Report on the EEA Professional Development Award 2008

Huazhuo Lin, *Performance and Asset Investment Manager, WEL Networks Ltd*

Background

As the Awards recipient in 2008, Huazhuo Lin attended the Third World Congress on Engineering Asset Management and Intelligent Maintenance System Conference 2008. It was held in Beijing International Convention Centre, Beijing, China during 27-30 October 2008. Organisers were China Association of Plant Engineering, Division of Mechanical and Vehicle Engineering, Chinese Academy of Engineering and National Science Foundation Industry/University Cooperative Research Centre on Intelligent Maintenance Systems (IMS), USA. Over 300 delegates attended the conference.

The international conference was set up in 2006, to run on an annual basis. The 1st World Congress on Engineering Asset Management (WCEAM 06) was held in June 2006 at Gold Coast, Queensland, Australia and organised by the CRC for Integrated Engineering Asset Management (CIEAM) and the Maintenance Engineering Society of Australia (MESA), while bringing together a number of major internal conferences, and combining the interests of both academic and industry groups. The Second World Congress on Engineering Asset Management and Fourth International Conference on Condition Monitoring (WCEAM-CM2007) were held at Harrogate, UK in June 2007.

Outline of the conference

The theme of WCEAM-IMS2008 was "Engineering Asset Management – a Foundation for Sustainable Development". There were ten keynote presentations:

> K1: Engineering Asset Management – Trends, Drivers and Challenges
> Speaker: Joe Mathew, CEO, Cooperative Research Centre for Integrated Engineering Asset Management, Australia

> K2: Risk Based Dynamic Intelligent Maintenance for Process Industry
> Speaker: Gao Jinji, Ph.D Member of Chinese Academy of Engineering, Professor of Beijing University of Chemical Technology, Ph.D candidate advisor

K3: Future Trends of Manufacturing, Maintenance, and Service in Japan
Speaker: Yuji Furukawa , the Dean and Professor for Graduate School of Technology Management, Tokyo University of Agriculture and Technology

K4: Strategic Management and Optimal Investment in Reliability
Speaker: D. N. P. Murthy, Division of Mechanical Engineering, The University of Queensland, Q 4072, Australia

K5: Progress Of Application Of Engineering Risk Assessment Technology In Equipment Management Of Chinese Petrochemical Enterprises
Speaker: Chen Xuedong

K6: Trends on Smart Instrumentation Platform for Rapid Deployment of Intelligent Maintenance System for Engineering Asset Management
Speaker: John Hanks, Vice President, Data Acquisition and Industrial Control, National Instruments

K7: Optimization of your asset through state of art Knowledge Management
Speaker: Elling Rishoff, Professor of DNV

K8: Research on the intelligent maintenance of metallurgical equipment and application of the "thousands of points controlled" engineering in Wuhan Iron And Steel Co.
Speaker: HU BangXi

K9: The technical progress on the safety management of the Special Equipment in China
Speaker: Mr. Shou Binan, The Chief Engineer of China Special Equipment Inspection & Research Institute(CSEI)

K10: The Strategic Alignment of Reliability and Sustainability Initiatives - Exploring the Connection
Speaker: Jim Henry, Global Industry Specialist in the Hydrocarbon Processing Industry/Oil Gas Marketing Segment for SKF

The proceedings of WCEAM-IMS2008 contain 237 papers from 19 counties covering 13 main streams. The statistics are provided below:

Category of papers	# of Paper
Advanced maintenance strategies (RCM,CBM,RBI)	26
Asset data management, warehousing and mining	8
Fault dianostics method	21
Design and Life cycle integrity of physical assets	6
Information systems and knowledge management	14
Intelligent maintenance systems	17
Sensors and monitoring system	27
Optimization and decision making	19
Regulations education and practices in EAM	10
Reliability modelling	17
Engineering asset management strategies and practices	18
Fault signature extraction and processing	28
Health evaluation and maintenance	26
Total	**237**

Presentations attended:

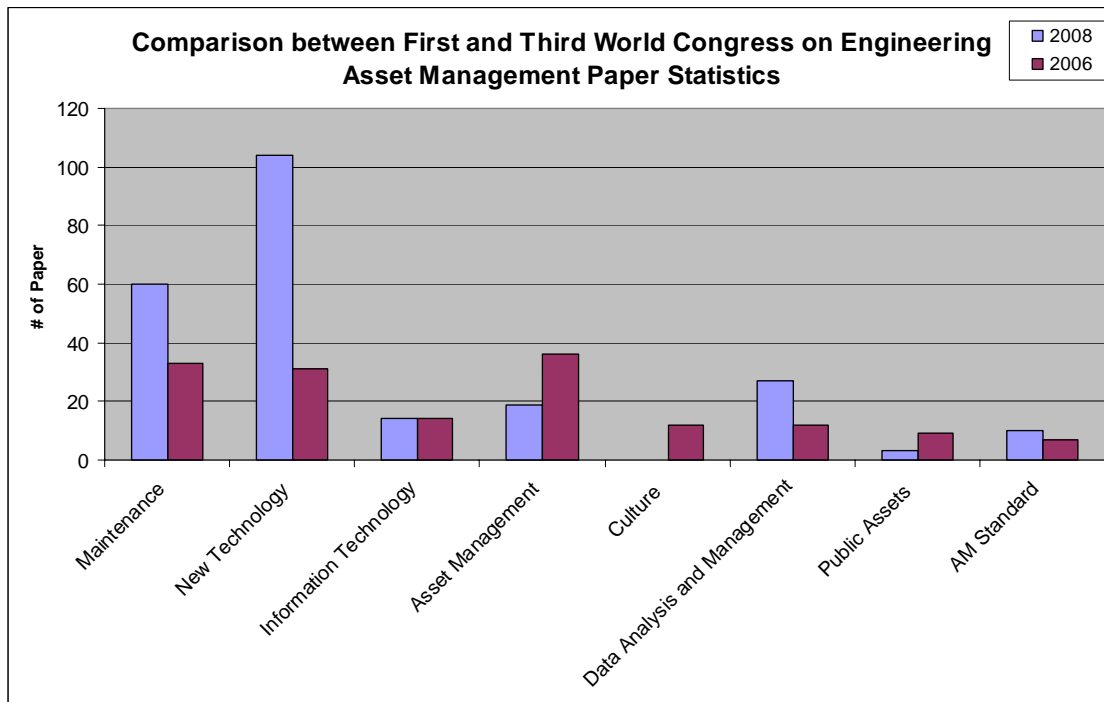Those presentations most relevant to the New Zealand were:

All 10 keynote speeches.
1. Full conference scheduled activities. Listened to over 20 papers, discussed issues with presenters, mainly on the areas:
   a. Advanced maintenance strategies
   b. Asset data management
   c. Design and life cycle integrity of physical assets
   d. Information systems and knowledge management
   e. Intelligent maintenance systems
   f. Optimisation and decision making
   g. Reliability modelling
   h. Engineering asset management strategies and practices
   i. Health evaluation and maintenance
2. I participated in panel discussion and made contributions to the discussion.
3. Presented a paper on "The Application of a Performance Management Framework". It was well received. (Copy attached)
4. Established a useful contact list for future reference.

Issues arising from the conference that may impact upon the New Zealand electricity supply industry:

As I attended the 1st WCEAM conference in 2006, I have identied the industry trends from 1st to 3rd conference by analysing the number and content of papers in each area. The following summary provides a very high level overview for the movement of focus.

The following graph showed the movement of focus from 1st conference to 3rd conference.

Comparison between First and Third World Congress on Engineering Asset Management Paper Statistics

Legend: 2008, 2006

Y-axis: # of Paper (0 to 120)

Categories: Maintenance, New Technology, Information Technology, Asset Management, Culture, Data Analysis and Management, Public Assets, AM Standard

Key points are summarised below:
  1. New technology was a very hot topic.
  - The paper number increased from 31 in 2006 to 104 with a 235% increase.
  - The conference chairperson stated that "the core of engineering activity is to create new societal existence, including both tangible assets and intangible assets, which in themselves are products of human invention and realisation of technology. These assets are the products of engineering activities, and could be termed engineering assets. As societies modernise, they increasingly depend on industries with high mechanisation, automation and sophistication to create wealth and provide services. Thus, it is necessary to create more and more modern engineering assets to satisfy the ever-increasing demands of the modern society".

- o The focuses were on engineering product design using modern diagnostic and prognostic equipment embedded within the product and new energy sources initiatives.
- o **Key implications:**
  - In a new asset selection process, it would be wiser to choose an asset with shorter life in order to minimise the risk of stranding assets and technology by-pass (smart metering is a prime example, given developments taking place in the smart grid areas),
  - The "green house" technology is coming. A research centre in Australia moved into a new-built "green house". They indicated that a potential energy saving could be up to 40%. This may significantly change the existing network planning and design methodology, and also may result in stranding of assets.

    Were there any examples of the new technology that is now being deployed in the industry that could be highlighted to the NZ industry? What are the modern diagnostic and prognostic equipment embedded within products, what information are they collecting that could be highlighted to the NZ industry?

2. **Intelligent maintenance system became one of the most crucial parts in engineering asset management.**
   - o The papers presented increased from 33 in 2006 to 60, an 82% increase.
   - o The conference chairperson stated that "with incessant improvements in production automation, maintenance plays an increasingly pivotal role in modern enterprises. Statistics indicates that the ratio of fault maintenance costs plus breakdown losses to manufacturing cost is ever-increasing. At the same time, legislation for environment conservation and safety in production is becoming more and more stringent. Maintenance, serving as the productivity and the investment for the future, as well as ensuring for sustainable development, must become one of the most crucial parts in engineering asset management."
   - o The focuses were on enhancement of advanced maintenance strategies for preventative maintenance at cost effective way without decreasing the reliability performance.
   - o **Key implications:**
     - Life cycle cost has to include ongoing maintenance cost as part of decision making.
     - Continuing to implement advanced maintenance strategy development and implement processes and tools.

     Were there any examples/information on intelligent maintenance systems/processes/tools that are being deployed in the industry that could be highlighted to the NZ industry?

Any examples/information on specific changes in life cycle costs that could be highlighted to the NZ industry?

3. **Data quality became a global issue. Data management and data analysis was one of the most crucial parts in engineering asset management.**
   - The paper number increased from 12 in 2006 to 27, 125% increase.
   - The focuses were on how to fix data quality issues, and how to feed more useful and meaningful information from existing data sources to optimise the asset management decision making process.
   - **Key implications:**
     - Data and associated meaningful information is the most important asset for a company. The quality of decision making throughout an organisation is directly affected by the quality of information available to its decision makers at all levels. Just as a large number of small raindrops can make a flood, so a large number of small but good decisions can have a powerful and positive impact on a company. The health of any company is dependant on the quality of information available to it. In turn, information is critically dependant on the quality of data from which it is drawn. So how can a company ensure good data quality?
     - There is a reasonable time lag between defining data requirements, data collection, data validation and generating meaningful information from the available data to optimise decision making.

     Were there any examples of the type of data and meaningful information that is now being collected in the industry that could be highlighted to the NZ industry?

THE APPLICATION OF A
PERFORMANCE MANAGEMENT FRAMEWORK

3RD WORLD CONGRESS ENGINEERING ASSET MANAGEMENT CONFERENCE PAPER
OCTOBER 2008

Huazhuo Lin (Ling) and Roger Oed

WEL Networks Ltd, 711 Victoria Street, Hamilton, New Zealand

The purpose of this paper is to share with other industry participants, the lessons learned in developing a Performance Management Framework (PMF) and its implementation using Performance Management (PM) in WEL Networks Ltd - a New Zealand lines company.

The paper critically analyses some of the literature on the topic. In particular it identifies the benefits claimed for a PMF and some of the reported difficulties with implementation. It then considers the historical situation within WEL shows how some of the reported problems were to be found within the original system. It will detail the steps that we have taken in developing and implementing the performance management framework within the company. We will discuss the objectives and critical success factors in the implementation of Performance Management. Examples relating to SAIDI, NPAT, Cost per Customer and other business support areas will be provided. The mechanisms for determining the effectiveness of the PMF implementation is described. The paper concludes with a case study of how the PMF has been successfully applied to improve the reliability of the network in a highly cost effective manner that has been recognised internationally.

1 Introduction

The purpose of this paper is to share with other industry participants, the lessons learned in developing a Performance Management Framework (PMF) and its implementation within WEL Networks Ltd (WEL)- a New Zealand electricity lines company.

Performance Management Frameworks (PMFs) have received extensive publicity in management literature over recent years. The benefits are widely recognised, but there is general concern that so many attempted applications have failed. (Bacal, 1998) Consequently, the fundamental validity of the model is questioned. There are however successful implementations, so what makes the difference? Historically WEL had implemented a PMF that failed to deliver the intended benefits. However, more recently it has implemented a very successful PMF. By comparing the two systems the paper attempts to highlight how to implement a successful PMF.

Firstly, the paper critically analyses some of the literature on the topic. In particular it identifies the benefits claimed for a PMF and some of the reported difficulties with implementation. It then considers the historical situation within WEL shows how some of the reported problems were to be found within the original system. Next a crisis that precipitated the change to the new system is described. The means by which the successful PMF emerged is described next. All too often systems are implemented and become part of the business without an evaluation of their effectiveness. By comparison, WEL is careful to collect feed back on how effective its implementations have been. The mechanisms for determining the effectiveness of the PMF implementation is described. The paper concludes with a case study of how the PMF has been successfully applied to improve the reliability of the network in a highly cost effective manner.

