Improving Works Delivery within an Electricity Distribution Business

Unison Contracting Services Limited

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EEA Conference & Exhibition 2014, 18 - 20 June, Auckland

1 INTRODUCTION

Unison Networks Limited (Unison) is an electricity distribution business (EDB) serving approximately 109,000 customers across the Hawke's Bay, Taupo and Rotorua regions of New Zealand.

Unison undertakes around $50m of planned, reactive and customer driven construction works on the electrical network per annum. The majority of the field work is delivered by wholly owned subsidiary Unison Contracting Services Limited (UCSL) with the balance delivered by local and national third party service providers.

This paper identifies the challenges faced by electricity distribution businesses in reliably delivering the range of project works required to maintain and grow an electrical distribution network.

The paper then discusses the specific works delivery challenges faced by Unison and how these have been addressed to improve works delivery.

The paper then concludes with the ongoing focus and continuous improvements required to ensure that works delivery can remain efficient and adaptable to future industry demands.

2 TERMINOLOGY

The following project related terminology is used within this paper:

Scope – Defines the outcomes required from a project.

Project – A temporary endeavor, with a defined start and end, which achieves the outcomes specified within the scope. In the context of this paper, projects relate to electrical network capital expenditure (CAPEX) and operational expenditure (OPEX) and for simplicity all work is referred to as a project irrespective of size or complexity.

Project Lifecycle – The series of phases that a project passes through from its initiation to its closure.

Programme – A group of projects managed in a coordinated way to obtain benefits not available from managing them individually.

Programme of Work (PoW) – A programme required to be completed within a set timeframe. In the context of this paper this is within a specific financial year.

Works Delivery – The process of progressing a programme &/or programme of work.

3 OVERVIEW OF A TYPICAL WORKS DELIVERY PROCESS

EDB projects will typically follow a project lifecycle; a Unison specific lifecycle is presented in Figure 1.

Depending on organisational process and project complexity, the lifecycle may be scaled to fit the size of the project.

