.15**	**0.15**	**0.41**

7.2.5 Polymer Insular Diagnostics

Description: Polymer insulators used in SP AusNet's transmission lines and substations provide a safe working environment in the event of explosive failures and are lightweight. However, as these insulators reach the end of their lives, research is required to build a new monitoring system for polymer insulators. This will involve identifying and/or developing techniques which are most effective and efficient to determine the condition, integrity (especially for live line work) and remaining life of these insulators, which will enhance the efficiency of future replacement programs.

Cost: It is proposed to progress this work with a partner academic institution and through seeking Australian Research Council support. SP AusNet's expected costs are shown in Table 7.3.

Table 7.3: Polymer Insulator Diagnostics – Costs ($m, real $2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour	0.10	0.10	0.10	**0.31**
Material	0.00	0.05	0.05	**0.10**
Total	**0.10**	**0.15**	**0.15**	**0.41**

7.2.6 Nano Technology Development

Description: Nano technology has many potential applications for the transmission network, including:

- Nano coatings – to reinstate hydrophobicity of insulators
- Nano sensors – real time monitoring of transformer incipient faults
- Nano fluids – improve heat transfer capacity of a transformer

It is proposed to conduct research in developing the applications of nano technology to provide innovative network solutions.

Cost: It is proposed to progress this work with a partner academic institution and through seeking Australian Research Council support. SP AusNet's expected costs are shown in Table 7.4.

Table 7.4: Nano Technology Development – Costs ($m, real $2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour	0.05	0.05	0.05	**0.15**
Material	0.00	0.05	0.10	**0.15**
Total	**0.05**	**0.10**	**0.15**	**0.31**

7.2.7 Total Costs

The total estimated costs of the proposed Innovation Program are shown in the table below.

Table 7.5: Innovation Program ($m, real $2013-14)

Item	Y1 (14/15)	Y2 (15/16)	Y3 (16/17)	Total
Labour	0.41	0.41	0.41	**1.23**
Material	0.00	0.26	0.26	**0.51**
Total	**0.41**	**0.66**	**0.66**	**1.74**

Attachment 1 – Briefing Note – AEMO's Network Outage Schedule (NOS)

Agenda Item 16 – NEMOC Meeting 31 May 2012

13 Month Planned Outage Information – NOS vs. Spreadsheet Approach

NEMMCO commenced publishing 13 month network outage information in April 2003. At the time the information was published in spreadsheets. The intention at the time was for the TNSPs to move to using the NOS to publish this information via B2B. The NOS was modified at the time to make the process of providing this information more efficient. NEMMCO also held meetings with the TNSPs in mid 2003 to explain the benefits of moving to a B2B/NOS process.

As of March 2012 TransGrid and Transend are the only TNSPs to have adopted B2B to provide their 13-month network outage plans. The other TNSPs continue to provide their information through spreadsheets.

For those TNSPs who rely on spreadsheets the 13-month planned outage information is published from a different database to the NOS information. The TNSPs have informed AEMO that a manual process would be required to transfer the 13-month planned outage information to NOS, and this transfer would need to be performed each month. This process would be labour intensive and could lead to issues regarding the consistency of information between the NOS and spreadsheets.

AEMO has observed an increasing focus by participants and the AER regarding differences between the information published in the NOS versus that in the spreadsheets over recent years. For example AEMO received a number of submissions to the 2010 and 2011 Congestion Information Resource consultations on this matter. A number of participant queries have also been received on mismatches between transmission outages in the spreadsheet and NOS.

This focus is likely to increase as AEMO moves to publishing more NOS information, more frequently, in response to participant requests. Recent changes include the NOS data now being published every 30 mins on the AEMO website and via the MMS Data Interchange. By mid 2012, the NOS data will also be available in the MMS Data Model. Through these changes, the NOS data will become more visible to participants.

AEMO would prefer that all planned outage information be submitted via the NOS so that the 13-month planned network outage rule requirements can be met by publishing the NOS data. This would preferably be by using B2B systems (such as those being used by TransGrid and Transend), but could also be achieved by entering 13-month outage information into the NOS manually. This latter approach has drawbacks as mentioned previously.

Discussion with OPWG members indicated that they also had a preference to use B2B to submit planned outage information, but that it had been difficult to achieve progress on B2B implementation within the TNSP organisation.

It is also noted that the PSSWG is discussing the option of submitting rating information via B2B. Similar to the 13 month outage information, the ratings information is currently provided via spreadsheets (known as Ratings Workbooks). These workbooks are getting quite large and about to reach their end of life. The process of entering, sending, checking and loading ratings manually also causes delays in entering updates into AEMO's EMS. Using B2B for submitting ratings is a further incentive for the implementation of B2B for those TNSPs that currently do not have it.

Considering the increasing focus on published network outage information, and the benefits that can be realised by moving to a more efficient way of providing planned outage information to

the market, AEMO is seeking agreement with those TNSPs that do not currently have B2B systems to commit to a process for installing B2B that will:

- facilitate the provision of all planned network outage information through the NOS, and
- allow a more efficient and accurate method for providing rating information

Note that the submission of ratings via B2B will require some development work by AEMO as well.

Attachment 2 – Legislation, Standards and Advisory Documents setting out Security Standards

- SPIRACS Volume 5 – Part 1 Corporate Security Policy
- SP AusNet Information Security Policy;
- Victorian Emergency Management Manual
- Emergency Management Act 1986 (VIC).
- ENA – National Guidelines for the Prevention of Unauthorised Access to Electricity Infrastructure
- Part 6 of the Terrorism Community Protection Act which dictates that owners of declared essential services take appropriate steps to secure their assets against foreseeable risks.
- SP AusNet Tactical Security Plans
- Victorian Framework for Critical Infrastructure Protection from Terrorism
- ISO 31000:2009 Risk Management-Principles and Guidelines
- HB436-2004 Risk Management Guidelines
- HB167-2006 Security Risk Management
- Australian Government Department of Industry Tourism & Resources: Electricity Systems - Risk Context Statement, March 2007
- Australian Government's (ASIO) Business Security Report July 2006 – Electricity
- Department of Infrastructure Risk Context Statement for Energy
- Critical Infrastructure Emergency Risk Management Assurance Handbook

Additional standards are detailed in:

- Energy Networks Association – National Guidelines for the Prevention of Unauthorised Access to Electricity Infrastructure.
- AS/NZ ISO:31000:2009 Risk Management Standard.