2 Background

2.1 Historical Development of Performance Management Frameworks

The ultimate goal of any company is to create sustainable profits. Annual reports are compiled to show the performance of the company over the last year. These results are compared against its goals for that year. The results of the comparison typically provide strong incentives for senior management, since their bonuses depend on them. However, until comparatively recently lower level employees did not receive any significant incentives to support the achievement of these goals. Arguably most never receive any feedback about how management perceive their performance. The key question is how can the behaviour of the employees be encouraged to be in alignment with the overall company objectives? A common answer to this question is to implement performance management.

The Human Resources Institute of New Zealand defines performance management as "The process of identifying, evaluating and developing the work performance of employees in the organisation, so that the organisational goals and objectives are more effectively achieved, while at the same time benefiting employees in terms of recognition, receiving feedback, catering for work needs and offering career guidance" (HRINZ, 2007). Central to the success of performance management is the evaluation of performance. Thus clear goals with objective measurable outcomes must be set, anything less leads to failure. These are generally called "key performance indicators" (KPIs).

Traditionally the annual accounts have provided the key performance indicators of the performance of a company. These measures are of limited value because they are obsolete by the time they are published. They cannot support effective management decision making, especially in the dynamic business environment of today. Further, as already explained, they are generally considered irrelevant by the average employee. However, up until about the Second World War they were adequate due to the less dynamic nature of the business world.

In the 1970s Japanese companies gained a critical competitive advantage through the application of statistical process control, total quality control, six sigma and such processes. (Bounds et al 1994; DeCarlo &Hodges 2007) The basic idea is to create continuous improvement through measuring multitudes of parameters within a process. Statistics were applied to identify deviations early. By contrast with the annual financial reports, these measurements provided timely information. Thus operators and managers are able to make better decisions, so deviations are contained before they can adversely affect the business. The basic assumption with this method is "take care of the pennies and the pounds take care of themselves". Or in business terms, ensure that the detailed processes are not producing deviations and the profits will automatically follow. Fifteen years of Japanese recession have given the lie to this assumption.

At the other extreme, an alternative approach is to adopt management by objectives. The basic philosophy is to ignore the details of the process and focus on the goals or outcomes. This assumes the processes will somehow be created in order to meet the defined goals. But this does not appear to happen in practice. (Bacal, 1998a)

Kaplan and Norton (1992) recognised the failings of these methods and developed a more holistic, integrated approach. In recognition that it was a balanced amalgamation of previous attempts to score performance they called it a "Balanced Scorecard". The Balanced Scorecard is a model that can be used as the foundation on which to build a performance management framework. The Balanced Scorecard approach considers that both goals and processes are important and provides a model for creating KPIs for both in holistic way.

2.2   Barriers

Many companies have attempted to implement a performance management framework, but without realising the promised benefits. There are a variety of reasons for this some of the key ones appear to be: (Bacal, 1998b; Hittmann et al, 2007)

- The lack of management
- The lack of a clear organisational vision and strategy
- Confusion of purpose
- The difficulties of defining good metrics that correctly motivate employees
- Lack of training and support
- Lack of trust between boss and employee

Management commitment is essential to the success of any endeavour within a company and this support must come from the CEO down. (Parmenter, 2004) Any wavering in senior management support causes the endeavour to be undermined. This is particularly true when implementing a performance management framework, which affects the whole company. There is a natural reluctance for people to allow themselves to be held accountable for their actions, so unless senior management set the example, others in the organisation will not comply. In one overseas example senior management were so uncomfortable with being assessed that they did all they could to cover-up areas needed for development and were extremely protective of one another. The implementation failed. (Christensen 2006)

In order for a performance management framework to work it must be a "living" system. Senior management commitment is needed to ensure this happens. That is the company must dedicate resources to recording and reporting on the metrics. It must make time available and insist on regular performance reviews – monthly reviews at a minimum. (Barker, 2007b) It must be seen as core to the normal functioning of the business, and therefore the responsibility of every manager and subordinate– not delegated (or maybe relegated) to the human resources department.

The fundament principle of performance management is the employees receive rewards for performance (may just be a compliment on performance) that assists the company achieve it strategic objectives. If there is insufficient management commitment, then the resources are not made available to provide the tangible and intangible that people need for their motivation.

Sometimes the problem rests not with the performance management framework, but rather with the lack of vision and strategic focus within an organisation. (Porter 1996; Travers in Read 2007 p.63). This is particularly crippling for a performance management framework, since its whole intent is to bring alignment between individual performance and the company strategic goals. It is possible to have a vision, strategic goals and critical success factors that are not aligned with each other. This creates confusion at the highest levels of the company and filters down through any performance management framework that is in place. WEL Networks Ltd experienced just such confusion with its first attempt at implementing a performance management framework. At the lower levels within WEL managers were setting key performance indicators (KPIs) for their subordinates whereby they were competing for resources with their colleagues – and as we all know "a house divided against itself cannot stand".

Confusion can also result when the purpose of the performance management framework is not clearly annunciated by senior management. Problems can arise when attempts are made to use it as a career path planner (involving co-operation between manager and subordinate) or to highlight poor performance (an adversarial situation). (Bacal, 1998c) Where the idea is to set the goals in consultation with the subordinate, it creates somewhat of a pretend relationship, because ultimately the manager has the final authority and the subordinate knows that. Within WEL under the first performance management framework personal goals were set in this manner. In theory training was available to help the subordinate achieve the agreed goals. The subordinates agreed to the goals hoping that they could meet the targets, but knowing no training was forthcoming.

One of the classic problems associated with performance management systems is the difficulty of creating objective performance measures. (Bacal, 1998d; Kerr, 1995) A typical mistake it to create say a ranking for each measure, say within a range of 1 to 5, where 1 is poor and 5 is excellent. It becomes subjective when the rankings are described as unacceptable, poor, adequate, good and excellent. Each person has a different

perspective on what these words mean and the same person will probably apply them differently to different subordinates. Objective measures are essential if the performance management framework is to be fair and more importantly be seen to be fair.

Typically performance reviews are undertaken once a year. But effective reviews are reliant on both the manager and subordinate being able to communicate sensitively, yet honestly. This can only happen where there is a good level of trust. Trust is not cheap. It can only be established through consistent fair behaviour over time. Gradually people are able to become more open with each other. Unless a conscious effort is made to establish that trust between each contiguous reporting level, then the performance management framework cannot function correctly. It certainly will not work with only annual reviews.

2.3   WEL Networks Ltd – the Company

WEL is the fifth largest electricity network company in New Zealand. WEL delivers energy to more than 81,000 homes, businesses and organisations throughout the Waikato region. The Network incorporates more than 5,000 kilometres of line and cable, and has an annual throughput of over 1,130GWh. WEL has total assets in excess of $330 million. The Company employs more than 160 staff and has its headquarters in the city of Hamilton - 130 kilometres south of Auckland. WEL follows strong commercial principles and is fortunate to have an expert Board of Directors. WEL is committed to providing reliable power at good prices and is focused on being a world-class supplier of energy services.

WEL Networks Ltd is taking steps to help achieve the national target of 90% renewable energy generation by 2025. The company is currently exploring alternative power generation to complement its core business. It operates a 1MW landfill gas generation plant, and is working through the consent stages of a 80MW wind farm project.

WEL Networks Ltd has one shareholder, the WEL Energy Trust. The main beneficiaries of the Trust are local councils; Hamilton City Council, Waikato District Council and Waipa District Council. The Trust requires the company to manage its assets in a commercial manner. As an alternative to dividends the Trust requested the funds be returned to the 81,000 consumers. To do this the Company introduced an annual discount programme that has resulted in discounts of approximately $104 million to customers over the past six years.

3   The Historic Performance Management System

The original PMF implemented by WEL had a number of short comings. It did not produce alignment with the strategic goals of the company because individual managers were able to independently set goals for their subordinates. Consequently, the managers set goals that would optimise the performance of their group, but actually created conflicts with other groups. There was therefore no alignment between the mission statement, strategic goals and individual KPIs. That is there was no line of sight from the individual up to the team and on up to the company level. Thus the PMF failed to generate the very benefit it is designed to produce. Instead, there was confusion of purpose.

Furthermore, the KPIs were typically subjective. Even where they were objective measures, managers were found to have superimposed their own subjective judgements, usually to the detriment of the subordinate. However, this was not always the case, some departments received 100% bonus where no objectives had been set. Senior management even changed the basis for awarding bonuses when it was realised that staff would receive a large payout. This was counter productive to both motivation and trust.

It appears that the senior management of the time did not subject themselves to the same PMF as the rest of the company, which is a further indication of lack of management commitment to the process. It has been reported that everyone knew what the strategic goals were at the time, but all felt they were irrelevant to the daily work.

At this time there were significant "political" wranglings over the ownership of the company. Full control eventually passed from an American company to the community owned trust. This change of ownership brought a very significant change of priorities to the company, so it is not surprising that it had been difficult to implement a successful PMF.

4   Second Attempt
4.1   Drivers for Change

Crises precipitate change. A new CEO was appointed to the company at about the same time as the Government decreed that the electricity lines companies could not be both a retailer and owner of monopoly assets. WEL had to sell off its retail business. This in effect created a crisis of identity. Other drivers were also significant at the time. The regulator introduced the first of the 5 year regulatory periods and the owners, the Trust, vigorously challenged WEL to improve the value returned to it. One of the key problems management

identified at this time was that the company culture was rather "laid back" and not performance driven. The CEO engaged international consultants to undertake a bench marking study, comparing WEL with similar businesses overseas. This identified the need for the company to undergo a process re-design assessment. The consultants used the model developed by Tom Peters and Robert Waterman, and first published in 1983, as the basis for the assessment. (Peters & Waterman 2004) The re-design began in 2003, with the following objectives:

- Improved effectiveness and efficiency
- Informed decisions regarding organisation structure
- Formalisation of ad-hoc arrangements
- The development of a common understanding on how WEL works
- The identification of specific gaps and bottlenecks in key processes
- Consistency throughout the organisation.

The re-design created eleven master processes. The following master processes have been defined:

- Asset Investment Strategy
- Business Development
- Business Support
- Contract Strategy and Management
- Corporate Governance
- Operate and Restore
- Performance Management
- Revenue Management
- Strategy and Planning
- Staff Development
- Works Delivery

The overall architecture of the WEL master processes is shown in Figure 1.

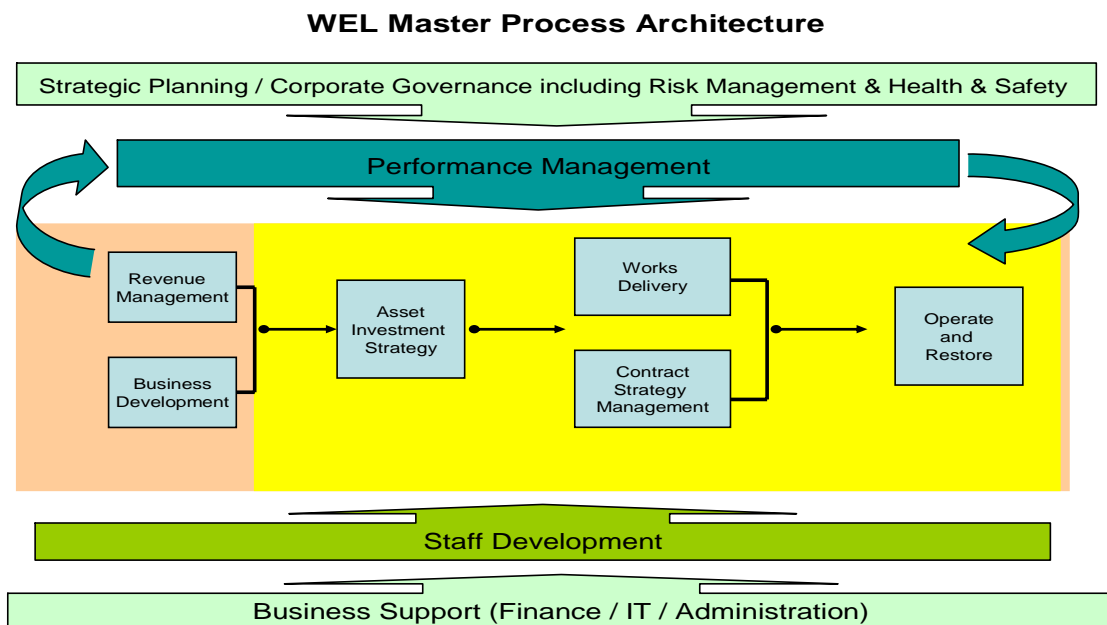## WEL Master Process Architecture

Figure 1 The Master Process Architecture

Each master process was described by a hierarchy of three levels. The top level, level 1, is very simple. It has a set of inputs, a process, which generates a set of outputs.

