Energy Management Plan

2012–2020

Auckland Airport

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QUALITY INFORMATION		
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1.0	01/01/13	Martin Fryer/Gary Root	Initial Plan
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1.0 Overview

1.1 Introduction

This energy management plan for Auckland Airport is designed to meet an organisational objective of a 20% reduction in energy consumption across the airport by 2020. The energy performance of the domestic and international terminal buildings towards this goal, will be measured as the reduction in kWh's of energy used per passenger.

The baseline year for measurement purposes is 2012, (international terminal 4.4kWh/passenger, domestic terminal 2.8kWh/passenger). While these baseline benchmarks already compare favourably to other airports, comparison is not straightforward, and the 20% reduction target is still considered achievable. As part of this plan, airport staff will monitor international progress towards common conventions which allow meaningful comparisons.

Across the first few years of this plan (and those preceding it), staff have focused on improving energy performance in the international terminal, and this continues to be an important focus. This terminal alone has used up to 20million kWh of electricity per year historically and in the last 7 years, energy efficiency projects have reduced usage by at least 3.3million kWh and more than this when normalisation from increased passenger numbers is taken into account.

However the total energy consumption of the airport is much larger than the international terminal. Whole of airport energy usage includes operations, commercial businesses and lighting for roads and carparks. This energy management plan allows for "all of airport" with the intent that the impact of future developments (at least with respect to energy) can be mitigated by careful planning and management.

Energy efficiency projects identified to date are detailed in this plan, together with additional measures, education, awareness and training needed to ensure projects are not only implemented but also maintained. This plan is to be reviewed regularly to ensure it continues to meet the organisation's objectives.

The projected savings so far identified, is in the order of 13 million kWh of electricity and natural gas, equating to a reduction of 2,000 tonnes of carbon.

1.2 Risk

The process of identifying and managing risks remains at the core of all processes to ensure that Auckland International Airport (AIAL) is able to meet its long term goals and strategy. The AIAL Risk Management Policy defines that risks that require particular focus are:

- Risks that create public annoyance and impact on the reputation of AIAL, and
- Risks that result in financial loss or budget deviation.

It is recognised that the following risks could apply with respect to this plan:

- Energy costs will continue to rise
- Initiatives identified will fail to produce savings
- Initiatives implemented will negatively affect the operation of the site and/or service delivery.
- Failed initiatives will cost more to remove and reinstate to their previous state

The increasing cost of energy has been assessed using AIAL's Risk Calculator and has been defined as a High Risk, requiring Senior Leadership Team Attention. As AIAL cannot control the price for energy, the only applicable approach is to work on reducing energy consumption across the organisation. That is the ultimate goal of this Plan.

Risks associated with energy efficiency initiatives are assessed before any work is undertaken. This is to allow a review by the activity stakeholders to minimise the risk to their operation and ensure improved outcomes.

2.0 Detailed Plans

2.1 Introduction and Scope

Auckland International Airport is the key gateway into New Zealand handling some 14million passengers per annum, a number that includes 73% of all international visitor arrivals. In 2008, the company produced its first sustainability policy with a target of reducing its carbon footprint by 5%. This target was achieved in 2010 by the successful implementation of energy efficiency projects in the international terminal.

In 2012, an updated sustainability policy and plan was established with a target of 20% reduction in energy consumption on a per passenger basis. It was agreed that this target would extend beyond facilities where the organisation has direct control and to the overall campus (including tenanted facilities). The scope of this energy management plan therefore includes engagement with property and retail tenants and the inclusion of energy efficient design in infrastructure and building developments.

AIAL has entered into an agreement with the Energy Efficiency and Conservation Authority (EECA) to support the energy management programme. EECA provides funding assistance for the energy management programme and in return AIAL agrees to achieve energy reductions.

The energy management plan will sit with the organisation's energy management team but its implementation will touch on a wide array of internal and external stakeholders. The outcome is expected to be an efficient and cost effective airport city with a corresponding environmental footprint.

The airport precinct can be likened to a small city in its own right which includes shopping centres, warehouses, restaurants, office buildings, freight forwarding and receiving centres, recreational facilities, transport facilities, sewage and waste treatment and roading. Even though airport operations are the primary purpose, energy use of the airport terminals accounts for less than half of the total site energy consumption.

The international terminal is the largest single energy user under AIAL's direct control and uses up to 20million kWh's per annum. This facility is a key focus for this energy management plan and many of the initial projects relate to its plant and services. Its energy performance is measured as kWh per passenger whereas other facilities are measured as kWh/m2 of gross building space.

The breakdown of energy usage in the international terminal has been classified as:

Ventilation and Air Conditioning 31%
Tenants 31%
Boilers 22%
Lighting (exc. Tenants) 13%
Baggage Handling 2%
Domestic Hot Water 1%

To date, the key focus has been to improve the energy performance of the boilers, ventilation and air conditioning systems. A pilot controls upgrade project carried out in 2013 demonstrated savings of 83% in electrical energy and 58% savings in natural gas use. Similar upgrades form part of this plan and are detailed further in this document.