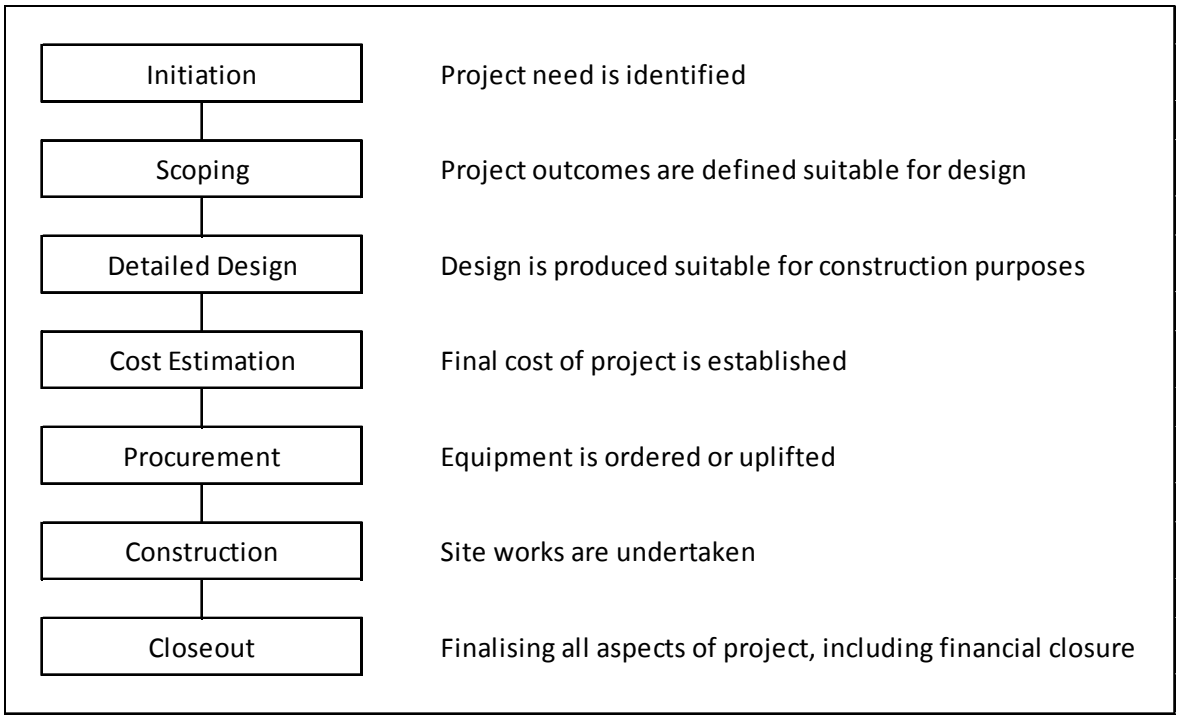

Figure 1 – Example Project Lifecycle

4 WORKS DELIVERY CHALLENGES WITHIN AN EDB

Based upon discussions between the author and a number of other EDBs and industry contracting organisations, irrespective of whether projects are undertaken utilising internal resource, or undertaken by external service providers, there are common works delivery challenges.

4.1 Volume of Construction Work

The primary works delivery challenge that Unison encounters is the volume and nature of construction projects required to be undertaken.

Figure 2 below approximates the number of CAPEX and OPEX construction projects required to be delivered by Unison during the 2013/14 financial year[1].

It can be seen that there are more than 5000 individual projects to be tracked and delivered, with 5% of projects accounting for 80% of the annual capital and operational spend.

To achieve efficient works delivery, both efficient processes (to manage the volume), efficient project and programme management (to manage the higher value projects) and process flexibility (to account for the unknowns) are required.

[1] 1 April 2013 to 31 March 2014.

