

Investment Evaluation Summary (IES)



Project Details:

Project Name:	Power Quality (PQ) Operational Program
Project ID:	01063
Thread:	Power Quality
CAPEX/OPEX:	OPEX
Service Classification:	Standard Control
Scope Type:	D
Work Category Code:	AIQMO
Work Category Description:	PQ monitoring & investigations
Preferred Option Description:	Do nothing
Preferred Option Estimate (Nominal Dollars):	\$0

	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27
Unit (\$)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Volume	1	1	1	1	1	1	1	1	1	1
Estimate (\$)										
Total (\$)	\$700,000	\$710,000	\$730,000	\$750,000	\$780,000	\$810,000	\$840,000	\$880,000	\$920,000	\$980,000

Governance:

Project Initiator:	Leon Kwek	Date:	19/06/2015
Thread Approved:	Stephen Jarvis	Date:	19/10/2015
Project Approver:	Stephen Jarvis	Date:	19/10/2015

Document Details:

Version Number:	1
------------------------	---

Related Documents:

Description	URL
PQ Operation Program -Investment Evaluation Summary	http://projectzone.tnad.tasnetworks.com.au/business-projects/nis-program/DD17SAM/Deliverables/Power%20Quality/IES%20-%20PQ%20OPEX.docx

Section 1 (Gated Investment Step 1)

1. Background

Around 10-15% of customer complaints TasNetworks receives through the call centre are due to issues with power quality (PQ): the output of a power supply with respect to electrical tolerances (as opposed to power availability or reliability). Poor power quality may result in obvious equipment malfunction (such as flickering lights or slow acting appliances), non-fault tripping of protection devices or more subtle equipment degradation resulting in premature appliance failure. From the perspective of a general customer, a PQ issue may not be perceived as any different from overall loss of supply.

Unlike more straight forward network issues (e.g. asset failure), PQ disturbances are frequently intermittent and generally more difficult to quantify and effectively address: local correction options may resolve the immediate complaint but shift the issue to resurface later and elsewhere in the network. Local PQ issues may be symptoms of wider, systematic problems in the network area.

This program finances the scheduling, installation and data management of portable load data loggers as required by the Customer Service team to quickly escalate customer complaints for technical investigation if PQ issues are suspected. It ensures the availability of reliable loading data (i.e. voltage and current flows) for various engineering teams to efficiently diagnose and resolve PQ issues.

The maintenance of the logging devices is also budgeted under this program.

It is the primary conduit through which power quality issues have historically been identified within the Tasmanian distribution network for action. While proactive power quality improvement projects using newer network technology (e.g. increasing availability of fixed measurement devices and simulated network data) are scheduled throughout the next determination period, basic reactive load logging is still a cost effective means of gathering critical data.

It is a continuation of activities from Aurora Energy; however it is strongly suspected that a new systematic network problem can be expected in the next ten years due to the increasing uptake of photovoltaic (PV) generation. The onset of these issues will manifest first through customer complaints; this program has been expanded to accommodate them.

Volumes and requested expenditure are projected from the previous nine years, taking into account a forecast buffer for the uptake of PV generation.

1.1 Investment Need

Ongoing PQ issues are a persistent feature of distribution networks. Complex and unique localised causes, combined with relatively minor consequences, result in diffuse and widespread network performance issues that are expensive to locate and correct proactively.

Ignoring the complaints customers make as a result of poor PQ exposes TasNetworks to an immediate risk to its customer service objectives, through the perceived willingness and competence of the business in resolving customer issues. Also, TasNetworks is legally required to maintain PQ standards by the National Electricity Rules (NER) with thresholds generally set by Australian Standards.

Over the longer term, PQ issues can be indicative of hidden systematic design flaws or failing assets. Thorough investigation of individual PQ complaints can allow for early detection of wider network issues and allow for cost-effective network augmentation for larger numbers of customers.

Further to previous iteration of this program, it is strongly suspected that a systematic network problem can be expected in the next 10 years due to the increasing uptake of distributed generation. Though this is already a significant issue in other distribution networks, the full extent and magnitude of the impact in Tasmania is currently unknown.

This submission proposes a reactive but sophisticated PQ investigation and logging program that will provide critical data to help support decision making and resolutions in response to all of these issues simultaneously.

1.2 Customer Needs or Impact

The reactive approach means that distribution customers may continue to experience PQ issues following their

complaint for the period of time it takes for the complaint process to reach resolution. This disadvantage of the reactive process is outweighed through other direct benefits delivered by the program:

- improved customer service experience, as the call centre is appropriately resourced to give assurance and escalate more complex issues for investigation; and
- faster restoration or correction of supply issues, as a result of better technical insight and an accumulating database.

The installation of monitoring devices through the logging period (typically 1 week) is occasionally noticed and reported by concerned customers, but not of any significant impact.