2.2 Quality

This energy management plan will be developed in accordance with the energy management standard ISO 50001. It is intended that the standard be used as a guide rather than for certification purposes. Each year a quality management review will be undertaken and the results summarised in a report to the senior management team.

2.3 Resources

The resources for this project will be primarily provided from the Aeronautical and Property Division and supported by external expertise as required. The intention is to build capacity within the organisation, thereby reducing the reliance on external expertise to support the programme.

Energy Management Team

AUCKLAND INTERNATIONAL AIRPORT	
Energy Management Representative	Graham Matthews, GM Airport Development & Delivery
Energy Champion	Martin Fryer, Sustainability Manager
Projects	Martin Todd, Project Manager
Operations	Jason Gray, Manager Engineering Services
Maintenance	Geoff Alley, Building Services Maintenance Planner
Property	Paul Vaughan, Property Asset Manager
Finance	Alena Rivera, Financial Accountant

Energy management training will be undertaken for key personnel in order to build capacity.

EXTERNAL	
Client Manager	Pramesh Maharaj, EECA
BMS Specialist	Duncan Hand, Siemens
Facilities Maintenance Contractor	Tom Kelly, Cushman Wakefield
Energy Management Advisor	Martin Lynch, 0800 Save Energy

External support will be used to enable fast identification of energy savings and the provision of expert advice.

Budget

In general projects that have a five year or better simple payback will be implemented where budget allows. The EMT will work with existing budget holders and their asset management plans to ensure energy performance improvements are achieved as part of capital renewal and new capital spend.

Additional capital, required to achieve energy performance measures but not budgeted for, will be put up as a business case to senior management.

Funding will be sought from external agencies where appropriate and AIAL has entered into an agreement with EECA whereby funding is available for agreed projects.

Low cost energy efficiency measures (under $10,000) may be implemented as part of regular maintenance spend.

Technology

Auckland airport has many revenue and check meters located across the facility. These are read on a regular basis and until recently this data was gathered into a spreadsheet system and utilised to bill tenants as well as provide energy usage information.

Over time this system has become cumbersome and inaccurate. In the last 12 months, an “off the shelf” energy monitoring system has been deployed and implemented. Usage and cost data for electricity and natural gas is now provided directly from the energy supplier in electronic form and meter locations and loads have been confirmed. It is intended that the system will be extended to include other utilities and will be able to provide carbon reporting. The organisation is now able to easily identify and report energy usage across the campus.

In-depth energy monitoring of some large buildings (International Terminal) is available by utilising the data and historical trending facilities on the Building Management Systems (BMS).

Monitoring and verification services are also secured as required to confirm the expected savings arising from energy efficiency projects.

Training

Specific training of staff is undertaken on an “as is and when required” basis. An example is the introduction of new lighting and a sophisticated control system, whereby the organisation’s in-house electricians were trained by the supplier of the system. As energy efficiency measures are introduced, staff will be given appropriate training to ensure that plant is operated and maintained appropriately so that the benefits of the measure are fully realised.

Organisational representatives undertake EECA’s One to Five programme on a regular basis. This programme provides another independent reference point to assess how well energy is being managed and provides pointers to how that management can be improved.

2.4 Energy Management Policy

Energy Policy

The organisation's latest energy policy was set in 2012.

Purpose

Auckland Airport is committed to, and will practice, responsible energy management throughout its facilities, premises, plant and equipment.

The four primary objectives of this energy policy are to:

- Achieve a proactive reduction in energy and fuel consumption and cost
- Optimise capital investment to reduce energy use
- Reduce pollutants and greenhouse gas emissions
- Increase the use of sustainable and renewable fuels

Targets and Goals

Auckland Airport's 2012 sustainability plan has a target of reducing energy and fuel consumption by 20% per passenger by 2020.

Energy Management Programme (EMP)

This policy will be implemented through an EMP that will sit with the Energy Management Team (EMT) responsible for:

- Developing an Action Plan
- Implementing cost effective energy savings initiatives (with a simple payback of <5 years)

Auckland Airport will streamline policies and procedures, as necessary, for the success of the EMP. The EMP will be supported with managerial and financial resources and seek by-in from relevant stakeholders and staff. Auckland Airport will provide the training and incentives needed to encourage employee support for the EMP.

Savings, in terms of cost, energy and carbon, will be closely monitored, measured and verified for each project.

Accountability and Structure

The General Manager Aeronautical Operations is the sponsor of both the EMP and the EMT. The EMT will be comprised of representatives from across Auckland Airport and, where appropriate, outside organisations. The EMT will appoint a Chair/ Energy Champion to manage its activities and seek external funding opportunities to achieve the objectives of this policy.

Review

Energy Management activities will be subject to on-going review by the EMT who will report the energy performance of Auckland Airport and progress towards long term targets, on a monthly basis. The report will include details of energy consumption, key performance indicators and progress on energy management activities, using 2012 as the base year. An annual report on energy use will be prepared by the EMT, together with a documented review of this policy and its implementation.