4.2 Implementation

A fundamentally important change was made to the conventional approach of defining the inputs. Conventional management thinking of the time dictated that the inputs should be derived from the business plan. However, this assumes the business plan is in alignment with the strategic goals, which is not necessarily true. Instead, the processes must be created using the strategic goals as inputs to the master processes - the goals being derived from the company vision. This is vitally fundamental because it ensures that all the processes are implicitly in alignment with the vision and strategic goals of the company. The business plan is then produced using the appropriate master processes and is implicitly in alignment with the business objectives of the company.

The first two processes to be developed were the Contract Strategy and Management Process and the Performance Management Process. While the work of Peters and Waterman was used for the overall assessment, the work of Kaplan and Norton on Balanced Scorecards was used to develop the performance management framework. They highlight the importance of the need for extensive analysis in order to understand the interrelationships within the company. WEL performed an extensive sensitivity analysis in order to deduce the interdependencies and the extent to which any one factor influences the achievement of the strategic goals. This is a critically important factor on which the success of the whole implementation depends. Further, note that identifying the sensitivities for the strategic goals is only practical if the strategic goals are the inputs to the master process at level one. The sensitivity analysis for network reliability (one of the strategic goals) is shown in Figure 2. (The wider the bar, the more sensitive network reliability is to the associated parameter.)
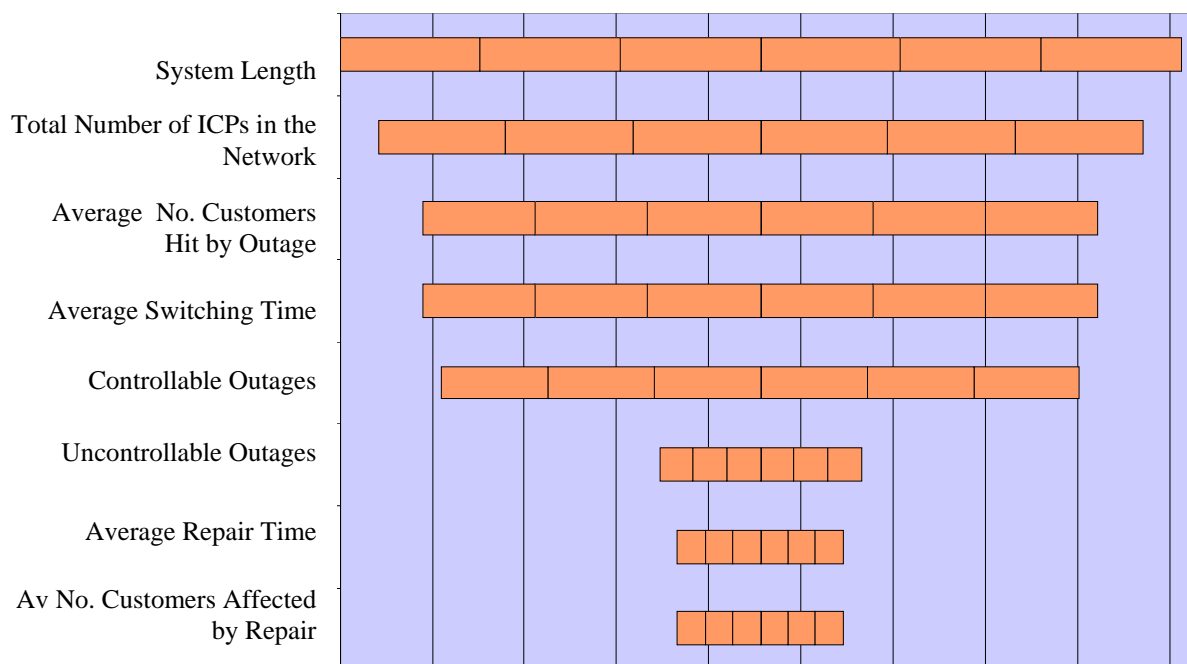
Figure 2 WEL Sensitivity Analysis for Reliability

The sensitivity analysis is vitally important in determining KPIs for the PMF. Arguably the most critical part of implementing a PMF is the definition of an objective, coherent and fair set of KPIs that provide alignment with the strategic goals for all parts of the organisation. A sensitivity analysis is the key to creating a set of KPIs that meet these criteria. Many implementations of a PMF, using the most sophisticated software on the market, fail because there are too many KPIs and they create tensions between different parts of the organisation due to their lack of coherence. A sensitivity analysis exposes the one or two really important parameters around which a small number of coherent KPIs can be built. Further, and perhaps most importantly, these KPIs directly impact the strategic goals, which ensures alignment (or line of sight) between the performance of the individual and the company vision and strategic goals. The application of the WEL PMF to network reliability is discussed in more detail in later sections.

The process re-design produced new processes, new roles and a new company structure. It did result in a company restructuring in which the number of executive managers was reduced from eight to four. Others were also made redundant. It produced a company conforming to the Peters and Waterman principle of 'simple form, lean staff'. (Peters & Waterman 2004)

After people had been appointed to their new positions, business had to continue as usual. In some situations people continued working in their old roles even although they were supposed to have transferred to the new one. This was a serious problem, because the company had made a major investment and created a upheaval for the staff, but was failing to reap the benefit. The prognosis was bad.

Two key appointments were made that changed the prognosis. One was the appointment of an external recruitment to the position of GM Operations and the other an internal appointment to the position of Performance and Data Manager, reporting directly to GM Operations. Both these people are performance outcome orientated and very capable and have complementary skills. It was then that the paper changes became reality and the company has continued to reap the benefits of the changes.

The CEO was already highly committed to the changes, but these two appointments brought that commitment down to the functional level of the organisation as well. This resulted in the necessary resources of time and material being allocated to the PMF. Time is a key. An effective performance management framework requires trust between the manager and his subordinates. Annual performance reviews cannot achieve that level of trust. WEL have monthly performance reviews, each one lasting approximately one hour. Not only is performance reviewed, but there is always opportunity for discussing personal issues as well.

All levels of management participate in giving and receiving performance reviews. Hence each successive level of management is taught by example how to give a performance review. It is effectively training by mentoring programme, which at least one study has shown is the most effective way of learning.

Due to the high level of management commitment financial resources are made available for training to help employees improve their performance. Approximately, 80% of WEL staff are engaged in some on-going training programme.

With the complete commitment of management, the alignment resulting from the well designed KPI structure and development of trust the culture at WEL has changed from being relatively "laid back" to a performance driven one.

4.3   Evaluation

Performance Management was adopted as the mechanism to ensure the following benfits:
- Clear linkage between the company vision and strategic targets
- Alignment of performance objectives and business activities through the establishment of that clear linkage.
- Clear accountability at all levels - from executive to individuals, for the delivery of performance objectives.
- Improved relationships with critical business partners through an agreed sharing of common goals. E.g. Alliance contractors
- An effective team working environment
- Provision of easier and more effective monitoring of performance so that shortfalls can be handled sooner.

Before the performance management framework can be used to measure the other process outcomes it must be validated itself. This happens in two key ways. Firstly, after the PMF had been implemented it was audited by an external consultant to see if the initial objectives had been achieved. The following is an extract from that report. (Sage Technology 2005)
- *WEL Networks has fully implemented the "line of sight" performance measures for the three key performance drivers – NPAT, CPC and SAIDI.*
  - *These measures have been cascaded from key strategic plan items through to group plans and individual performance measures where appropriate. This is bringing a focus on the "right things" as determined by the board and organisation.*
  - *At a group level, we now understand how all of the factors that drive performance come together to determine the overall performance outcome for the organisation*
  - *There is clear accountability for that performance at all levels of the business*
- *Individual staff has been engaged in delivering performance through the performance and bonus system.*

– *Individual performance plans include sub elements of the key performance drivers and measures. In addition, the reporting at "Info Share" and team meetings has kept the focus on reviewing and taking action to improve performance.*
- *The process has also increased the knowledge about how an individual can contribute to the teams success*
- *There is clear evidence of corrective action being taken to address performance gaps in the key measures – e.g. SAIDI and Cost Per Customer helping ensure the organisation meets its key targets*
- *There is evidence that this has become "part of the way we do business" in many areas of the organisation, particularly in relation to the three key performance drivers*

In summary as at 2005 all the benefits had been realised, except the one relating to alliance partners as it was not so relevant at the time of the evaluation.

Secondly, the Executive evaluate the functioning of the PMF in conjunction of the strategic and business planning process annually. And finally, it provides a self check, because if the company strategic goals are not being met, then it is highlighting a problem and the PMF provides the mechanism to identify the cause of it.

The goals of the process re-design were defined above to be:
- Improved effectiveness and efficiency
- Informed decisions regarding organisation structure
- Formalisation of ad-hoc arrangements
- The development of a common understanding on how WEL works
- The identification of specific gaps and bottlenecks in key processes
- Consistency throughout the organisation.

The PMF has contributed towards the achievement of these goals. In particular it has provided consistency throughout the organisation because of the alignment with the strategic goals that it creates. The improved communication has increased the level of understanding throughout the company. The PMF has identified gaps in skill levels and provided a mechanism to close the gap for the individuals and teams concerned.

5   An Alternative to the Performance Management Framework

The performance management framework is mechanistic in nature and is very well suited to those who have clearly defined roles who are highly motivated by monetary reward. However, where employees are engaged in creative type work, this model may not be the best. An alternative approach is to build a "Creative Management Framework". A number of key factors have been identified in various papers. (Dollinger, 2003b) (Evans & Wolf, 2005) (Florida & Goodnight, 2005) Some of them are:
- Define the foundational values of the organisation. From the values comes understanding of what is the right value for the company to create and the right way to create it (Barker, 2007a). Examples might be to a provide sustainable and positive benefit to mankind and a satisfying and harmonious work environment for all staff, so all feel valued and appreciated
- Careful selection of people, looking for those who have internal motivation. Internal motivation is characteristic of creative people
- Provide good monetary reward, but more than that provide recognition, both within the organisation and outside it. One highly motivating reward for such people is the responsibility of an even more challenging project than the last one. Rigorously seek out what motivates each individual and group within the company and reward accordingly
- Provide generous opportunities for people to develop intellectually. WEL pursues such a policy
- Dedicate resources to caring for employees in tangible and intangible ways, so that they feel valued. WEL also practices this
- Remove obstacles. This may mean re-organising work, creating positions tailored to individuals or hiring extra staff who are more gifted in areas that other people would find boring
- Give permission for people to experiment and make mistakes, but within the constraints of the values of the company and management lead initiatives. View mistakes as highly valuable learning experiences. This could be viewed as an ideas friendly culture. Create a framework to support the adoption of new ideas, which includes scouting, packaging, advocating and implementing
- Encourage attention to details and "doing it right first time". This includes rigorous and thorough testing
- Actively encourage the development of relationships with customers, so that they become an integral and valued part of the software development life cycle. The reason being that creativity needs to be viewed as a product of interactions rather than a collection of ideas. Therefore the wider the

interactions the better the creation

- Managers are appointed by virtual of managerial and technical skills, not either factor by itself. This may require management training for technical people. Managers remain practitioners as well
- Ensure management support for these principles at all levels of the organisation
- Relationships of trust developed over the long term

In order to implement some of the above policies a long term financial perspective is imperative, which may involve a radical shift from the classic model of a publically listed company. ESRI is the leading global supplier of geographic information systems and is privately owned. Tait Electronics in Christchurch, New Zealand is privately owned. SAS, the software giant, is privately owned. All three companies re-invest large proportions of their profit back into the company. They are not constrained by the expectations of the stock market. This suggests that the best model for a creative company is private ownership instead of the apparent glamour of public listing. WEL is fortunate in this respect that it is wholly owned by a community trust.

Motivating people in a creative environment rests on two tenants. Firstly, that they are highly self motivated and secondly that gaining a high the reputation for one's name is a great reward. This appears to be essence of the SAS model for motivating its employees. Interestingly this framework accords with the Hebrew view of nature of man. It recognises the holistic nature of an individual, who has an inner life (where motivation originates) and has the outworking of the inner life, which is visible to others. Interestingly, the Hebrew word for this outer appearance can be translated "name". So carries the idea of who we are, our reputation as a person. (Vine, 1984). Thus the inner and outer life corresponds to self motivation part of the creative management framework and the outer appearance corresponds to imputing of good reputation to one's name. By contrast the Greek view is to compartmentalise man, the two most significant parts are body and soul. This is the basis for many of the Western views. The fact that the creative management framework works so well calls into question the Greek perspective.

The performance management framework is based on a more mechanistic, Greek, view of human behaviour, which can be isolated from the fundamental essence of who a person is. Further, the primary rewards a monetary, and this is where the real focus is in practice - although some would challenge such an assertion. A performance management framework can be very effective in encouraging desired behaviour (Kaplan & Norton, 1992), but can be in mechanistic with comparatively narrow outcomes. The creative management framework may be a good model to apply to the design team at WEL.

6   Detailed Case Study of the WEL Performance Management Framework

6.1   Background

WEL Networks is a company that focuses on continuous improvement and a key component of this continuous improvement drive has been its investment in internal process redesign. One of the first processes to be redesigned and implemented was the Performance Management Process - a critical component for understanding how WEL'S business outcomes are planned and achieved.

WEL Networks has completed the development of the Performance Management Framework, set the targets, implemented the measures, and assigned accountabilities to staff. Four years after the implementation, significant benefits have been realised.