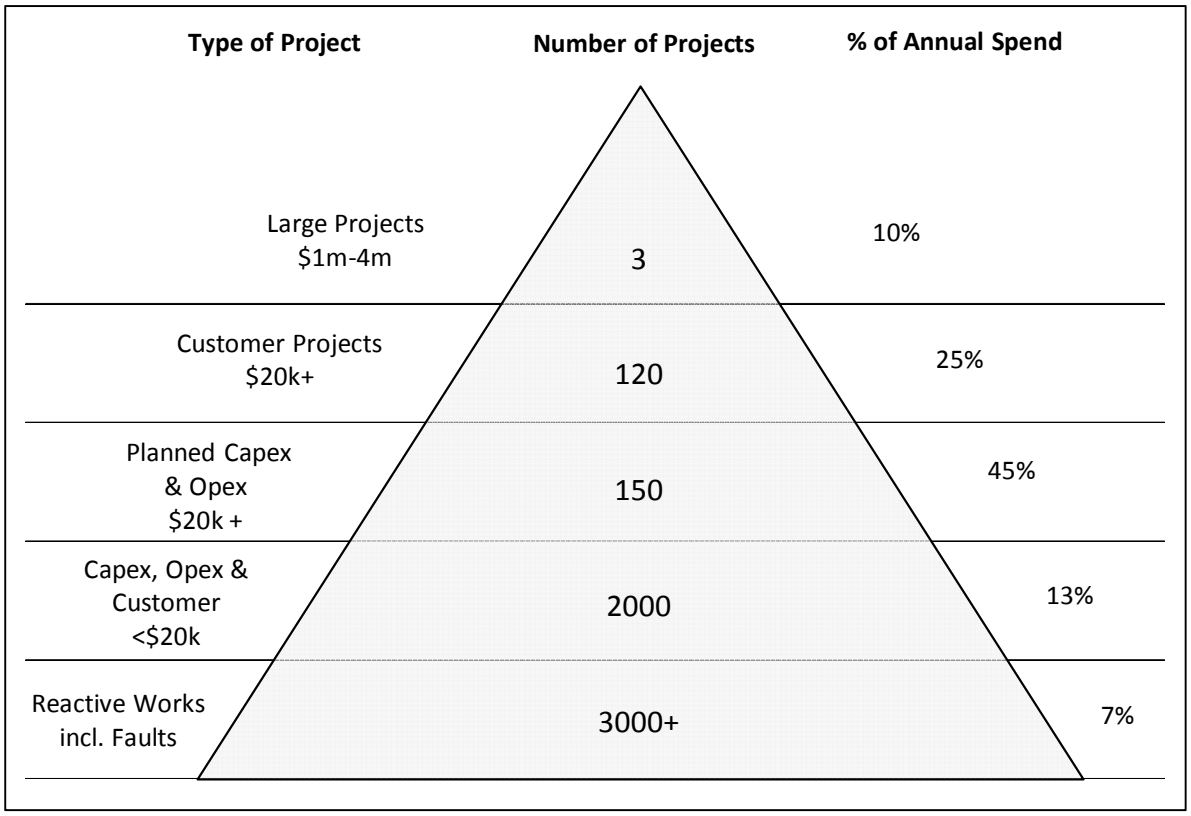

Figure 2 - Typical Unison Works Delivery Profile (p.a.)

4.2 Work Prioritisation

In any given month, multiple projects will be competing for allocation of internal and external delivery resource.

Prioritisation can be undertaken in a number of ways, usually with 'keeping the lights on' and customer driven projects taking precedence over planned CAPEX and OPEX.

On a day-to-day basis 'the squeaky wheel gets the grease' idiom can ring true. Inefficient prioritisation of projects and resources can significantly affect the efficiency of works delivery and programme of work completion.

4.3 Significant Unknowns

As shown within Figure 2, around two-thirds of annual spend is known about at the start of the financial year, with the remaining third being unknown customer initiated, unplanned and reactive projects.

The profile and prioritisation of programme of work delivery can be significantly affected by unanticipated internal (e.g. organisational structure, business priorities, resource constraints) and external forces (e.g. large customer works, regulation) with little notice.

The works delivery process must be robust and sufficiently flexible to quantify, analyse and adapt to unknowns as they arise.

4.4 Resource Alignment

At any stage of programme delivery bottlenecks[2] in both process and resource availability can occur. Process bottlenecks can often be quickly overcome by a temporary or permanent amendment to the process.

Where a bottleneck occurs due to a shortfall in resource (for example the availability of Protection Technicians) this can quickly affect the duration and efficiency of delivery. If the resource bottleneck persists, this can compound and become an obstacle to completing the programme of works.

The resource alignment challenge is twofold; to forecast what internal and external resource is required to ensure programme delivery, plus attract and retain resource.

This is no easy task as the spend profile in Figure 2 fluctuates from year to year, with additional impacts from changing network technologies.

4.5 The Changing Nature of the Network

The electricity industry is, at varying speeds, in the midst of a paradigm shift transforming conventional electrical transmission and distribution networks into smart networks.

This has the potential to shift the profile of capital work along with the skill profile of staff required to scope, design, install and maintain the increasingly smart technologies.

Unison's experience with this profile shift is summarised within Section 5 below.

5 UNISON'S WORKS DELIVERY CHALLENGES

5.1 Programme of Works Completion

At the end of the 2011/12 financial year, more than 40% of the Unison CAPEX programme, some 76 projects, planned for delivery during that year remained incomplete.

The backlog of construction works was inhibiting the ability for Unison to efficiently maintain and grow the electrical network, and was having a consequential effect on morale for those involved with works delivery.

With a large queue of projects awaiting construction, prioritisation became highly reactive as urgent and overdue projects were elevated to the top of the list.

Customer and reactive projects were being completed, but planned CAPEX >$20k suffered.

It was recognised that a more comprehensive and structured manner of capturing and prioritising the programme of works was required.

[2] The term 'bottleneck' is used here instead of 'constraint' as this more descriptively represents the (temporary and sometime sporadic) restrictions in performance that can occur during works delivery. Should a bottleneck persist it can become a more significant constraint on works delivery.

5.2 Project and Programme Management

Programme management was, as the time, undertaken via a top down approach. The Programme Manager established the preferred timings for a project to be undertaken, which were communicated to the project designer, who also acted as the project manager, and subsequently the construction crews.