Auckland Airport will, in addition, publicly disclose energy and carbon performance on an annual basis through the Carbon Disclosure Project.

Corporate Energy Management Activities

The EMT will also work with other parts of the organisation to develop policy and activities which promote improved energy performance across the organisation. The management and operations activities of importance are:

- Development of an organisation energy efficient purchasing policy
- Incorporate energy efficiency into critical job descriptions
- Encourage the use of alternative and renewable fuels
- Develop Environmentally Sustainable Design (ESD) standards that comply with the EMP
- Develop procedures to assess the financial and operational risks of energy savings projects for the purposes of managing those risks
- Develop metering, monitoring, and recording systems that aid the verification of savings from energy conservation investments
- Publish the performance of the energy policy through the organisation's sustainability reports.

2.5 Baseline Energy Use

The energy baseline of the campus includes energy used by airport operations as well as energy used by tenants and retailers onsite. It does not include commercial facilities usage located away from airport operations and these facilities are to be evaluated separately. The baseline year for the purpose of the energy management plan will be FY12.

In 2012, the airport spent $4,399,000 on energy in the International Terminal. This is a significant ongoing cost and is part of the justification for capital investment for energy performance improvement.

Table 1: Energy usage breakdown FY12 – International Terminal Airport Operations (excludes retail)

FUEL SOURCE	TOTAL ANNUAL CONSUMPTION	TOTAL ANNUAL COST	% OF TOTAL PLANT ENERGY COST
Electricity	20,151,268kWh	$3,719,222	
Natural Gas	11,016,000kWh	$439,628	84%
Fuel Oil	82,864 litres	$165,815	10%
Jet Fuel	25,244 litres	$74,128	4%
Total Cost		$4,399,000	2%

In FY12, the international terminal used about 31 million kWh and the domestic terminal used 5 million kWh. Total airport energy usage is approximately 36 million kWh. To reach targeted savings of a 20% reduction in energy use, the airport needs to save 7,200,000kWh by 2020.

In FY12, the international terminal managed 7 million passengers and the domestic terminal managed 6 million passengers. On a per passenger basis, the domestic terminal has a better energy performance indicator, however this number is misleading as airfield operations for both terminals were included in the international terminal.

Terminal energy performance indicators FY12

International and domestic terminals ..... 2.77kWh per passenger (electricity only)

International terminal only..... 4.37kWh per passenger (electricity only)

Historical Data

For a number of years, the organisation has published its carbon footprint and so has several years of historical data which show how energy use has changed, see Table 2 below.

Table 2: Historical Energy Data

FUEL SOURCE	UNIT	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15
Natural Gas	MWhr	9,789	12,024	10,750	9,457	11,721	9,868	9,202	10,649
Petrol 91	Litres	82,558	59,429	52,416	42,049	30,782	33,155	42,333	35,281
Petrol 96	Litres	12,002	5,527	193		1,298	4,355	3,925	3,716
Diesel	Litres	108,402	102,964	113,852	65,134	50,784	44,589	78,342	65,450
JetA1	Litres	30,250	41,210	30,065	34,265	25,244	29,148	35,222	31,478
Electricity	MWhr	85,558	93,989	96,037	100,442	101,405	98,227	97,292	98,885

Table 2 shows that natural gas, JetA1, and electricity use have plateaued despite significant business growth. Petrol and diesel have reduced significantly. The reduction in fuel use has come about due to a real focus on vehicle fuel efficiency. This has included a reduction in vehicle fleet numbers and improved fuel performance.

The terminal facilities and operations use about half of the electricity recorded at the main incoming meters for the entire airport electrical distribution network. The remaining electricity is used by commercial properties in the airport district. Table 3 shows the breakdown of electricity use within the airport district and reveals that 11% of the load is unmetered past the incoming meters.

Table 3: Breakdown of Electricity Usage across the Airport District (FY12)

FACILITIES	kWh	% OF TOTAL	UNCERTAINTY %	DATA SOURCE
Aeronautical	20,151,268	20%	3%	Airport Electrical Metering
Commercial/ITB	11,321,346	11%	2%	Airport Electrical Metering
Infrastructure, Roads & Parking	1,410,104	1%	5%	Airport Electrical Metering
Commercial Property	51,458,104	51%	6%	Airport Electrical Metering
Domestic Terminal	5,664,580	6%	1%	Airport Electrical Metering
Unmetered Electrical	11,399,487	11%	1%	Airport Electrical Metering
Total	**101,404,889**	**100%**		

The unmetered electricity total is particularly high and will be investigated further as part of the energy management programme.

Commercial Properties

If the commercial properties located at the terminals and the off-site commercial properties electricity usage is combined, this equates to 62% of all the electricity used through the airport main electricity meters. Energy usage of these facilities is a focus of this energy management plan, in that the organisation can influence energy use of its tenants by promoting good design and sharing energy efficient knowledge and practices.