At WEL the Performance Management Process is a core process that facilitates successful delivery of outcomes against the business and strategic plans. WEL's Performance Management Framework is a means by which every person in a group can understand how they positively contribute to the agreed goals of the group. When shown in a diagrammatical form, a PMF looks very like an organisational chart in structure. The PMF demonstrates a direct link from the Company vision and strategic direction through to executives and individuals contributions to the desired business and personal outcomes. There are four components for each identified contributing factor:

1. Objectives;
2. Measures for the objectives;
3. Processes including systems, tools and data to be used to deliver the required outcomes; and
4. People who are responsible for the outcomes.

As the Company strategy changes so do the performance measures and targets. The process is robust enough to support these changes, indeed this is one of the core facets of the process.

6.2 Requirements

The Process and Framework must be meaningful and measurable so that users of the process easily and clearly understand how their contributions support the Company vision and strategy.

In order to limit the amount of subjective decision making, the process must be based on clear and defined policies. The process must have clear accountabilities for outcomes and be supported by a rigorous Performance Management Framework.

The development of performance measures, target setting and testing, monitoring and reporting of results is essential in ensuring ongoing alignment to strategic targets.

6.3 Critical Components of the framework and process

The following components are necessary to ensure clear staff understanding of the strategic direction and successful delivery of the desired outcomes:

- People: the people need be from the 'right' culture, have the 'right' skills and be in positions that have appropriate accountability;
- The Process / System must be focused on efficient and effective business outcomes and there must be clear business ownership of the Process/System;
- There must be Shareholder objectives focused on the delivery of shareholder outcomes; and
- Customer objectives focused on satisfying customer and regulatory demands

6.4 Scope

The scope of the Performance Management Process ranges from the identification of performance requirements through to accountability for results, target setting and testing, performance data collection, performance monitoring and reporting, corrective action development and implementation, effective communication, and input into other core business processes.

It is particularly important as a key input for the refinement and enhancement of company strategy.

The Process is designed to ensure that performance shortfalls are identified as early a possible so there is time for remedial action.

The Performance Management Process flow, at a high level, can be defined in 11 basic steps:

1. Development of a performance management strategy and framework
2. Identification of performance management requirements
3. Assessment and prioritization of performance management requirements and requests
4. Establishment of performance management measures
5. Design and establishment of a performance management data collection framework
6. Establishment of performance management targets
7. Design of reports
8. Collection, validation and storage of data
9. Report on and assessment of results
10. Development of corrective action plans
11. Consideration of lessons learned from Process Review

6.5 Performance Management Process Redesign

- The following documentation was produced:
    o Level 1, 2 & 3 Process Maps – these were basically flow charts illustrating the relevant steps in the Process at different levels of detail.
    o Process Guide – a document explaining each step in the process.
    o Change Matrix – a document outlining the changes required from current practices to transition to the new process.
    o Information Dictionary – a listing of information requirements for each process step.
    o Competency Matrix – an outline of the skills required by staff to enable them to undertake the new process.

6.6 Performance Management Framework Development

- The framework established the linkage between the Company vision and its strategic targets.

- It encompassed strategic measures, individual measures of the System Average Interruption Duration Index (SAIDI), Net Profit After Tax (NPAT), Cost per Customer as well as other business support measures such as corporate governance, business administration, legal support, and risk management, etc.
  For each measure, the objectives were identified, the process needed to manage the outcome was clarified and the accountabilities were set.
  For example, the Performance Management Framework illustrates the clear link between measures - the strategic SAIDI measure, the System Average Interruption Frequency Index (SAIFI) measure and the Customer Average Interruption Duration Index (CAIDI) measure, and the Company's maintenance, investment, operation and contracting strategies.

6.7   A Practical Illustration of the WEL Performance Management Framework

This diagram is part of the WEL's Performance Management Framework on reliability.
(Note that in the diagram, the term *objective* is synonymous with *goal*.)

Performance Management Framework Example - Fred
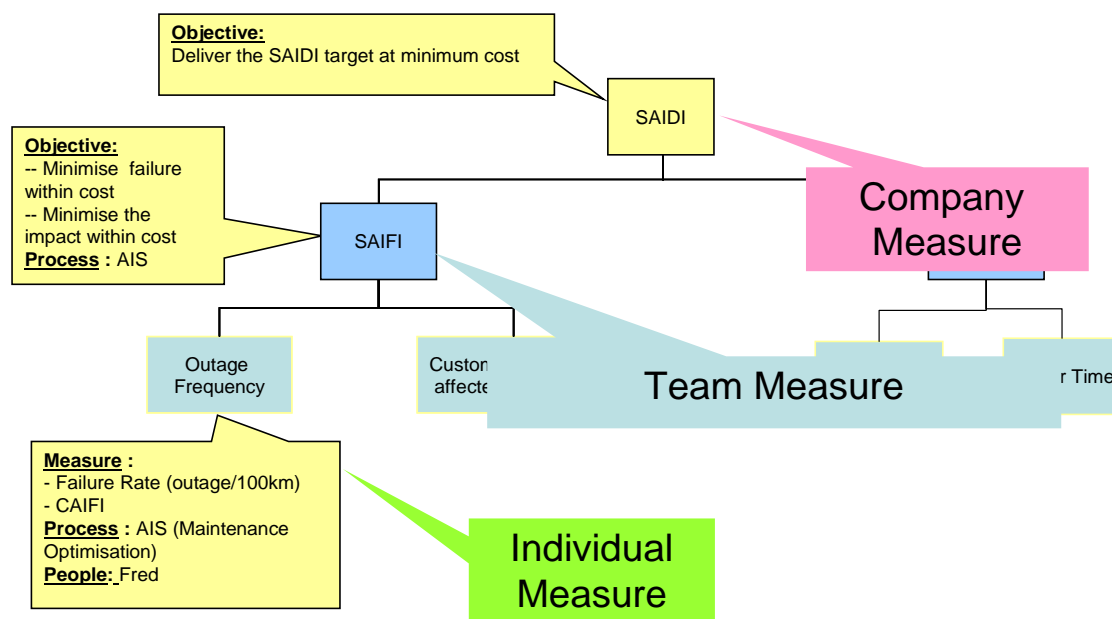
Figure 3. Diagram for the demonstration of a PMF

The diagram shows that:
- Fred is solely responsible for optimising the maintenance strategy of network equipment.
- Measures of his individual contribution are, Failure Rate and Customer Average Interruptions Frequency Index (CAIFI) - two different aspects of Outage Frequency.
- Outage Frequency contributes to SAIFI.
- Fred's work team has SAIFI as its group measure. So as a member of this team, Fred has an interest in Failure Rate, CAIFI and SAIFI.
- SAIFI contributes to SAIDI. SAIDI is one of the strategic objective measures of WEL
- Fred's team works for the Company. As a member of this team Fred has an interest in Failure Rate, CAIFI, SAIFI and SAIDI
- So, Fred can look at the PMF and understand exactly how his individual contribution and that of his team, are supporting the Company objectives.

6.8   The SAIDI (System Average Interruption Duration Index) Pilot

WEL decided to pilot the use of the Performance Management Framework in one key strategic objective, measured by SAIDI.

The pilot was very successful and delivered the following outcomes:

- The completion of a Measures database. This is a repository for all information about measures including identification of the Outcome Owner (who is the person accountable for delivering the required targets), the Measure Owner (the person who is accountable for ensuring that the collected performance data is validated against the measure), the Team Contributors (who are those staff members that either directly or indirectly contribute to the outcome), and other measure parameters such as unit, frequency etc.

- Agreed five-year indicative targets for sub-measures of SAIDI are in place. The process for target setting was based on historical performance, benchmarking of peer companies and best practice. We have established what improvement is required by both our customers and the regulator, both at the appropriate levels.

Understanding the relationship between the SAIDI requirement and permitted expenditure was critical. It was found that as reliability improved, the incremental costs to save another SAIDI minute increased dramatically. Awareness of this ratio, enabled planners to amend proposed targets, confidently set final targets and make plans for outcome delivery.

Also, a clear understanding of the relationship between target setting, planning and budgeting was required. If target setting occurred in isolation then there were no checks and measures in place to ensure that business activities delivered the required targets. It was also necessary to take into account the lag in benefit realisation due to timing issues occurring in the annual target setting process.

The pilot's Target Setter was responsible for communicating PM measures and targets to all stakeholders in order to ensure their acceptance and 'buy-in'. It was important to undertake this indicatively at first. Then all the agreed assumptions and methodologies were documented. Targets were revised and then finalised after the budgeting process was complete. (including any changes due to the budgeting process)

The company also needed to understand the trade-off between capital and maintenance expenditure. The real question was, 'What is the most efficient way to spend our money, on capital or maintenance, to make the biggest improvements in SAIDI results?'

A strategy was developed to ensure that correct investment, maintenance, operation and contracting prioritisations were in place.

As a result of the work on the SAIDI pilot, accountability for specific outcomes was clearly allocated to individuals and teams. This led those staff involved to react when they recognized that they lacked the relevant information and correct tools for the job.

One outcome of the PMF pilot was the development of a prototype Network Reliability Monitoring System.

- The purpose of the Network Reliability Monitoring System was to provide a central location to capture in chronological sequence all the relevant data associated with failure events.

- Once captured, the data could be used for Root Cause Analysis (RCA) of performance gaps. After analysis, feedback could be given to the appropriate manager so that a suitable corrective action plan could be developed, gaps could be closed and knowledge gained be incorporated into long-term scenarios.

Now, after the successful completion of the reliability pilot, WEL is applying the same PM techniques to the remaining strategic objective i.e. NPAT *(*Net Profit After Tax) and Cost per Customer

6.9   Performance Management Reporting System

Performance Management needs to be transparent. The way measures and target data is published is critical. An effective reporting system helps:

- Outcome owners to ensure they are on track towards their target
- Owners of all outcomes so they can have confidence that their own efforts are not being undermined by another outcome owner
- Management for an overview of the progress to the target and timely corrective action if needed

To aid in this transparency, it was decided to build a prototype reporting dashboard using the spreadsheet and database tools that were already available for short term planning. The most important features of this dashboard were:

- A single access point for all performance information
- Drill down system that mimics the PMF

- The use of modular applications - this would allow easy modification in the event of changes to the PMF.
- Displays showing the actual value of each measure and target, and colour coding of under- and over-achievement as well *as 'this time last year'??*
- A 'click-through' connection to contributing measures, full explanation of the measures and targets and to 'slice & dice' performance reporting tools

This system helps the following on-going process steps being undertaken

- Performance data collection, validation and store
- Performance monitoring & reporting,
- Corrective action plan development and implementation,
- Lessons learned.

6.10 Staffing Structure

WEL is well advanced in establishing a performance-driven culture. We believe we have gone a long way to ensure the right outcomes are delivered by selecting the right people for key positions. We have an executive team focused on strategic issues who have clear accountabilities for achieving these. At the operational level the focus is on business delivery, again with clear accountabilities in place.

6.11 Performance-Based Incentives

WEL has established a linkage between the PMF and our performance bonus system. This linkage was established by restructuring the existing bonus payment system. The restructured system contains the following four key components:

1. Company strategic targets that reflect company-wide success or failure at the highest level.
2. Team targets that encourage collaborative team-work by setting common goals for a number of individuals in a group and use common measures to assess success or failure.
3. Individual targets. These encourage personal accountability for outcomes.
4. Cultural / Personal Development Targets that foster personal development and cultural change.

The business has allocated different weightings to each of these areas in order to reflect the importance of each area and the different influence of staff.

6.12 Performance Outcomes from the Implementation of PMF

6.12.1 The establishment of a Performance Driven Culture

WEL has established a performance-driven culture through its implementation of a PMF. In October 2005, Sage Technology, an Australian consulting firm was engaged to assess if the Performance Management Process Implementation had achieved its aims.

The overall assessment of Sage Technology found that the performance management process had been well designed, had been thoroughly implemented (particularly in relation to the three key business drivers), and required very little enhancement at that time.

NPAT, CPC and SAIDI were the three key performance drivers that Sage found had been fully implemented with "line of sight" performance measures. These measures are cascaded from key strategic plan measures through to group plans and to individual performance measures where appropriate. This cascading brings about a focus on the "right things" as determined by the company Board and Executive team.

At a group level, we now understand how all of the contributing factors that drive performance come together to determine the overall performance outcome for the organization. There is clear accountability for that performance at all levels of the business.

Individual staff members have been engaged in delivering performance through the performance and bonus system. Individual performance plans include sub elements of the key performance drivers and measures.   In addition, the reporting at monthly "Information sharing session" for all staff and team meetings has kept the focus on reviewing progress and taking action to improve performance.

The process has also increased the knowledge about how an individual can contribute to the team's success. There is clear evidence of corrective action being taken to address performance gaps in the key measures – e.g. SAIDI and Cost per Customer, helping ensure the organization meets its key targets. There is evidence that this has become "part of the way we do business" in many areas of the organization, particularly in relation to the three key performance drivers.

The review of reliability targets was undertaken using the performance management methodology. This included determining and re-setting the original measures from board level through to the individual level, and also a review process which determined the point at which it no longer became economic to continue to seek reliability improvements.

The performance management process was used to re-focus and improve the maintenance program through analysis of units, costs and volumes. This analysis identified areas on the network which required action – e.g. the insulator replacement program.