Tracking and reporting on programme of works delivery was via spreadsheets and an internally developed management reporting database.

The status of individual projects was well known, however the practical challenges to be overcome in achieving robust programme delivery, in particular alignment of work with delivery resources, were slow in being recognised until a significant backlog of projects had been established.

Often projects were started because of an urgent internal or external driver, but not delivered in a continuous manner as resource was diverted onto more urgent projects.

It was recognised that dedicated and coordinated project management would provide focus to individual project delivery, plus allow a more cohesive approach to delivering the wider programme.

5.3 Smart Network Implementation

Unison is in the midst of a smart network rollout, which includes the implementation of significant new communication, automation, sensing and network operation technologies.

This rollout was increasing the near term works delivery workload, which compounded the backlog.

Additionally, as the smart technologies are implemented the consequential impacts on works delivery are that:

- The long term profile of capital work is projected to shift significantly as smart network benefits are realised, and
- The required skill profile for construction resource will change, with skilled resource required to design, install and maintain smart technologies.

For Unison, this is anticipated to mean reduced spend on traditional ‘poles and wires’ CAPEX over time and an increase in staff skilled in maintaining protection, sensor and communications networks. However, the full impact on long term works delivery resourcing is not yet fully understood and will not be understood for some time.

This was an additional catalyst for significant changes in the management of works delivery.

6 ADDRESSING THE CHALLENGES

The approach taken to address the works delivery challenges, both immediate and longer term, has been to:

- Build dedicated programme and project management capability

- Improve visibility and prioritisation of the programme of works, including implementation of Microsoft Project Server and other tools, and
- Improve alignment between the anticipated annual project workload with the availability of in-house and external construction resource.

These steps are discussed in more detail within the following sections.

6.1 Building Programme and Project Management Capability

In early 2012, the Unison project lifecycle was reviewed, understood and each phase remapped in order to improve delivery efficiency. The outcomes of this process were to:

- Document clearly the project lifecycle phases
- Establish approval gates and signoffs which would form the end of each phase, and
- Identify and remove duplication of effort and process bottlenecks.

Some key changes were made to the internal delivery structure, including:

- Separation of design and project management functions
- Integration of cost estimation within the design function
- Creation of a dedicated project management team, and
- Rescoping of the existing Programme Manager function.

The establishment of a dedicated project management team was a significant departure from the previous organisational structure. Since its inception, the focus of the team has been to:

- Ensure construction planning and risk management is completed and well understood
- Provide hands-on project management support for construction crews
- Improve project related communication with internal and external stakeholders, and
- Champion the adoption of best practice project management within Unison.

The role of the Programme Manager was shifted to a more delivery focussed role, in part supporting and in part directing the project managers and the overall works delivery function.

6.2 Providing Programme Visibility

Once the project lifecycle was clearly established, the next challenge was to capture all projects currently under construction and projects planned for delivery.

As noted previously, programme management and reporting was undertaken using ad-hoc internally developed tools. These were discarded and Microsoft Project Server 2010 (Project Server) implemented as the key software tool for managing the programme of works.

The aims of the Project Server implementation were to:

- Implement a standardised enterprise tool for visualising all projects
- Improve visibility and access to the programme of work across the business
- Capture, forecast and smooth (where required) delivery resource requirements, and
- Integrate Project Server with Unison's existing Microsoft Sharepoint platform for centralised storage of project files

Despite the decision to take an 'out of the box' approach to implementing Project Server, the rollout has been a significant undertaking with the key challenges of:

- Capturing and managing the volume of projects efficiently
- Integration of Project Server with Unison's other information systems
- End-user training
- Establishing how Project Server should be best used to add value to works delivery, and
- Building acceptance and buy-in to using Project Server as the primary tool for programme management and reporting.

Around 18 months was required to become comfortable with the key challenges above, with initially only the project managers and Programme Manager as end-users.

At the time of writing (two years post-implementation) Unison now has a cohesive system which provides the project design and construction timings and delivery status (% complete) of each project $>20k.

In January 2014, customisable intranet dashboards displaying physical and financial project and programme completion were implemented – which have greatly improved project transparency and visibility across the business.