Offsite properties are benchmarked for energy performance by classifying like businesses and calculating energy use per m2 of gross floor area. Long term plans include obtaining a NABERS energy rating for relevant facilities in the Property portfolio. As energy performance improves at the airport facilities, more attention will focus on the energy performance of the commercial properties.

Planned Energy Efficiency Measures

A number of energy efficiency measures are already known and detailed in Table 4 below. These capital projects relate to the international terminal and include replacement of chillers, lighting upgrades, an interface between the Flight Information Display System (FIDS) and the BMS, and other projects that will allow optimisation of central plant capacity.

Table 4: Planned ITB Energy Efficiency Measures

PROJECT DESCRIPTION	FUEL TYPE	FUNDING	LOCATION	SOURCE OF SAVINGS	ESTIMATED ENERGY SAVINGS (KWH/YEAR)	ESTIMATED CARBON SAVINGS (TONNES)	ESTIMATED COST SAVINGS ($/ YEAR)	GROSS ROI %	CAPEX BUDGET YEAR	STATUS
Chiller Replacement PC11	Electricity	CAPEX	Central Plant	Improved COP & staging of compressors	1,800,000	288	$200,000	20%	FY15	Completed
Server Room Cooling	Electricity	CAPEX	Server Room	Reduce base cooling loading from central plant	250,000	40	$27,500	10%	FY16	Completed
Chiller Replacement Pier A	Electricity	CAPEX	ITB Pier A	Improved COP & staging of compressors	900,000	144	$100,000	15%	FY16	Completed
BMS Replacement – Customs Hall Plantroom (SP1)	Electricity and Gas	CAPEX	ITB	Better DESOPs, reduced run time	490,000	79	$54,500	20%	FY16	Completed
BMS Replacement – Plantroom 3A (SP8)	Electricity and Gas	CAPEX	ITB Pier A	Better DESOPs, reduced run time	142,000	23	$15,800	20%	FY16	Completed
BMS Replacement – Main Plantroom (SP9)	Electricity and Gas	CAPEX	ITB Pier A	Better DESOPs, reduced run time	243,000	39	$27,000	20%	FY16	Completed
HVAC Retro Commissioning	Electricity and Gas	CAPEX	ITB Wide	Tuning, better performance of controls	1,475,000	236	$97,500	83%	FY14	On-going
BMS Replacement – Skybridge Plantroom (SP3)	Electricity and Gas	CAPEX	ITB	Better DESOPs, reduced run time	171,000	27	$19,000	20%	FY16	Underway
BMS Replacement – Arrivals Plantroom (SP2)	Electricity and Gas	CAPEX	ITB	Better DESOPs, reduced run time	290,000	46	$32,200	20%	FY16/17	Planned
BMS Replacement – FCU & VAV Units Controls (SP12)	Electricity and Gas	CAPEX	ITB	Better DESOPs, reduced run time	972,000	156	$108,000	20%	FY16/17	Planned
BMS Replacements – Plantrooms 1 & 2 (SP6)	Electricity and Gas	CAPEX	ITB Pier A	Better DESOPs, reduced run time	177,000	28	$19,600	20%	FY17	Planned
BMS Replacements – Plantroom 4 (SP10)	Electricity and Gas	CAPEX	ITB Pier A	Better DESOPs, reduced run time	169,000	27	$18,800	20%	FY17	Planned
BMS Replacement – Air NZ & Qantas VIP Lounge (SP7)	Electricity and Gas	CAPEX	ITB	Better DESOPs, reduced run time	203,000	33	$22,600	20%	FY17	Planned
BMS Replacement – FIDS Interface & BMS Graphics (SP11)	Electricity and Gas	CAPEX	ITB	Better DESOPs, reduced run time	79,000	13	$8,800	20%	FY17	Planned
Total					**7,361,000**	**1,179**	**$751,300**			

Energy Data File

Each key facility will have its own energy data file which will be regularly maintained. The energy data file is in addition to energy data and will hold information such as:

- the sources of energy used by each facility (electricity, natural gas, solar, etc)
- a breakdown of the areas in the facility and their respective energy use (where significant), and this could be by equipment, systems, processes and personnel
- identification of any other variables which have a significant impact on energy use
- the current energy performance of facilities, equipment, systems and processes
- basic modelling to allow estimates of future energy use.

2.6 Opportunities

For each facility, a process will be undertaken to identify, prioritise and record opportunities for improving energy performance including:

- review of existing energy audits where previously undertaken
- walkthrough and desktop assessments equivalent to a Level 1 energy audit as defined in AS/NZS 3598:2000
- identification of those areas where and in depth review for an investment grade audit is required.
- This information will be held in the facilities energy data file.

Employee participation and awareness in the energy management programme will be encouraged. Awareness of energy efficiency has already been introduced to staff wellbeing programmes whereby the company's Sustainability Manager presented to interested staff on the importance of a healthy home and opportunities through EECA's home owner's grants scheme.