The process of identifying current and potential performance gaps, analysing reasons for those gaps and taking action to close them is becoming routine. Some examples are

- The integration of key performance drivers developed in a two-company alliance partnership that is now defunct using the performance management (PM) process.
- A detailed understanding of Call Centre performance was developed using the PM process and this led to a decision to propose outsourcing of the service with possible savings of $190,000 per annum.
- Corrective action was taken by the Executive Group to address an unacceptably high Cost per Customer.

Some further opportunities for development and 'fine-tuning' were identified. Some important ones are:

- Further development of a performance driven culture partly by using the technology of choice to deliver performance goals and progress to the desktop of all employees.
- The establishment of a fourth key performance driver. This driver would relate to people (staff members? personal aims and plans?) and would use the performance process to establish the appropriate measures and targets.
- The provision of both initial training for new employees and refresher training in the performance management process. Key WEL cultural values would be included in this training.

6.12.2 Reliability Projects

WEL Networks Ltd (WEL) embarked on a reliability improvement project as an outcome of adopting the PMF. The performance management process and PMF has been used to guide consultation with customers, to increase the understanding of performance drivers, to improve project planning, to optimise decision making, to increase the effectiveness of communications, to improve ongoing performance management for project delivery and to add to knowledge about continuous improvement.

The requirements identified from customers resulting from the consultation were an opportunity for WEL to develop an innovative approach to asset investment. The result has been a synergistic fusing of business drivers with sound engineering practice. The benefits to the company and community are far-reaching, so much so that the work has received international recognition.

6.12.2.1 Customer Focus and Consultation

WEL has a regulatory SAIDI threshold of 109 SAIDI minutes. However, after this threshold had been set the Executive announced a more ambitious target of 50 SAIDI minutes. In order to gauge consumer reaction to this new target, a survey was conducted in 2003. The results indicated that the consumers expected a reliability outcome equivalent to about 58 SAIDI minutes. The CBD was exceeding customer expectations, but the other areas were not. This is shown in the output and SAIDI in Figure 4 below. Because WEL is makes long term

Calculated SAIDI from Survey Result (excluding 400V)										
Customer Group	Historical performance for the HV outage #					Input from survey		Output		
	0	1	2	3	>=4	Acceptable Ouage Number / Customer / Year	Average duration (minutes)	SAIDI (minutes)	SAIFI	CAIDI (minutes)
CBD	98%	2%	0%	0%	0%	1	41	0.03	0.00	41.00
IND-M	78%	22%	0%	0%	0%	2	34	0.06	0.00	34.00
URB-C	57%	18%	6%	6%	13%	1	35	2.27	0.06	35.00
URB-R	40%	19%	16%	7%	17%	2	53	34.78	0.66	53.00
RDL	6%	13%	20%	2%	59%	3	56	20.50	0.37	56.00
Rural	50%	0%	0%	50%	0%	4	77	0.25	0.00	77.00
Grand Total								57.89	1.09	52.97

Those customer groups should be our focus

Figure 4   Survey results for reliability improvement

investment decisions and customer expectations change over time, it wished to provide a superior supply for its customers current expectations. Accordingly, the company opted for 50 as its SAIDI minute target.

The SAIDI count recorded by WEL at the time of the survey was approximately 80, so the customers were desirous of a significant improvement in reliability. However, a significant cost can be associated with significant improved reliability. The community was consulted to determine what it felt was the acceptable trade-off between cost and reliability. The results of Figure 5 shows they were generally unwilling to pay a significant cost increase.
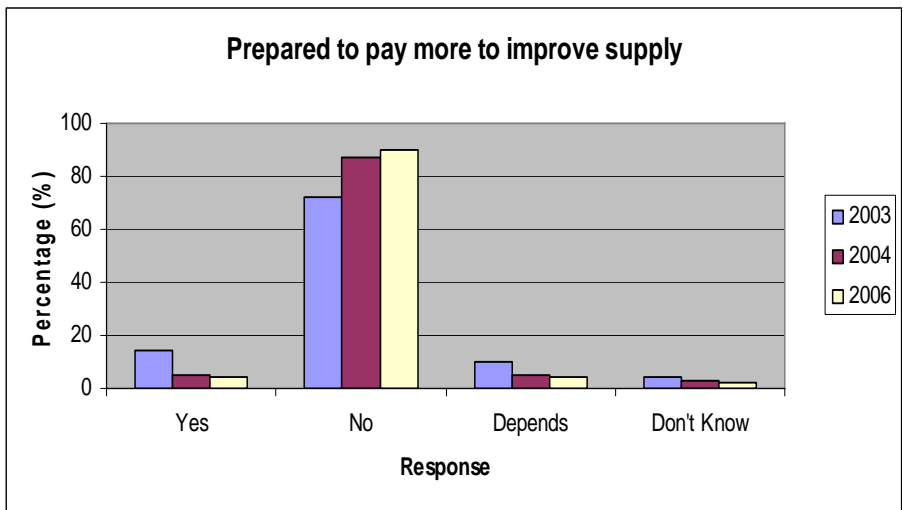
Figure 5 Survey results - Willingness to pay for reliability improvement

6.12.2.2 Sensitivity Analysis

How could the WEL meet these conflicting desires? The company had to find a very efficient way of improving reliability. The attempt to find a solution to the problem started with an obvious, but rarely followed, process. First - what was driving current performance? WEL's Performance Management Framework provided a very comprehensive 'contributing factors tree'. It was important to understand the sensitivities of these contributing factors. Understanding sensitivities would allow WEL to calculate how much impact certain initiatives would have. The tree revealed a number of sensitivities, which are shown in Figure 6. (Note that the width of each bar represents the degree of sensitivity associated with each characteristic listed on the left-hand side of the diagram.)
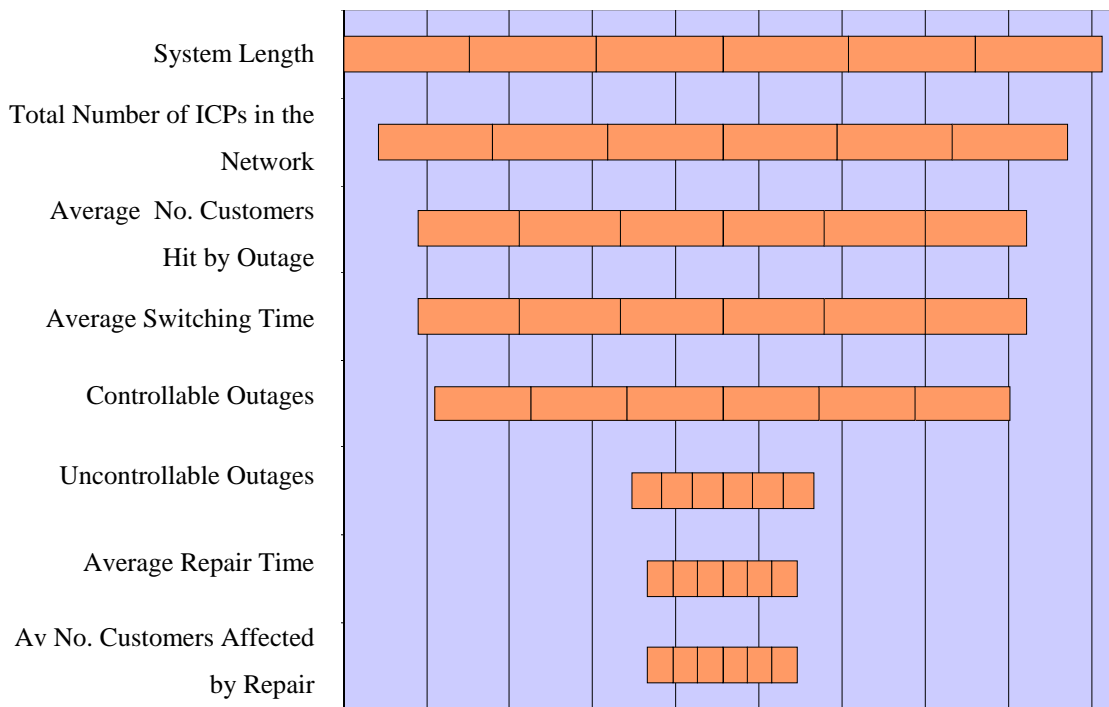
Figure 6 Results of Sensitivity Analysis for Reliability

The two most sensitive factors are conductor length within the network and the number of ICPs connected to it. These are relatively fixed in the short term. The long term planning and sales departments need to be cognisant of these facts, but short to medium term decisions make little impact on these factors. The most sensitive factors have been identified, because improving them gives the best value for money benefit to the community and the best return on investment to the company.

6.12.2.3 Optimization of investment based on knowledge of sensitivity factors

The third and fourth most sensitive factors identified are particularly important because they are the factors most easily addressed in the short term. The next step taken was a planning workshop. To ensure that the actions were actually implemented it was important to involve the people who were responsible for the SAIDI sub-measures. These were the following groups
- Maintenance (responsible for the failure rate)
- Control (responsible for the efficiency of the switching process)
- Performance (responsible for overall performance monitoring and analysis)
- Planning (responsible for engineering solutions)
- Executive *with commitment* (responsible for SAIDI outcomes)

It was also necessary to have the right information about
- company historical performance
- faults and impacts
- the network configuration (high level),
- customers
- fault location
- possible improvement initiatives, costs and benefits

And finally, the right questions had to asked
- Where are we going?
- How are we going to get there?
- What resources will we require?

A list was drawn up of reliability projects that might reduce the number of customers affected by an outage and the length of switching time taken to restore supply after an outage. The performance of each feeder outside the CBD was analysed and the following results were obtained.

Reliability Project Ranking						
Project Name	Project Description	Total Cost ($)	Expected SAIDI Saving	Cost / SAIDI	Accumulated Cost	Accumulated SAIDI Savings
FINCB2	Automation	1,250	0.44	2,853	1,250	0.44
TEUCB1	Automation	5,308	1.83	2,897	6,558	2.27
TEKCB2	Automation	3,950	0.40	9,878	10,508	2.67
GORCB2	Automation	21,800	1.75	12,487	32,308	4.42
WEACB5	Automation	5,200	0.37	14,228	37,508	4.78
HAMCB2782	Automation	4,350	0.29	15,184	41,858	5.07
TEKCB3	Automation	13,800	0.77	17,863	55,658	5.84
TEUCB2	Automation	8,300	0.40	20,891	63,958	6.24
SANCB3	Automation	3,600	0.15	23,674	67,558	6.39
GORCB1	GORCB1/GLACB	49,068	1.97388	24,859	116,626	8.36
LATCB3	Automation	20,900	0.81	25,775	137,526	9.17
SANCB4	Automation	8,300	0.32	26,138	145,826	9.49
WALCB4	automate open po	89,916	2.92176	30,774	235,742	12.41
HORCB5	Automation	44,761	1.45	30,850	280,503	13.87
LATCB2	Automation	18,200	0.51	35,934	298,703	14.37
PEACB2	Automation	19,500	0.49	39,566	318,203	14.86
TEKCB5	Automation	5,000	0.10	48,294	323,203	14.97

Figure 7 Results of feeder analysis

Figure 7 shows how investment was optimized. The feeders with the poorest reliability were identified and plans made to improve their reliability. The plans involved installing numerous auto-reclosers and remotely operated switches throughout the network as well as a range of other improvement strategies. The first planned action reduced the number of customers affected in any one outage and the second dramatically reduced switching time. This work done on the feeders significantly improved the operability and maintainability of the network.