With transparency and visibility has come increased focus on efficient works delivery.

6.3 Aligning Construction Resource with Forecast Work

With a visible programme in place the remaining challenge was to gain confidence that sufficient resources were available to ensure completion of construction works.

This has been the most significant, and challenging, step undertaken by Unison in improving works delivery.

Based upon the 2012/13 known projects and the history of unplanned and customer project data from previous years - design, project management and construction resources were allocated against individual projects in Project Server.

An early realisation was that there was a shortfall between the existing internal resource and the forecast resources that would be required to deliver the 2012/13 works programme.

6.3.1 Resourcing the Shortfall

Resource shortfalls were identified in three areas:

- Protection Technicians
- Electrical Fitters, and
- Line Mechanics (in specific network regions)

The shortfall was addressed in a number of ways:

- Reallocation of multiskilled internal resource, where possible
- Recruitment of new experienced permanent staff and trainees, and

- Identification of suitable external service providers.

While internal recruitment would resource the more significant resource shortfalls, external service providers remains a key part of the works delivery strategy.

Building long term relationships with service providers and providing advance notice of impending workload peaks will help Unison deliver a more reliable programme.

Over the course of 2012/13 and 2013/14, Unison increased locally based field staff numbers by around 30% and employed on a regular basis specialist live-line mechanic, protection technician, cable jointing and civil service providers.

Design, project and programme management staff numbers have remained constant.

6.3.2 Achieving Programme Alignment

Where projects had been previously delivered in either a first-in, first-out basis or in response to the 'squeaky wheel', there has been a realisation that a combination of large, medium and small projects need to be in design and construction at any one time.

Each project is now resource loaded in Project Server and any priorities or constraints established at the start of each financial year.

The programme is then aligned to smooth resource utilisation evenly throughout the year, making allowance for unknowns that will eventuate.

This ensures good alignment between the anticipated annual project workload and the availability of in-house and external construction resource.

6.4 Stakeholder Management

As mentioned in section 5.1, the backlog of construction works at the end of 2011 had left disenchanted internal and external stakeholders.

As part of the works delivery improvements, solid working relationships have been built between the works delivery teams and local and regional councils, roading authorities and other utility providers.

By reliably delivering projects as planned, Unison has been able to successfully increase the volume of works undertaken and decrease disruption to stakeholders without issue.

7 WORKS DELIVERY IMPROVEMENTS - RESULTS TO DATE

At the time of writing (April 2014) the 2013/14 financial year has now been completed and comparisons of works delivery over the previous two financial years are possible.

Unison measures programme of work completion through:

- Carryover – movement of incomplete projects between financial years, and
- CAPEX delivery – financial spend of the CAPEX budget to achieve the planned programme of work.
- OPEX delivery - financial spend to achieve the planned operational work budget.

Completion of CAPEX projects >$20k (incorporating large projects) is the primary comparison used, as these projects represent the majority of construction spend and have been the projects that have historically remained incomplete or had significant delays in construction timings.

7.1 Carryover

Figure 3 below presents the number of CAPEX projects >$20k that were incomplete and have become 'carryover' between financial years.