2.7 Targets

AIAL's energy policy calls for a 20% reduction in energy consumption of airport operations by 2020, relative to baseline energy use in 2012.

If all energy measures currently identified were implemented, then actual energy savings achieved would be 35% of the energy consumption in airport operations. Energy efficiency projects performed on commercial properties (outside airport operations) would yield additional savings.

The table below shows the expected savings to arise year by year:

Table 6: Targeted savings in electricity and natural gas.

YEAR	SAVINGS TARGET (kWh)	TARGET ($/year)	CARBON (tonnes)	TARGET SAVINGS (%)
FY12	1,100,000	$166,000	176	0.9%
FY13	5,070,000	$417,000	811	4.4%
FY14	8,870,000	$720,000	1419	7.6%
FY15	1,400,000	$95,000	224	1.2%
FY16	1,400,000	$95,000	224	1.2%
FY17	1,400,000	$95,000	224	1.2%
FY18	1,400,000	$95,000	224	1.2%
FY19	1,400,000	$95,000	224	1.2%
FY20	1,400,000	$95,000	224	1.2%
Total	**22,840,000**	**$1,842,000**	**3,750**	**20%**

Actual savings achieved are recorded and measured against targeted savings in Appendix 3 of this document.

2.8 Action Plans

An Action Plan will be established to achieve the energy management objectives and targets for the organisation (refer to Appendix 1 & 2).

This will include:

- the means and timeframe by which each facilities saving target can be achieved
- designation of responsibility for achieving the targets
- the method by which energy performance improvement will be measured, verified and reported
- how energy savings will be achieved on an ongoing basis

how energy savings will be reinvested into future energy initiatives.

A rolling three year action plan will be documented and will form part of AIAL's Energy Management Plan Schedule (refer to Appendix 1 & 2).

The Action Plan is to be updated quarterly and will also be subject to an annual review. This annual review will include a report to the senior management team identifying progress towards energy management goals and objectives, and recommendations for improvements where necessary.

The review of the Action plan will also facilitate the inclusion of projects into relevant capital expenditure budgets. All capital projects have a standard approval process to ensure it is financially beneficial or necessary. It is the role of the respective project manager to put together a business case that ensures energy efficiency measures are justified and approved. The EMT will provide assistance in this process.

2.9 Business Case for FY13 & Forward

A detailed plan for each financial year, starting July 2012, will be compiled (see Appendix 1). It will include:

- a description of each opportunity, how it will be implemented and implementation timeframes and responsibilities
- costs of each opportunity, which may include, the estimated costs of an investment grade audit, implementing a measurement and verification system, carrying out continuous commissioning, and installing the appropriate technology solutions
- benefits of each opportunity.

An investment analysis will be undertaken showing:

- cash flow analysis
- return on investment for the total package of measures
- that the recommended actions meet the organisation's investment criteria.

Energy efficiency projects are expected to have a simple payback of less than three years, which equates to a 33% gross return on investment. These investment returns also demonstrate the organisation's commitment to improved business performance and reducing its carbon footprint.

2.10 Reporting, Review & Communication

The EMT will met monthly to ensure that the energy management plan is on track. At this meeting the following information will be reported:

- performance of each facility in the Plan, actual against budgeted
- savings achieved from the energy management plan for the current financial year
- an update on progress of the various components of the Action Plan.

Each energy saving opportunity will be documented in an “Energy Initiative” sheet. This information will be held in the relevant facility “Energy Data File” and consolidated in a schedule of energy saving initiatives.

The energy management plan is not a static document and will be updated and reviewed by the EMT, at least annually. This is in addition to the quarterly updates of the Action Plan. The annual update will be signed off by the senior management energy representative.

The senior management team will be updated on progress of the plan at least annually and the organisation’s sustainability reporting will include energy and carbon performance out to 2020 as these are material issues for stakeholders.

The energy management plan is a public document and will feature on the company’s website as one of a suite of documents enabling the business to develop in a more sustainable manner. It will also be made available through the organisation’s internal file storage system and will brought to the staff and public’s attention through the company’s intranet and sustainability blog, and periodic articles in the “Airport Times”.

2.11 Measurement & Verification

Measurement and verification is to be implemented through a metering data acquisition, analysis and reporting tool. The system will be capable Measurement & verification of both verifying the energy impact of specific projects and reconciling that information with the energy consumption of individual airport properties. It will also reconcile against the energy consumption of the entire Auckland Airport site.

This approach has been recommended as it allows continuous updates of energy consumption data, flexible implementation and verification of energy projects and allows the impact of individual energy projects to be evaluated.

BMS logging and metering will be used for additional measurement and verification. The format of data will be chosen to allow it to integrate with existing data contained in the main energy monitoring system.

Appendices

Appendix 1.

Energy Management Plan Schedule

The schedule below provides a plan and time frame of the expected activities to be undertaken in the next 12 months. More general information is provided for energy savings measures in the Project Action Plan (Appendix 2) including expected investment levels.