Having specified the work required, costing was undertaken and the potential SAIDI saving calculated. Then the cost per SAIDI saved was calculated for each feeder. The feeders were ordered according to cost per SAIDI saved. Those with the lowest cost per SAIDI saved were upgraded first, because they are the most cost effective options. The whole project is thus based on the sound economic principles of marginal costing, intricately interwoven with sound engineering practice. The feeder upgrade project was called the "Reliability Project" by WEL staff. The following graph derived from the analysis shows the relationship between the strategic glide path and the cost incurred to achieve it.
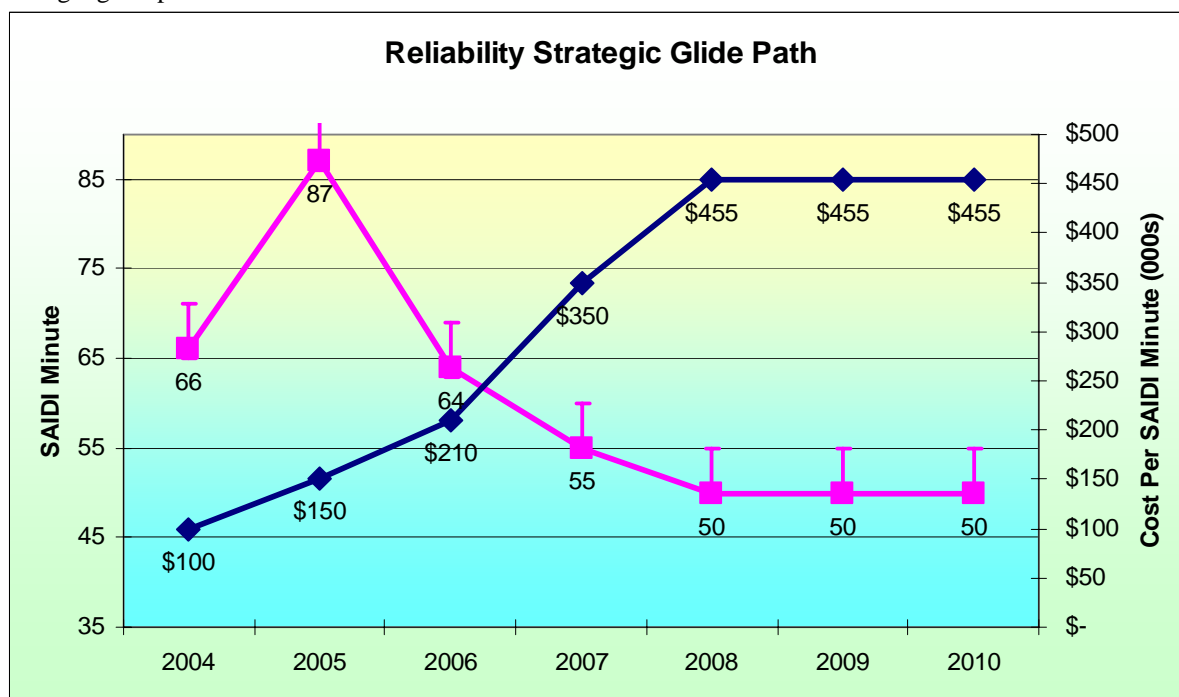
Figure 8 - cost per SAIDI minute versus reliability strategic glide path

This allowed us to clearly communicate to the Board the reliability strategy to achieve the strategic objectives and to engage with them on a cost / benefit basis relating to reliability *improvements*. Due to the thorough analysis and the clearly demonstrable cost benefit of the project the WEL Board readily sanctioned the expenditure of 9 million dollars over four years. Thus the communication with the board was extremely effective. The Reliability Project was designed to improve the two most important measures. They were Average No of Customers Hit by Outage and Average Switching Time. This project has been successfully completed on time and to budget. The improvement rates for Average No of Customers Hit by Outage and Average Switching Time were 31% and 18% respectively from 2004 to 2008. The benefits of the project have been measured in terms of SAIDIs saved as well. On average there has been a reliability improvement of 23 SAIDI minutes per year, which since WEL has over 80,000 customers, is a major improvement in the quality of service.   Perhaps more significantly, without this improvement, WEL would have exceeded its regulatory threshold in two separate years due to a significant increase in uncontrolled outages.

6.12.2.4   Contribution to Reputation Enhancement and World Best Practice

The Reliability Project has also enhanced WEL's standing as a line company. In 2007 WEL participated in a benchmarking project (LEAPP) which included nine Australian lines companies as well as three New Zealand lines companies. (Marchment Hill Consulting were the facilitators and organisers of LEAPP). The Project found that while in most line companies there is a diminishing return between SAIDI improvement and expenditure on reliability and SAIDI improvement, WEL significantly 'bucked the trend' and WEL's performance in this area was exceptionally good. Figure 9 below illustrates this.

Figure 9 LEAPP Comparison with other line companies

Relationship between expenditure and reliability
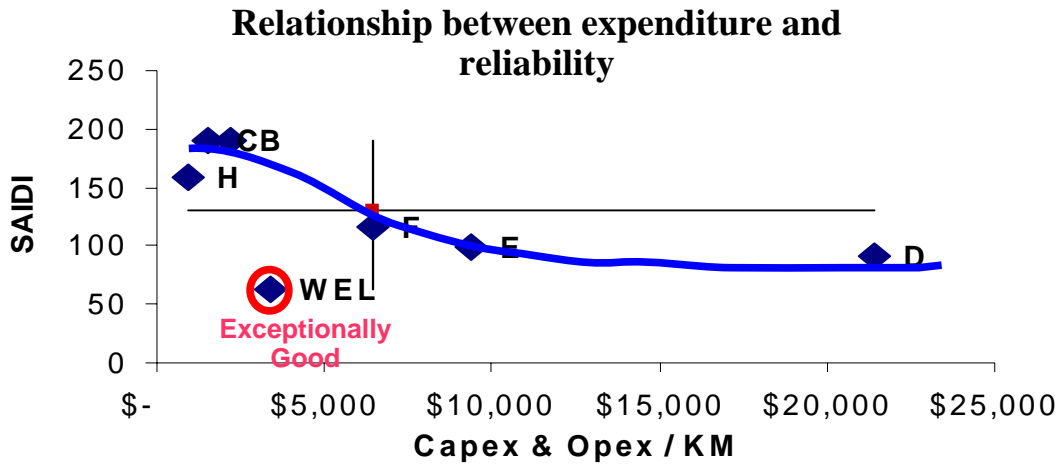
The Reliability Project was in fact, recognised as the best by LEAPP i.e.

> "WEL Networks' Reliability Strategy development and negotiations with the board are the most efficient and effective in the study, enabling both parties to work towards SMART reliability objectives."

Further comments from the LEAPP feedback are:

> "Regardless of Size, WEL is a Best Performer'

> "WEL is providing one of the most reliable networks in the study"

> "High level reliability at low cost"

> "WEL spends well below the industry average per kilometre of high voltage line, yet has one of the lowest SAIDIs"

> "WEL spends below the industry average per customer, without compromising reliability"

> "The innovation, creativity, ingenuity and strength of this project lies in the synergistic combination of engineering and business drivers. The wise use of scarce financial resources advances the sustainability of the company and its ability to provide an excellence service to the community it serves. Beyond the confines of its immediate community WEL has the opportunity to re-enter the export market, providing its proven world leading best practices as consulting services to other lines companies."

6.13 Lessons Learned

This final step in the Performance Management Process ensures on-going improvement in WEL's business and its performance. By this means, both success factors and improvement opportunities are fed back into company activities. It is important to note that increased knowledge can be applied both to multiple processes and to business activities thus ensuring that the business makes maximum gains from its efforts.

There is still some way to go before the Performance Management culture is embedded in the culture of the Company. Proper planning for the delivery of targeted outcomes must be in place and must be clearly understood by all involved. Because of the linkage aligning performance objectives with business activities, timing in relation to the business-planning round is all important and targets must be established before the planning round takes place.

Another lesson learnt - WEL utilised an across-the-company team to implement the Performance Management Project and the wide range of skills within the implementation team was critical to the success of the project. Expert planning, constructive challenge, skilled facilitation and executive support all contributed to the success of the implementation.

The Company also learned how important it was to gain the 'buy-in' of all outcome and measure owners in ensuring the successful delivery of the targets.

7   Conclusion

A Performance Management Framework and its application using specific Performance Management techniques is critical in aligning people, processes and systems in order to meet or exceed the demands of customers, to fulfil the expectations of shareholders; to satisfy the requirements of industry regulators, and to handle market pressure.

The key components of the Performance Management Project were -

- The establishment of a linkage between vision and strategic targets;
- A Performance Management Framework that handled performance issues from the strategic to individual;
- Executive buy in and the clear communication of accountabilities to those accountable;
- Robust target setting and testing;
- Business strategy planning for agreed targets;
- Effective performance monitoring and reporting;
- Corrective action plan development and incorporation of knowledge gained.

Delivering a significant step change in performance is a challenging task the best of times. Critical to the success of business improvement is executive alignment and an organisational commitment to change.

WEL is deeply committed to business improvement and has established a performance driven culture as a result of performance management process and its Performance Management Framework Implementation.

WEL has shown that the Performance Management Process has delivered significant benefits to the company and also that it would deliver similar benefits to other companies who adopt such a process.

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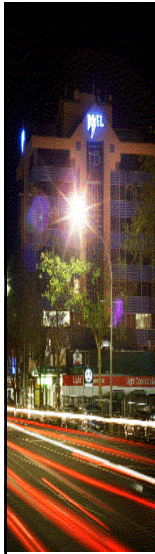
THE APPLICATION OF A PERFORMANCE MANAGEMENT FRAMEWORK

WEL Networks Ltd
Hamilton, NZ
Huazhuo Lin (Ling)
October 2008

3rd World Congress Engineering Asset Management and Intelligent Maintenance System Conference

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Agenda

- Background
  - New Zealand Overview
  - NZ Electricity Industry Overview
  - WEL Networks Overview
- WEL's Performance Management Framework
  - Balanced Scorecard
  - Employee Performance Management Plan
  - Performance Monitoring and Action
  - Aligning performance objectives and business activities
  - Performance Outcomes – LEAPP Study

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New Zealand Overview

4.2m population~60.2m in UK. 270,535 Km²~UK
Temperature - In summer, [20°C, 30°C]; in winter, [10°C, 15°C]

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NZ Electricity Industry Overview

220KV/110KV   220KV/110KV   66/33KV   11KV   400V   230V

How the network is made up   Your responsibility

Generators   Transmission   Lines Companies   Retailers   Customers
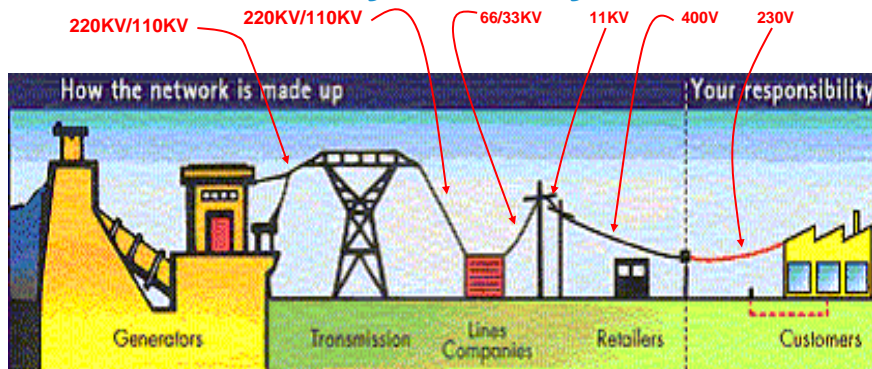
Generation	Transmission	Distribution	Retailers	Customer
▪5 major generators	Transpower	28 Lines Coys	Similar to generation	4.2m Population
▪3 State-Owned	State-Owned	Under Regulation		1.8 connection
▪2 private Coys				
▪60% by hydro				
▪40% Others				

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2

What does WEL do?

- 5th largest of 28 local power distribution companies. 81,000 connections, 1,190GWh, 5,000km of lines and cables.
- WEL does not sell electricity.
- 100% owned by the local consumers, represented by a Trust – WEL Energy Trust
- Under regulation until April 2009, then subject to disclosure.
- Employs 160 staff.
- WEL does not contract directly with customers. Retailers do. However end users are our customers regarding:
  - Safety
  - Reliability
  - Line Price
  - Main customer services – Fault service, new connections, capacity increase, subdivision, undergrounding, relocation, etc.
  - Customer survey, seminars and complaint processes

WEL Master Process Architecture
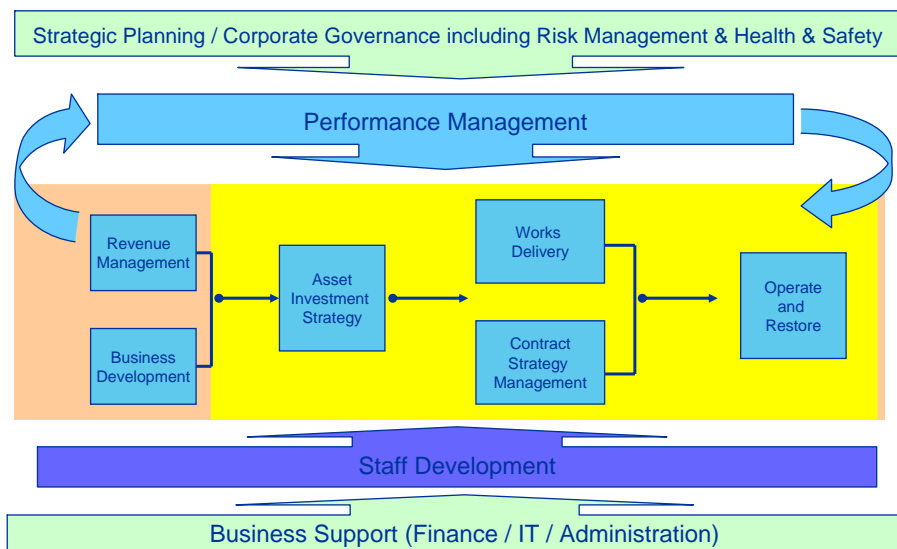
Ownership and Governance of WEL

Elected by local consumers every 3 years	→	WEL Energy Trust	←	100 % Ownership
Appointed by the Trust	→	Board of Directors	←	Governance
CEO is appointed by the Board	→	WEL Networks Ltd (a separate legal entity)	←	Operation Management & Compliance

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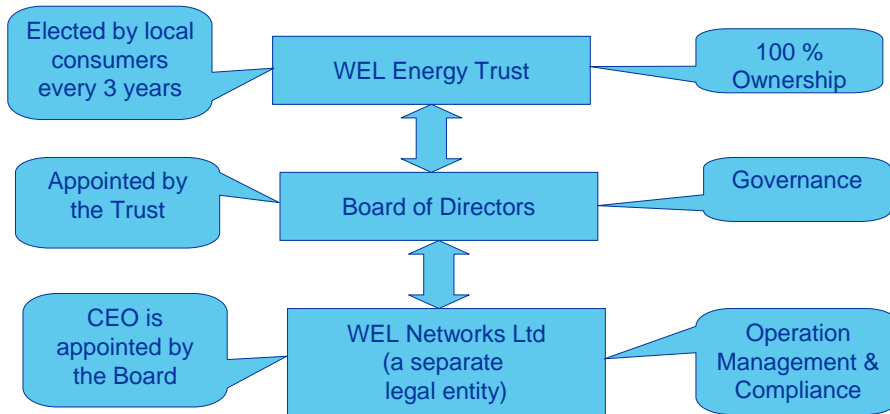
WEL's Performance Management Framework (PMF)

Balanced Scorecard

WEL's Balanced Scorecard

Outcome
Measures

Financial Perspective

Customer Perspective

Measure :
-- NPAT ($35m by 2013)

Measure :
-- SAIDI (50 Minutes by 2013)

Efficiency &
Effectiveness
Measures

Process Perspective (Systems, Tools, Data)

Measure :
-- Efficiency ($165/cust by 2013)

Team &
Individual
Productivity
Measures

Employee Perspective

Measure
--Employee engagement index (74% from best practice survey)

WEL Company Value

| A - Agility | B – Build the business | C – Care for each other | D – Do the right thing | E – Everyday home safe |

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Why we introduced the PMF at WEL Networks

- Understand the drivers of performance
- Create a common focus
- Align the company
- Make individuals accountable
- Deliver results
- Reward performance

In short – to create a performance culture

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Cascading performance measures linked to roles

Performance Management Framework

Vision

To be a World-class Supplier of Energy and Network Services, focused on Customer Service and Value Creation .