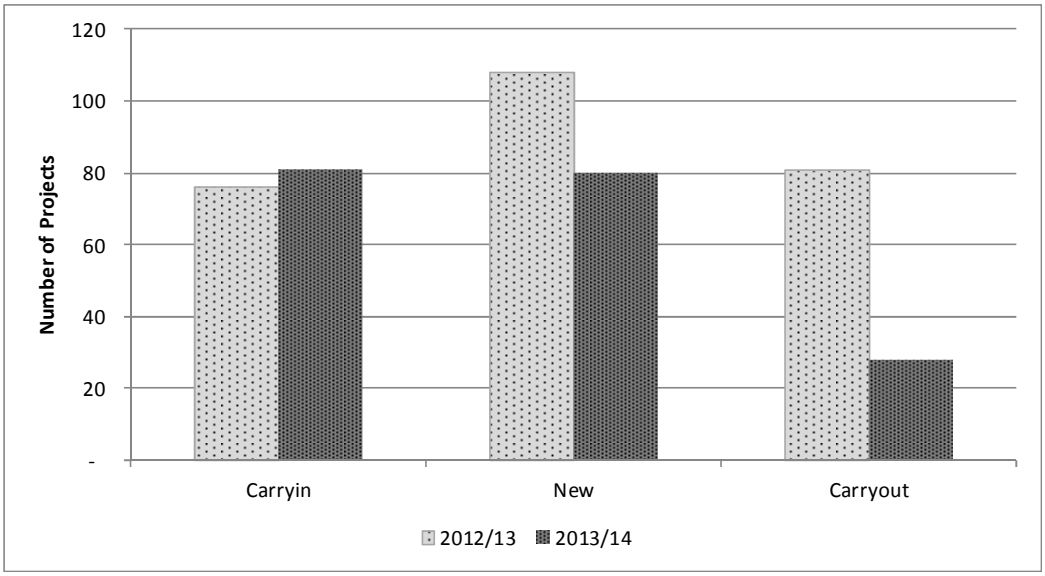

Figure 3 - Carryover of >$20k CAPEX Projects - 2012/13 & 2013/14

It can be seen that the carryover of works from 2012/13 was similar to that of the previous year. This was reduced by two-thirds at the end of 2013/14.

7.2 CAPEX delivery

Figure 4 below presents the financial spend on CAPEX projects >$20k.

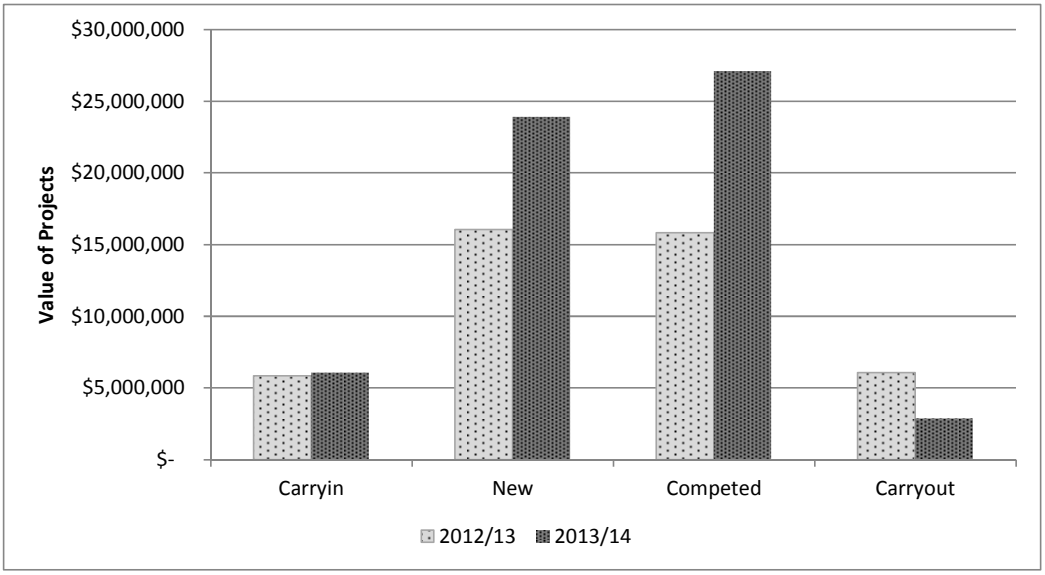

Figure 4 - Spend of >$20k CAPEX projects - 2012/13 & 2013/14

This more clearly demonstrates the improvements in works delivery that have been achieved, being a significant reduction in the value of carryover and the value of projects delivered during the year increasing by ≈70%.

7.3 OPEX delivery

Figure 5 below presents the financial spend on OPEX projects, demonstrating that improvements in CAPEX project delivery have not prejudiced ongoing network maintenance and fault restoration requirements.