Implementation of Projects

Resources to implement the Project Action Plan are expected to be as follows:

- Finance provided from planned CAPEX or as part of maintenance spend if low value;
- Project brief, design and cost estimate arranged by the Project Manager, supported by the EMT as required;
- Measurement and verification savings methodology specified by the EMT, undertaken by Project Manager and reported to the EMT;
- Actual work is undertaken by in-house staff or the organisation's preferred contractor where possible.

Recurring Activities

- The energy management team meets every month.
- Identification of new initiatives and update of the Action Plan
- Update and report on the energy management plan once per month at the EMT meeting including;
  - Actual against budgeted energy cost by major facility
  - Savings achieved for the current financial year
  - Progress against Schedule.
- Update the energy data file for each facility as information becomes available.
- Document each completed energy saving project in the agreed Energy Initiative sheet.
- Prepare brief articles outlining projects and savings achieved for distribution within the organisation.

Specific Activities

July 2015 to September 2015

Installation of EnergyPro software to measure utilities (initially electricity and natural gas) and integrate this function into the airport financial system. **Update:** Completed.

Implement energy efficiency measures and monitoring and verification of savings as per the table below.

PROJECT	OUTCOMES
Engage with the HUB (commercial properties) to raise awareness of energy efficiency.	
• Mini energy audits at up to 25 sites • Generate reports and share information • Cushman Wakefield engaged to deliver report.	• Better understanding of the energy performance of tenant facilities • Identification of tenant organisations that may wish to form a precinct wide energy management user group • Potentially further EECA support to encourage participation in such a group. Update: The project is being implemented in the third quarter of this year, approximately ten tenancies have expressed interest.
Reconfigure Server Room Cooling	
• Remove cooling connection from central plant and replace with dedicated split systems.	• Reduced energy use by using a dedicated system. Update: The project was completed but savings were not able to be verified.
Install meters in intensive energy use areas.	
• To assist with M&V of energy savings projects.	• Establish consumption trends prior to energy projects being implemented to assist with verification of savings. Update: EnergyNZ meters installed in Main plantroom and Pier A plantrooms with web based access to consumption data and dashboard.

October 2015 to December 2015

- Undertake energy efficiency peer review design of Quad 7 (multi-tenanted office building) and FujiXerox building (warehouse and office). Update: Completed by Exergy. No major changes were necessary for Quad 7 and confirmation was received that design should meet a NABERSNZ 5 star rating. Findings for the FujiXerox building are under consideration by the tenant.
- Undertake a design review of the “Phase 3 International Terminal Expansion”, a 1,400m2 expansion of the international terminal. Update: Underway by Exergy, but not completed to date. This will include simulation and modelling.
- Develop energy efficiency design specifications for the airport based on standard base builds undertaken by the property team. Update: Completed, presented to the Executive team, but guidelines were not adopted as a company standard.
- Implement energy efficiency measures and monitoring and verification of savings as per the table below.

PROJECT	OUTCOMES
Replace Pier A BMS Main Plant	
• Data loggers installed to confirm before and after usage patterns	• Improved control for demand management and variable speed on large plant

January 2016 to March 2016

- Review and update the energy management plan.
- Prepare a formal report for the senior management team identifying progress towards the energy policy target and objectives and recommendations for improvement.
- Develop an electricity meter map for the site to improve accuracy of data collected by Energypro. Use this information to focus on reduction of unaccounted electricity usage across the site.
- Engage with Property staff to identify what significant using energy plant has been upgraded this financial year and what upgrades remain to be implemented. Identify improvements in energy performance (if any) or reasons for lack of improvement in energy performance.

Implement energy efficiency measures and monitoring and verification of savings as per the table below.

PROJECT	OUTCOMES
Replace Pier A Cooling Tower and optimize controls	• Improved energy performance of tower and reduced running times
Replace Pier A Chiller and optimize controls	• Improved COP of chiller and reductions in run times

April 2016 to June 2016

- Following installation of new plant into Pier A, undertake an optimisation process to ensure all plant is working at best performance.
- Undertake an investigation into vehicle fleet optimisation - engaging Optifleet.

Implement energy efficiency measures and monitoring and verification of savings as per the table below.

PROJECT	OUTCOMES
Replace Pier A Boiler with new condensing boiler	• New condensing boiler has higher efficiency than a standard boiler leading to reduction in gas usage
Replace Pier A BMS Main Plant	• Improved control for demand management and variable speed on large plant
Central Plant controls optimization	• Improved control for staging and variable pumping
Undertake investigations into energy storage systems	• Alternatives to costly infrastructure and reduced peak demand from the International Terminal
Replace Skybridge BMS	• Improved control and reduced run times
Replace Arrivals Plantroom BMS	• Better DESOPs • Reduced run times
Replace Pier A Boiler with new condensing boiler	• New condensing boiler has higher efficiency than a standard boiler leading to reduction in gas usage
Cargo Central BMS & Chiller Upgrade	• Upgrade the BMS • Potential funding for a new chiller

July 2016 onwards

- Focus on further development of energy performance indicators using information gained from Energypro. This may include “dashboard” style data.
- Continuation of optimisation of pier A plantrooms.
- Review the viability of a Ground Source heat pump system with the optimised Pier A HVAC performance.
- Vehicle fleet replacement (12 vehicles) utilising Optifleet in FY17.