All distribution customers will benefit indirectly through prevention of external effects of local issues (e.g. PV system voltage impacting an entire circuit) and improved power quality of the network overall.

1.3 Regulatory Considerations

This submission is required to achieve the following operational expenditure objectives as described by the National Electricity Rules section 6.5.6(a).

Forecast operating expenditure 6.5.6 (a)

(3) to the extent that there is no applicable regulatory obligation or requirement in relation to:

- (i) the quality, reliability or security of supply of standard control services; or
- (ii) the reliability or security of the distribution system through the supply of standard control services,

to the relevant extent:

- (iii) maintain the quality, reliability and security of supply of standard control services; and
- (iv) maintain the reliability and security of the distribution system through the supply of standard control services; and

(4) maintain the safety of the distribution system through the supply of standard control services.

2. Project Objectives

This program finances the scheduling, installation and data management of portable load data loggers as required by the Customer Service team to quickly escalate customer complaints for technical investigation if PQ issues are suspected. It ensures the availability of reliable loading data (i.e. voltage and current flows) for various engineering teams to efficiently diagnose and resolve PQ issues.

The maintenance of the logging devices is also budgeted under this program.

The program is designed to align with the following specific business requirements:

- Maintaining network performance, both in controlling local issues and managing power quality overall
- Compliance with the TEC and Australian Standards
- Provision of good customer service (i.e. perceived as well as actual capability to respond to complex issues)

3. Strategic Alignment

3.1 Business Objectives

Strategic and operational performance objectives relevant to this project are derived from TasNetworks 2014 Corporate Plan, approved by the board in 2014. This project is relevant to the following areas of the corporate plan:

- Customers (“We understand our customers by making them central to all we do”)
- One Business (“We care for our assets, delivering safe and reliable networks services while transforming our business”).

3.2 Business Initiatives

This program supports the following greater 2014-15 business initiatives:

Initiative	Performance Indicators	Support Rationale
'Voice of the customer' program	Customer Engagement Prices for Customers	TasNetworks' response to customer complaints through the call centre will directly influence any customer engagement process. The PQ investigation program will allow the Customer team to escalate effectively and give customers concrete information and results in response to their enquiries.
Efficient and effective business systems	Network service performance	PQ investigations augment the customer complaint processing system, whilst leveraging the resulting data to create benefit for network performance, network planning, customer service, asset management and network operations
Asset management capability	Network service performance	PQ data can be also used to assess asset performance and condition, both key inputs to the asset management process.
Safe and reliable network services	Network service performance	PQ investigations will assist network services in more complex fault cases, enabling more efficient and safe allocations of field resources.

4. Current Risk Evaluation

Risks are presented in two categories: Table 1 lists the "traditional" localised PQ issues (targeted by previous iterations of this program at Aurora Energy) that result from ongoing development and movement in the distribution network. Though geographically diverse, these are considered to be contained locally and have root causes that are generally case-specific. Although the high likelihood of these events drives medium business risks, this is within the TasNetworks risk appetite for the relevant consequence categories.

Table 1: "Traditional" PQ Risk Analysis

Risk Category	Risk	Likelihood	Consequence	Risk Rating
Network Performance	Localised quality of supply issues (over/under voltage) due to load growth / shifting or individual PV installation; will not impact major industrials	Almost Certain	Minor	Medium
Reputation	Individual customers perceive TasNetworks unwillingness to respond effectively to PQ issues, especially in the case of small business or minor industry	Likely	Minor	Medium
Regulatory and Compliance	Minor isolated breaches of TEC and AS61000 PQ compliance thresholds	Almost Certain	Minor	Medium

Table 2 shows the forecast risk of increased PV penetration, which is uncertain but has the potential for widespread, recurring and intensifying consequences that cannot be contained on a case by case basis. In addition to addressing traditional risks, this program forms an essential network monitoring and data gathering component of the strategy to handle PV uptake.

At present, all risks are Medium as a result of low likelihood; however all may escalate to High by the end of the determination period if PV installation tracks toward moderate industry forecasts.

Table 2: Risk Analysis of PV Penetration Consequences

Risk Category	Risk	Likelihood	Consequence	Risk Rating
Network Performance	Interruption of supply to PV generators and substantial voltage issues for surrounding customers, across multiple areas.	Possible	Moderate	Medium
Regulatory Compliance	Minor network-wide, recurring breaches of TEC / Australian Standards	Possible	Moderate	Medium
Reputation	Widespread perception of TasNetworks' inability and unwillingness to accommodate new solar connections	Unlikely	Major	Medium

4.1 5x5 Risk Matrix

TasNetworks business risks are analysed utilising the 5x5 corporate risk matrix, as outlined in TasNetworks Risk Management Framework.