5 year Strategic Goals

NPAT, SAIDI, Cost-per-customer

Critical Success Factors

What will we need to do to achieve our goals?

Key Performance Indicators

Financial Perspective | Customer Perspective | Processes Perspective | People Perspective

What are the Key Performance Indicators for each of these four perspectives?

WEL Company Value

A - Agility | B – Build the business | C – Care for each other | D – Do the right thing | E – Everyday home safe

What are the Fundamental Values?

How did we develop the framework?

Methodology

- What is driving each of the outcomes?
- What influences these drivers?
- What processes are these controlled by?
- Who owns these processes?
- What is the sensitivity of these factors?

For example, what was driving our current SAIDI performance?

```
                    SAIDI

          SAIFI              CAIDI

   Outage      Customer       Switching      Repair Time
   Frequency   numbers        Time
               affected by
               outage
```

Measure :
-- Failure Rate (outage/km)
-- Customer Repeated Interruptions
-- Updated Maintenance standards
-- Meet WEL Safety & Maintenance standards
-- On time Within budget
-- Collect Asset Data
   - accuracy & timeliness
Process : AIS, RCA, Works Delivery
People :
--Maintenance Manager
--Field Services Manager

What is the SENSITIVITY of these factors?

Sensitivity Analysis (SAIDI minutes)

■ 10% change   ■ 10% change   ■ 10% change

Factor	Value
System Total Length excluding 400V (km)	8
System Total ICP Number	7
Average Customer Affected by an outage	6
Average Switching Time	6
Controllable Outage Events	6
Uncontrollable Outage Events	2
Average Repair Time	1
Average Customer Affected during repairing	1

- External subdivisions
- Internal subdivisions
- New connections

- Automation
- Split feeders
- Improve switching & field response

- Effective asset replacement
- Effective maintenance plan

- Efficient work force
- Innovative techniques

Once these are determined the factors with the greatest impact can be selected and used to develop the PMF.

Performance Management Framework
Customer Perspective - SAIDI

Objective:
Deliver the SAIDI target at minimum cost
Process : PM, Strategic Planning
People : GM Operations

SAIDI

Objective : Optimise fault location, dispatch, switching and repair solution based on current configuration
Process : O&R, Works Delivery
People : Control Centre Manager and Field Services Manager

SAIFI

CAIDI

Outage Frequency

Customer numbers affected by outage

Switching Time

Repair Time

Measure :
-- CAIDUST
-- Meet WEL Safety Standards
Process :
-- Operation & Restoration
-- Works Delivery
People :
-- Control Centre Manager
-- Field Services Manager

Performance Management Framework For Customer Perspective - SAIDI

Objective : Optimize fault location, dispatch, switching and repair solution based on current configuration
Measure : CAIDI
Process : OM&R, Contract Mgmt
People : Control Centre Manager and Field Services Manager

Objective:
Deliver the SAIDI target at minimum cost
Measure : SAIDI
Process : PM, Strategic Planning
People : GM Operations

SAIDI

Objective:
-- Minimize failure within cost
-- Minimize the impact within cost
Measure : SAIFI
Process : AIS
People : PAIM, FSM

SAIFI

Performance Management and Strategic Planning processes set targets within a given dollar spend

CAIDI
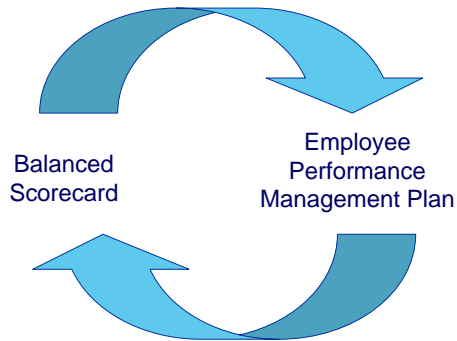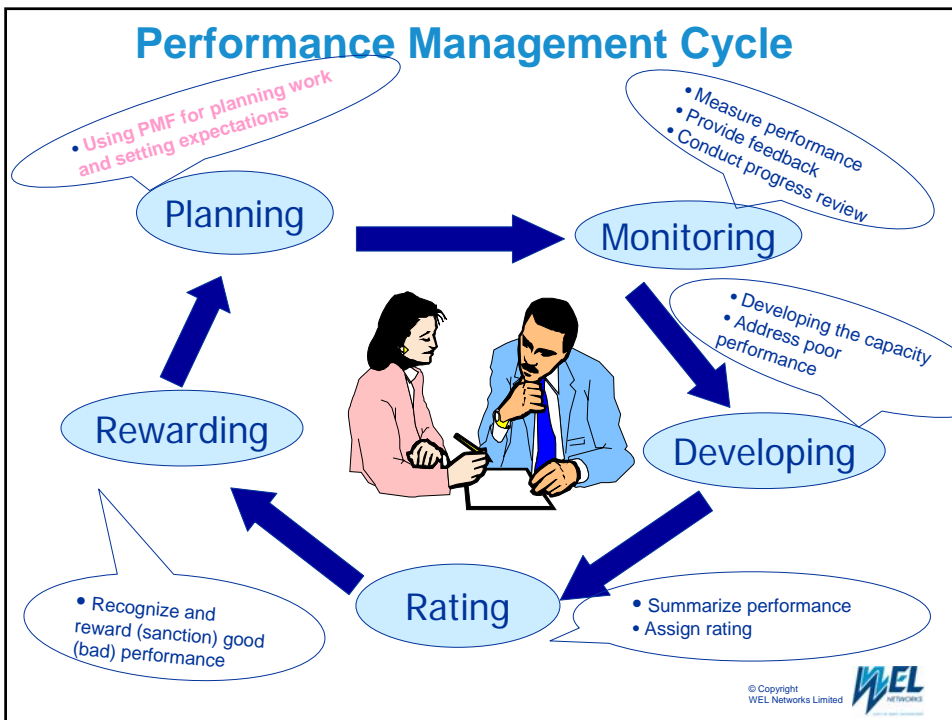
Outage Frequency

Customer numbers affected by outage

Switching Time

Repair Time

Measure :
-- Failure Rate (outage/km)
-- CAIFI
-- Update Maintenance standards
-- Meet WEL Safety & Maintenance standards
-- On time Within budget
-- Collect Asset Data
   - accuracy & timeliness
Process : AIS, Works Delivery
People :
--Maintenance Manager
--Field Services Manager

Measure :
-- ACNABO
-- MAIFI
Process: AIS
People: NP&DM, DTS

Measure :
-- On time within budget
-- Meet WEL Safety & Quality standards
-- Collect Asset Data
   - accuracy & timeliness
Process : Works Delivery, Contract Mgmt
People :
--Capital Projects Manager
-- Field Services Manager

Measure : -- CAIDUST
-- Meet Safety Standards
Process : O&R, Works Delivery
People :
CCM, FSM

Measure : System availability of
-- Operating system (SCADA, GIS, OMS, DMS, Sentry, etc)
-- Asset Database & AM tools
-- WEL Network Reliability Monitoring System
-- Slice & Dice and other reporting system
Process : Business Support (IT)
People : IT Manager

Measure :
-- CAIDUR
-- Meet Safety & Quality Standards
Process :
Works Delivery
People :FSM

SLA

WEL's PMF – Performance Management Plan

Balanced Scorecard

Employee Performance Management Plan

Performance Management Cycle

• **Using PMF for planning work and setting expectations**

Planning

Monitoring

• Measure performance
• Provide feedback
• Conduct progress review

• Developing the capacity
• Address poor performance

Developing

Rewarding

Rating

• Recognize and reward (sanction) good (bad) performance

• Summarize performance
• Assign rating

Transparent and direct relationship between performance and remuneration

Performance Management Plan

Bonus Scheme

From the company perspective -

The Principles of a Successful Performance Management Framework and Supporting Bonus Scheme are …

- All individuals must have line of sight to company goals expressed in bonus targets.

- Deliverables align with strategic / business plans

- You should be accountable for what you can affect

- You should be motivated to ensure the success of; you as an individual; your team; the relevant master process; and your business

- You should earn 100% of your bonus when targets are fully met

- You should have an additional share when **company** targets are exceeded (stretch)

- Everyone should share in the company's pain and gain

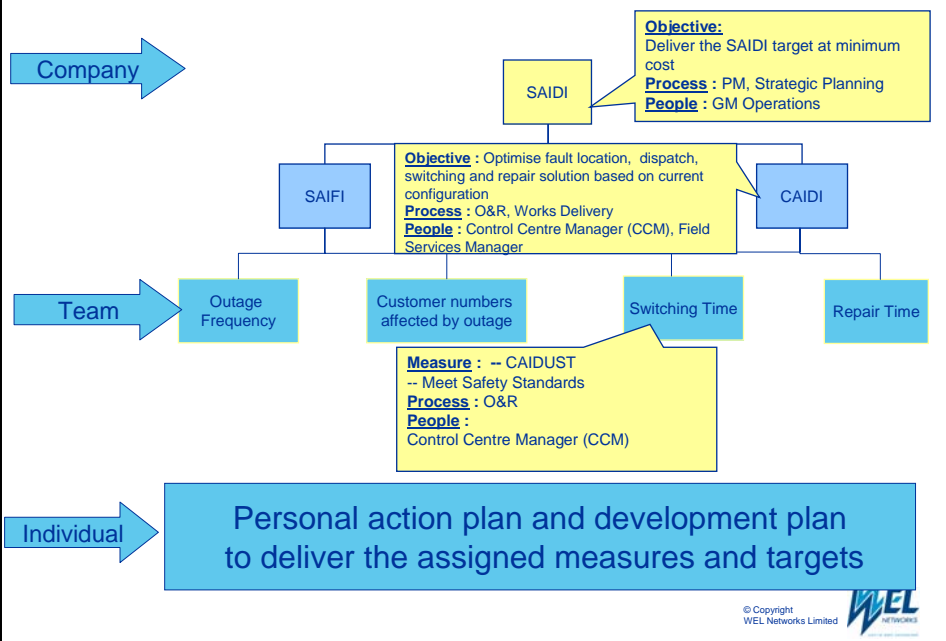- You should be visibly rewarded for improvement and innovation e.g. Employee of the Quarter, one off reward.

From the employees perspective -

The Principles of our Bonus Schemes…

- It will be possible to earn 100% bonus (and maybe more than 100%)
- What we have to do to achieve our bonus will be much clearer.
- A greater degree of objectivity will be used in calculating the bonus.
- This is a performance incentive scheme.
- Our success will lead to the company's success.
- It will be fair and equitable.