Implement energy efficiency measures and monitoring and verification of savings as per the table below.

PROJECT	OUTCOMES
Replace Air NZ & Qantas VIP Lounges BMS	• Better DESOPs • Reduced run times
Optimize FIDS & BMS Graphics	• To allow HVAC isolations where not required
Replace Emperor Lounge HVAC	• Improved control, reduced run times and new polarizing filters
Landside Exterior Lighting Upgrade	• Replace aged fittings with LED
Cargo 1 Chiller Upgrade	• Upgrade with new chiller

Appendix 2.

Project Action Plan

International Terminal

PROJECT	ESTIMATED Annual kWh saving	ESTIMATED Annual $ saving	INVESTMENT $	Payback yrs	IPMVP[1]	FY16	FY17	FY18
	147,600	$164,000	$820,000	5	N/A	$820,000		
Replace Pier A Chiller and optimize controls • improved COP	250,000	$27,500	$985,000	36	N/A	$985,000		
Replace Pier A Boiler • new condensing boiler, high efficiency	572,400	$63,600	$318,000	5	N/A	$318,000		
Replace Pier A BMS Main Plant • improved control for demand management and variable speed on large plant	243,000	$27,000	$135,000	5	N/A	$135,000		
Install meters in intensive energy use areas	144,000	$16,000	$80,000	5	N/A	$80,000		
Central Plant controls optimization • improved control for staging and variable pumping	57,600	$6,400	$32,000	5	N/A	$32,000		
Server Room Cooling • replace central plant connection with dedicated split systems	250,000	$27,500	$33,000	1.2	N/A	$33,000		
Replace Pier A Plantroom 3A BMS • better DESOPs • reduced run times	142,000	$15,800	$79,000	5	N/A	$79,000		
Replace Pier A Main Plantroom BMS • better DESOPs • reduced run times	243,000	$27,000	$135,000	5	N/A		$135,000	
Replace Skybridge BMS • better DESOPs • reduced run times	171,000	$19,000	$95,000	5	N/A		$95,000	
Replace Arrivals Plantroom BMS • better DESOPs • reduced run times	290,000	$32,200	$161,000	5	N/A		$161,000	
Replace FCU & VAV Units controls • better DESOPs • reduced run times	972,000	$108,000	$540,000	5	N/A		$540,000	
Replace Pier A Plantrooms 1 & 2 BMS • better DESOPs • reduced run times	177,000	$19,600	$98,000	5	N/A		$98,000	
Replace Pier A Plantroom 4 BMS • better DESOPs • reduced run times	169,000	$18,800	$94,000	5	N/A		$94,000	
Replace Air NZ & Qantas VIP Lounges BMS • better DESOPs • reduced run times	203,000	$22,600	$113,000	5	N/A		$113,000	
Optimize FIDS & BMS Graphics • to allow HVAC isolations where not required	79,000	$8,800	$44,000	5	N/A		$44,000	
Replace Emperor Lounge HVAC • improved control, reduced run times and new polarizing filters	1,602,000	$178,000	$890,000	5	N/A		$890,000	
Landside Exterior Lighting Upgrade • replace aged fittings with LED	121,500	$23,600	165,000	7	N/A			165,000
Total	**5,834,100**	**$805,400**	**$4,817,000**			**$2,482,000**	**$2,170,000**	**$165,000**

[1] International Performance Measurement and Verification Protocol. See Appendix 6 for further explanation.

Commercial Properties (precinct wide)

PROJECT	ANNUAL kWh SAVING	ANNUAL $ SAVING	INVESTMENT $	PAYBACK YRS	IPMVP	FY16	FY17	FY18
Energy Efficiency & Awareness Assessment of Tenancies • Conduct assessments of commercial building tenancies to raise awareness to tenants and encourage alignment with AIAL energy policy.	No savings anticipated from audits		$25,000			$25,000		
Cargo Central BMS & Chiller Upgrade • Upgrade the BMS. • Potential funding for a new chiller.	TBC							
Cargo 1 Chiller Upgrade • Upgrade with new chiller.	TBC							
Total			**$25,000**			**$25,000**		

Carparks and Roadways (precinct wide)

PROJECT	ANNUAL kWh SAVING	ANNUAL $ SAVING	INVESTMENT $	PAYBACK YRS	IPMVP	FY16	FY17	FY18
Puhinui Road Lighting Upgrade • Replace street lights with LED	TBC							
Total								

Appendix 3.