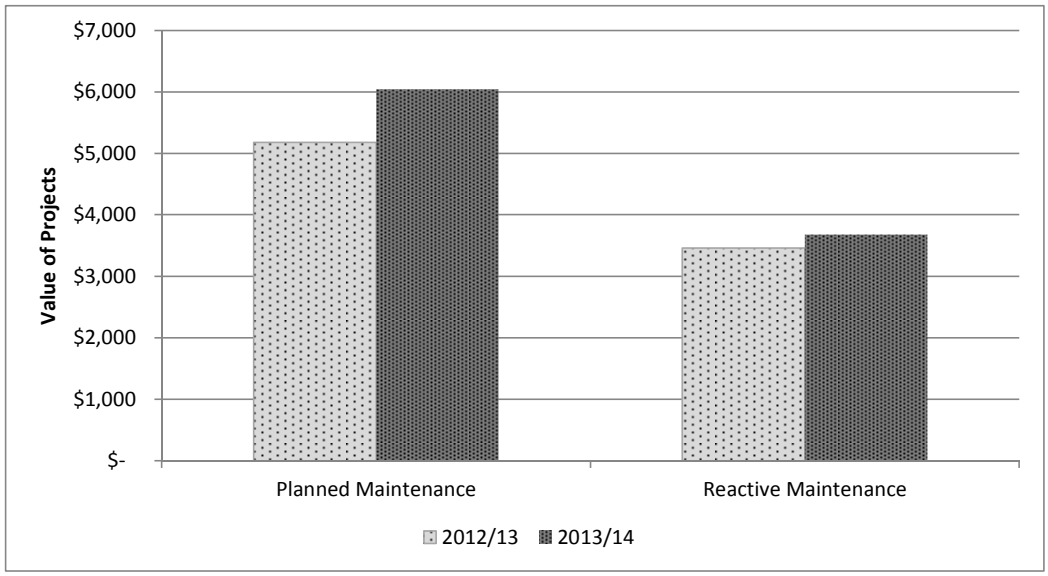

Figure 5 - Spend on OPEX projects - 2012/13 & 2013/14

7.4 Staff Morale and Turnover

Improvements in works delivery have some additional benefits. Construction staff morale, as measured by an annual staff engagement survey, has increased year-on-year.

Construction staff turnover has also dropped from 14% in 2011/12 and 18% in 2012/13, to 8% during 2013/14.

There is an ever increasing positivity about the ability of Unison to deliver on annual programme of work expectations, including strategic smart network projects.

8 THE FUTURE

Achieving efficient works delivery requires efficient processes, efficient project and programme management and the flexibility to account for future the unknowns.

In the short term, Unison needs to be able to adapt to unforeseen changes in the annual works programme of +/-10% (≈$5m) between financial years without impacting on carryover.

In the medium to long term, staff numbers and skillsets need to be closely aligned to the group asset management plan expenditure.

To achieve this, the following continuous improvements are foreseen:

Short term (1-2 years)

- Maintain focus on effective programme and project management disciplines
- Improve the timeliness of project delivery to lower value of work in progress
- Continue to increase programme planning horizons, and
- Maintain relationships with specialist external service providers to supplement internal resource.

Medium term (2-4 years+)

- Apply lean thinking to remove waste from all aspects of the project lifecycle
- Ensure retention of skilled staff and grow skillset flexibility, and
- Align project resourcing requirements with the long term asset management plan.

9 CONCLUSION

In 2011, Unison was experiencing challenges in programming and delivering the volume of work required to support the growing electrical distribution network.

These challenges have been addressed by:

- Build dedicated programme and project management capability
- Improve visibility and prioritisation of the programme of works, including implementation of Microsoft Project Server and other tools, and
- Improve alignment between the anticipated annual project workload with the availability of in-house and external construction resource.

Improvements commenced early 2012, but took twelve months to propagate through the business and start delivering quantifiable results.

After 18 months the results were visible and the continuous improvement momentum has continued to grow throughout the 2013/14 financial year. The impact of the previous two years of effort can be clearly seen in the 2013/14 results.

While pleasing gains have been made in project delivery as well as staff morale, the improvement focus continues to ensure that works delivery becomes increasingly efficient and remains adaptable to future challenges.