Relevant strategic business risk factors that apply are follows:

Risk Category	Risk	Likelihood	Consequence	Risk Rating
Network Performance	Interruption of supply to PV generators and substantial voltage issues for surrounding customers, across multiple areas.	Possible	Moderate	Medium
Network Performance	Localised quality of supply issues (over/under voltage) due to load growth / shifting or individual PV installation; will not impact major industrials	Almost Certain	Negligible	Medium
Regulatory Compliance	Minor network-wide, recurring breaches of TEC / Australian Standards	Possible	Moderate	Medium
Regulatory Compliance	Minor isolated breaches of TEC and AS61000 PQ compliance thresholds	Almost Certain	Negligible	Medium
Reputation	Widespread perception of TasNetworks' inability and unwillingness to accommodate new solar connections	Unlikely	Major	Medium
Reputation	Individual customers perceive TasNetworks unwillingness to respond effectively to PQ issues,	Likely	Negligible	Low

	especially in the case of small business or minor industry			
--	---	--	--	--

Section 1 Approvals (Gated Investment Step 1)

Project Initiator:	Leon Kwek	Date:	19/06/2015
Line Manager:		Date:	
Manager (Network Projects) or Group/Business Manager (Non-network projects):		Date:	
[Send this signed and endorsed summary to the Capital Works Program Coordinator.]			

Actions			
CWP Project Manager commenced initiation:		Assigned CW Project Manager:	
PI notified project initiation commenced:		Actioned by:	

Section 2 (Gated Investment Step 2)

5. Preferred Option:

The preferred option is a continuation of PQ data-logging, primarily in response to customer complaints.

Small-scale PQ issues are a persistent feature of distribution networks. Load growth (or geographic shifting), legacy assets and the installation of small-scale distributed generation all contribute to the degradation of power quality. Requiring customers to apply for a network design review with any action that may impact power quality could prevent accumulation of these issues; however this option would be restrictive and intensive to manage, resulting in poor service and a waste of technical resources.

Formal compliance thresholds are set by regulatory requirements of the National Electricity Rules and Australian Standards (primarily AS61000); however these limits are currently under review since they do not enforce prudent operation of the network. Specifically, these limits:

- place uniform standards for all customers (i.e. regardless of consumption type and usage patterns);
- set hard thresholds that ignore the short-term “peaking” nature of certain PQ violations; and
- do not give due consideration to the growing prevalence of small scale generation within distribution networks (“embedded” or “distributed” generation).

For example, many rural customers experience winter voltages below specification, but expenditure over remote distances and low customer density results in an order of magnitude in lost benefit through opportunity cost elsewhere. Strict network-wide adherence to the standards would require prohibitive expenditure, with disproportionate return in customer supply quality.

Reactive investigations are a means of efficiently gathering network information and focusing technical and field resources. Single customer PQ issues can be generally corrected through simple techniques (e.g. changes to distribution transformer tap or protection device settings) but repeated complaints in a localised area can indicate a need for more significant technical consideration and cost-effective network augmentation over a larger number of customers. Within the inherent visibility and data limits of distribution networks, these issues are otherwise expensive to predict, locate or prioritise effectively.

The approach leverages thousands of customer observations to locate issues, and true experience as an objective prioritisation scheme. While individual customers will almost certainly be adversely affected by a reactive approach, the impact is mitigated and made temporary by a Customer Service team appropriately resourced to respond and efficiently escalate complaint cases as required.

5.1 Scope

This program finances the scheduling, installation and data management of portable load data loggers as required during the approximate 400 annual expected power quality investigations. The ongoing maintenance of the loggers is also budgeted under this program.

It specifically does not cover any associated network studies, design or corrective works.

5.2 Expected outcomes and benefits

In as far as TasNetworks’ need to provide good customer service, this program will give direct benefit as measured in terms of a lack of negative customer feedback and press coverage. While customers and the wider media will not directly perceive the benefits of data logging, an inability of TasNetworks to effectively resolve complaints presents the risk of creating a widespread perception of indifference and poor customer service, resulting in reputational damage out of proportion to the customer value of high quality power supply. The ready-availability of logging resources gives the Customer Service team an effective means of escalating cases for technical consideration, whilst giving customers immediate assurance and directing appropriate corrective action in the longer term.

The objectives of network performance and regulatory requirements are also best weighed in terms of risk mitigation, as full statutory compliance is cost prohibitive and has never been achieved in Tasmania. The historical approach and spending levels for this program have supported keeping risks in check; however increasing penetration of PV generation may overwhelm current practices. Improvements to the overall PQ strategy are proposed to manage these increasing risks, while keeping this program at historical spending levels.