Project STATUS Summary

PROJECT	SCHEDULED	STATUS	ESTIMATED				MEASURED			
			kWh SAVING	$ SAVING	$ COST	ROI %	kWh SAVING	$ SAVING	$ COST	ROI %
ITB Check-In Lighting Upgrade: more efficient luminaires and lamps and a DALI control system leading to electricity savings. IPMVP Method B, Project Manager Martin Fryer.	June 2012	Completed September 2012	501,297	$83,000	$345,000	24%	480,409	$78,850	$345,000	23%
ITB Ist Floor Departures and Arrivals Lighting Upgrade: more efficient luminaires and lamps and a DALI control system leading to electricity savings. IPMVP Method B, Project Manager Martin Fryer.	July 2013	Completed February 2014	510,000	$83,000	$540,000	15%	464,000	$75,530	$540,000	14%
ITB Central Plant & Check-in 1&2 Controls Upgrade: improve HVAC control, install vsd and utilise demand control. IPMVP Method A, Project Manager Martin Todd.	July 2013	Completed July 2013	2,000,000	$125,000	$302,000	41%				
ITB Centralisation of HVAC Plant: improve HVAC control, loading and staging of chiller plant and isolate unnecessary chillers. IVMP Method A, Project Manager Martin Todd	April 2013	Completed April 2013	3,070,000	$292,000	$853,000	34%				
ITB Renewal of Central Chiller (PC11): replace lead chiller, giving improved COP, staging and better functional control. IVMP Method A, Project Manager Martin Todd.	July 2013	Completed July 2014	1,600,000	$180,000	$900,000	20%	Not measured			
Installation of Energy Pro to monitor gas and electricity	July 2014	Completed July 2015								
ITB Replacement of BMS Customs Hall: replace controllers giving better functional performance, demand response and reduced run time. IVMP Method B, Project Manager Martin Todd.	July 2015	Completed July 2015	498,000	$56,000	$272,000	21%				
ITB Replacement of Server Room Cooling: switch from central cooling to dedicated split systems. IVMP Method A, Project Manager Martin Todd.	July 2015	Completed August 2015	250,000	$27,500	$32,300	83%				
ITB Replacement of Pier A, 3A/3B: replace controllers giving better functional performance, demand response and reduced run time. IVMP Method B, Project Manager Martin Todd.	December 2015	Completed December 2015	195,000	$21,200	$79,000	27%				
Total (implemented only)			**8,374,297**	**840,200**	**3,291,000**	**26%**				

Appendix 4.

Energy Performance Summary

Energy performance is currently expressed in terms of energy and carbon per passenger and energy per square meter. This performance relates to terminal infrastructure only but will be expanded to include the property portfolio using EnergyPro.

Appendix 5.

Energy Performance Indicators

Current energy performance indicators relate to a 20% reduction target, by 2020, for energy and carbon per passenger using 2012 as a base year.

Additional indicators are being developed for terminals and the entire property portfolio using energy per square meter.

Appendix 6.

International Performance Measurement & Verification Protocol

The International Performance Measurement and Verification Protocol (IPMVP) defines standard terms and suggests best practise for quantifying the results of energy efficiency investments and increase investment in energy and water efficiency, demand management and renewable energy projects.

The purpose of the IPMVP is to present a framework and four Measurement and Verification (M&V) options for transparently, reliably and consistently reporting a project's savings. When adhering to IPMVP's recommendations, these M&V activities can produce verifiable savings reports.

IPMVP provides four Options for determining savings (A, B, C and D). The choice among the Options involves many considerations. The selection of an IPMVP Option is the decision of the designer of the M&V programme for each project. These options are summarised below:

Option A – Retrofit Isolation: Key Parameter Measurement

Savings are determined by field measurement of the key performance parameter(s) which define the energy use of the energy conservation measures (ECM), affected system(s) and/or the success of the project. Parameters not selected for field measurement are estimated. Estimates can be based on historical data, manufacturer's specifications, or engineering judgment. Documentation of the source or justification of the estimated parameter is required.

Typical applications may include a lighting retrofit, where the power drawn can be monitored and hours of operation can be estimated.

Option B – Retrofit Isolation: All Parameter Measurement

Savings are determined by field measurement of all key performance parameters which define the energy use of the ECM-affected system.

Typical applications may include a lighting retrofit where both power drawn and hours of operation are recorded.

Option C – Whole Facility

Savings are determined by measuring energy use at the whole facility or sub-facility level. This approach is likely to require a regression analysis or similar to account for independent variables such as outdoor air temperature, for example.

Typical examples may include measurement of a facility where several ECMs have been implemented, or where the ECM is expected to affect all equipment in a facility.

Option D – Calibrated Simulation

Savings are determined through simulation of the energy use of the whole facility, or of a sub-facility. Simulation routines are demonstrated to adequately model actual energy performance measured in the facility. This Option usually requires considerable skill in calibrated simulation.

Typical applications may include measurement of a facility where several ECMs have been implemented, but no historical energy data is available.

Appendix 6.

Graphical Summary of Performance FY16