Performance Management Framework Example for Individual

Company

SAIDI

Objective:
Deliver the SAIDI target at minimum cost
Process : PM, Strategic Planning
People : GM Operations

SAIFI

Objective : Optimise fault location, dispatch, switching and repair solution based on current configuration
Process : O&R, Works Delivery
People : Control Centre Manager (CCM), Field Services Manager

CAIDI

Team

Outage Frequency

Customer numbers affected by outage

Switching Time

Repair Time

Measure : -- CAIDUST
-- Meet Safety Standards
Process : O&R
People :
Control Centre Manager (CCM)

Individual

Personal action plan and development plan to deliver the assigned measures and targets

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WEL Bonus Structure Example

Company (30%)	SAIDI (15%)	NPAT (10%)	CPC (5%)
Team (30%) (Control Centre)	CAIDUST	System Max Demand	% of capitalized overhead
Individual measures and targets (20%)	Action plan		
Personal Development Plan (20%)	Competency assessment, career aspiration, PDP		

Other Rewards in WEL
- **Employee of the Quarter – personal and team**
- **Employee of the Month**
- **Appreciation for a job well done appreciation**
- **Celebrate team success**

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Leaders Walking the Talk, internal and external communications

- Collective business planning / reviews
- Management Meeting Agenda
- Board and Owner reporting
- Monthly Info Share Session on status of targets for:
  - SAIDI
  - NPAT
  - CPC

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SAIDI and its sub measures performance
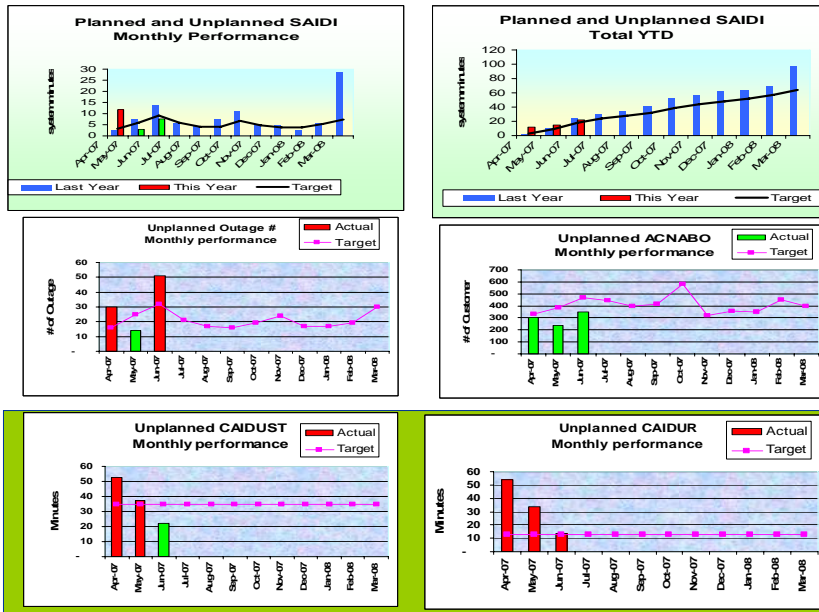
Analysis of performance and non-performance for reliability

- Correction of SAIDI performance gaps:
  - Capital projects (mainly automation) to improve ACNABO and CAIDUST
  - Establish protection setting process, review 11KV protection philosophy, implemented protection database.
  - Change HV dispatching process from Customer Contact Centre (outsourced now) to Control Centre
  - $1m increase of maintenance budget to reduce controllable outages

Performance Against Measures

Past 5 year's performance of ACNABO

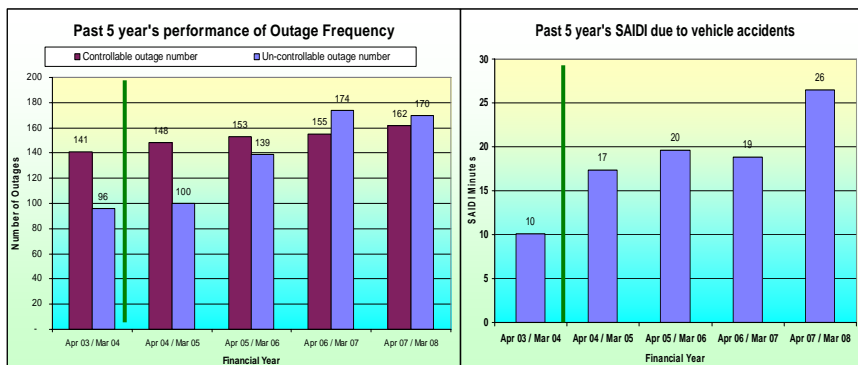**Past 5 year's performance of CAIDUST**
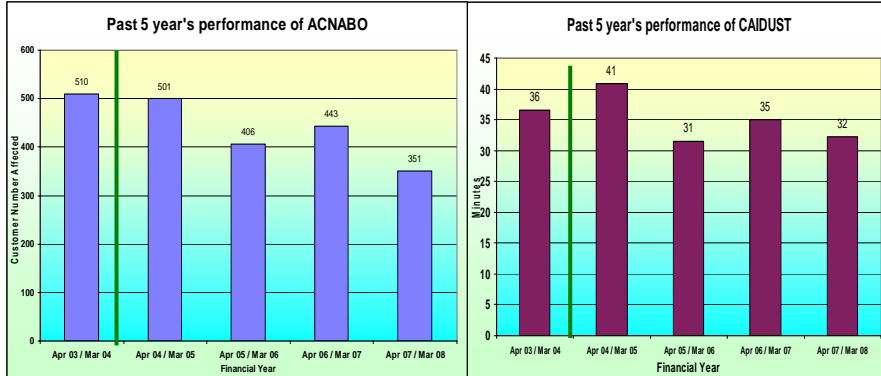
- Actual measurement of ACNABO, CAIDUST and CAIDUR started on Oct 2003 as a 6 month trial. Official measurements started from Apr 2004.
- The graphs demonstrate the improvements made.

Corrective actions have been taken

Past 5 year's performance of Outage Frequency


Past 5 year's SAIDI due to vehicle accidents

The number of outages is increasing, particularly vehicle accidents and other uncontrollable events. Based on these findings we have implemented:
- An insulator replacement program which was completed in the last two years.
- Identified defects are now planned maintenance items in the current year.
- Tree trimming program and establishment of a tree management database

Use PMF to Align Performance Objectives and Business Activities

• 5 year indicative* targets for sub-measures of Strategic Targets

• Accountable people work out 5 year strategies & plans

Performance Target Setting

Business planning & budgeting
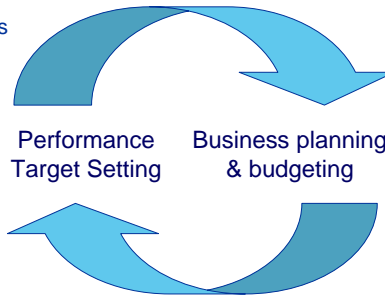
• Finalise the annual targets based on the approved budget & expected benefits.

• Apply for Budget approval

• Annual business plan

* An indicative target is the first proposal of what the target could be before full consideration within the budgeting process

---

Firm up strategic targets, a workshop to develop initiatives to achieve targets

1) Get the right people there:
   - Maintenance
   - Control
   - Performance
   - Planning
   - Executive with commitment

   Need to get ownership of actions

2) Have the right information
   - Historical performance, faults and impacts
   - Network configuration (high level), customers and feeders
   - Possible improvement initiatives, costs and benefits

3) Ask the right questions
   - How are we going to get there?
   - What resources are required?

Reliability Project Ranking

|		Reliability Project Ranking				
Project Name	Project Description	Total Cost ($)	Expected SAIDI Saving	Cost / SAIDI	Accumulated Cost	Accumulated SAIDI Savings
FINCB2	Automation	1,250	0.44	2,853	1,250	0.44
TEUCB1	Automation	5,308	1.83	2,897	6,558	2.27
TEKCB2	Automation	3,950	0.40	9,878	10,508	2.67
GORCB2	Automation	21,800	1.75	12,487	32,308	4.42
WEACB5	Automation	5,200	0.37	14,228	37,508	4.78
HAMCB2782	Automation	4,350	0.29	15,184	41,858	5.07
TEKCB3	Automation	13,800	0.77	17,863	55,658	5.84
TEUCB2	Automation	8,300	0.40	20,891	63,958	6.24
SANCB3	Automation	3,600	0.15	23,674	67,558	6.39
GORCB1	GORCB1/GLACB	49,068	1.97388	24,859	116,626	8.36
LATCB3	Automation	20,900	0.81	25,775	137,526	9.17
SANCB4	Automation	8,300	0.32	26,138	145,826	9.49
WALCB4	automate open po	89,916	2.92176	30,774	235,742	12.41
HORCB5	Automation	44,761	1.45	30,850	280,503	13.87
LATCB2	Automation	18,200	0.51	35,934	298,703	14.37
PEACB2	Automation	19,500	0.49	39,566	318,203	14.86
TEKCB5	Automation	5,000	0.10	48,294	323,203	14.97

- Examined historical performance, network configuration, customer no's etc.
- These projects were ranked in terms of costs per SAIDI impact.
- This gave us the work program plus the incremental cost per SAIDI minute.
- This was not accurate to 6 significant figures, it did not need to be.

Reliability Glide Path
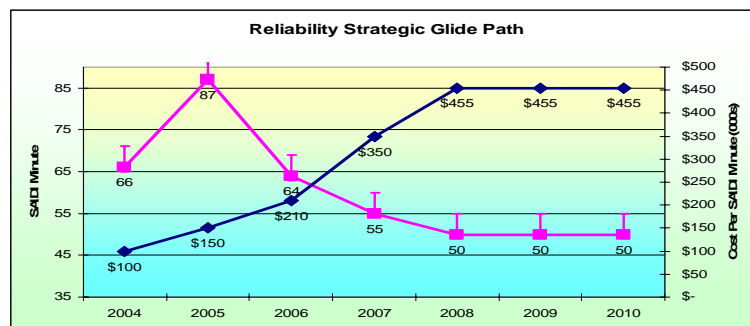
- This allowed us to clearly communicate the reliability strategy and initiatives to the Board.

- Board review of cost / benefit relating to reliability improvements.

- The capital budget required to implement these projects was approved. ($9M over 2 years, total Capital spend per annum at that time was $12M)

Reliability Glide-Path: Year 2

**WEL NETWORK 15 YEAR NON-GROWTH RELATED CAPITAL
SPENDING PROFILE ~ NETWORK DEPRECIATION**
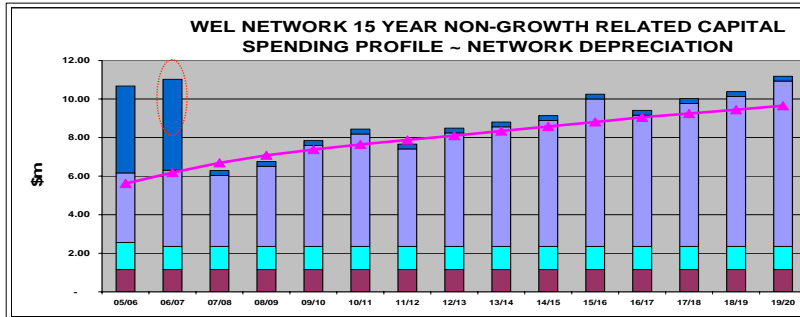
- In the second year we engaged the Board and Trust in the same discussions.
- As a result of this WEL adjusted its strategic reliability target from 45 by 2008 to 50 SAIDI minutes by 2010 based on the above economic cost analysis.
- This saved approximately $2M.

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Analysis of performance and non-performance for Call Centre
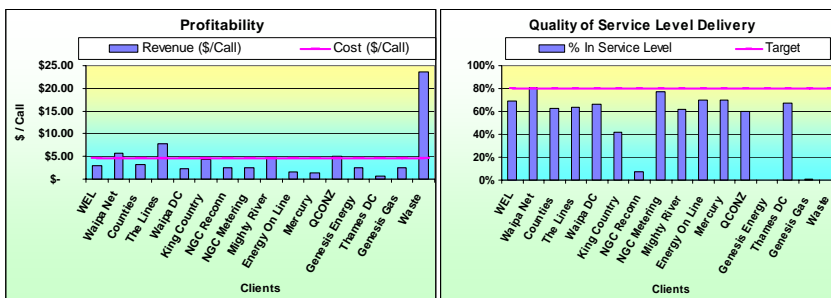
- A detailed understanding of Call Centre performance was developed using the PM process which has lead to outsourcing the service (saving $300k pa)

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Benefits of this Approach

- Clear linkage between vision and strategic targets
- Clear accountability across the business
- Clear linkage between performance objectives and business activities
- An effective team working environment
- More effective monitoring of performance so that shortfalls can be managed earlier.

WEL PMF and its implementation has been recognised as "best practice" by the Leading Efficiencies And Performance Practice Project (LEAPP) across NZ and Australia

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WEL Performance – LEAPP Study

- **Regardless of Size, WEL is a Best Performer**
  - WEL's network is one of the most reliable networks in the study.
- **High level reliability at low cost**
  - WEL spends well below the industry average per kilometre of high voltage line, yet has one of the lowest SAIDIs
  - WEL spends below the industry average per customer, without compromising reliability

Relationship between expenditure and reliability

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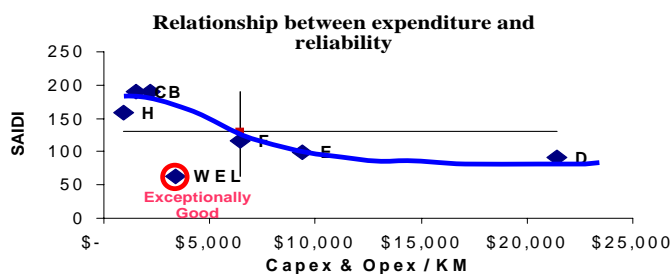
In Conclusion

- **Performance Management is critical in aligning people, processes and systems in order to:**

  - Meet or exceed the demands of our customers
  - Fulfill the expectations of our shareholders
  - Satisfy the requirements of industry regulators
  - Stay ahead of market pressures.

- **Any questions?**