The following table lists the options and reason for selection or rejection:

Option description	NPV	Reason got selection/rejection
Option 0 - Do Nothing	Unaddressed medium business risks	Leaves business exposed to significant array of Medium risks; potential to evolve into unacceptable High risks with large PV uptake
Option 1 – Reactive logging capability	-\$9.14M	Addresses current risks, supports TasNetworks' customer service objectives, and positions the business to deal with future PV-related risks
Option 2 – Proactive / targeted PQ logging	-\$9.14M	Network performance as defined by formal standards better maintained, but does not address on going customer complaints, leading to reputational consequences.

5.3 Regulatory Test

This does not apply to this initiative.

6. Options Analysis

The following table describes the options considered:

Option description	
Option 0 – Do Nothing	Complaint investigations are not resourced with the capability to log loading data. PQ issues are quantified and identified for action through engineering analysis (network studies, primarily using existing SCADA devices and theoretical prediction). Minimises operational expenditure. Business is subject to a set of almost certain medium risks, all with the potential to develop into unacceptable high risks through the next determination period.
Option 1 – Reactive logging capability	Data loggers are readily available for use in response to customer complaints. PQ issues are primarily identified through technical consideration of logged data combined with investigation details; engineering analysis is used to determine root causes of customer complaints and select the most effective corrective actions.
Option 2 – Proactive / targeted PQ logging	Potential PQ issues are primarily identified through engineering analysis. Theoretical prediction is confirmed through the use of proactively deployed data loggers, and results are used to prioritise issues through for correction.

6.1 Option Summary

Option description	
Option 0 (preferred)	Do nothing
Option 1 (preferred)	Reactive logging capability
Option 2	Proactive / targeted PQ logging

6.2 Summary of Drivers

Option	
Option 0 (preferred)	<p>Maintaining network performance</p> <p>Un-corrected ongoing issues will result in accumulating widespread minor issues. Future connection of PV generators may be restricted</p> <p>High uptake of PV may possibly result in widespread, intensifying issues that existing local practices cannot manage.</p> <p>Compliance with appropriate legislation</p> <p>Almost certain widespread minor non-compliance issues.</p> <p>High uptake of PV may result in systemic, state-wide breaches of legislation. May require intervention by the regulator or other legislative bodies.</p> <p>Provision of good customer service / reputational risk</p> <p>Individual customer perception of TasNetworks' unwillingness to respond effectively to PQ issues, especially in the case of small business or minor industry.</p> <p>High uptake of PV may result in a general customer perception of TasNetworks' poor service and inability to accommodate new solar connections</p>
Option 1 (preferred)	<p>Maintaining network performance</p> <p>Priority of limited performance monitoring resources is aligned to customer demand: higher density areas with more sensitive quality requirements (e.g. manufacturing). High uptake of PV issues likely detected earlier through complaint cases</p> <p>Performance is unmonitored in the absence of strong complaints, most notably rural areas. Disparity of network performance follows different customer types. Overall objective network-wide performance measures likely lower than Option 2, owing to sub-optimal works under time pressure.</p> <p>Compliance with appropriate legislation</p> <p>Will address local PQ at current or better than current standards.</p> <p>High uptake of PV will be detected earlier through complaint cases, and logging data will be readily available for analysis and strategic response.</p> <p>Provision of good customer service / reputational risk</p> <p>Customer service team is well resourced and able to respond to PQ complaints. Improved interface between customer service and engineering teams.</p>
Option 2	<p>Maintaining network performance</p> <p>Highest overall network performance, as measured through objective standards. Business is slower to respond to unpredicted issues (as compared to Option 1); several customer issues likely neglected.</p> <p>Compliance with appropriate legislation</p> <p>Likely to maintain average, network-wide objective standards significantly better than option 1 (as opposed to customer perceived quality).</p> <p>Provision of good customer service / reputational risk</p> <p>Customers unlikely to find assurance in long-term PQ programs, outcomes similar to</p>

option 0.

6.3 Summary of Costs

Option	Total Cost (\$)
Option 0 (preferred)	\$0
Option 1 (preferred)	\$8,100,000
Option 2	\$8,100,000

6.4 Summary of Risk

The preferred option of reactive logging is expected to address current risks, support TasNetworks' customer service objectives, and position the business to deal with future PV-related risks

6.5 Economic analysis

Option	Description	NPV
Option 0 (preferred)	Do nothing	\$0
Option 1 (preferred)	Reactive logging capability	-\$8,100,000
Option 2	Proactive / targeted PQ logging	-\$8,100,000

6.5.1 Quantitative Risk Analysis

No quantitative risk analysis available.

6.5.2 Benchmarking

No benchmarking available.

6.5.3 Expert findings

No expert findings available.

6.5.4 Assumptions

Not applicable.

Section 2 Approvals (Gated Investment Step 2)

Project Initiator:	Leon Kwek	Date:	19/06/2015
Project Manager:		Date:	

Actions

Submitted for CIRT review:		Actioned by:	
CIRT outcome:			