Attachment G Resource Use and Energy Efficiency

G1 - Resource Use

Facility operations involve the consumption of water, oil and electricity. The estimated quantities that will be used annually at full capacity are given in the table below

Resource	Quantities
Water	311m^3
Diesel	780,000 litres
Gas Oil	120,000 litres
Electricity	3,400MW

G2 - Energy Efficiency

Energy consumption is a significant operational cost and PANDA is committed to improving energy efficiency. In 2012 PANDA carried out an energy audit of the facility as required by Condition 7.1 of the current Waste Licence. A copy of the audit report is included in this Attachment.

PANDA has engaged with the Sustainable Energy Authority of Ireland (SEAI) in relation to implementing Energy Management Standard EN 16001 and joining the Large Energy Users Programme.

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ENERGY AUDIT

PANDA WASTE SERVICES LTD

MATERIALS RECOVERY AND TRANSFER FACILITY

CAPPOGUE

FINGLAS

DUBLIN 11

(Licence No W0261-01)

Prepared For: -
PANDA Waste Services Ltd.,
Cappogue,
Finglas,
Dublin 11

Prepared By: -

O' Callaghan Moran & Associates,
Granary House,
Rutland Street,
Cork

31st October 2012

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1. INTRODUCTION

The Panda Waste Services Ltd (Panda) waste transfer facility at Cappagh Rd, Finglas, Dublin 11 operates under a Waste Licence (W0261-01) issued by the Environmental Protection Agency (the Agency). Condition 7.1 and 7.2 of the Licence requires PANDA to complete an audit of the energy efficiency of the site. The audit should:

(i) Be carried out in accordance with the guidance published by the Agency – "*Guidance Note on Energy Efficiency Auditing*".

(ii) The audit shall identify all practicable opportunities for energy use reduction and efficiency and the recommendations of the audit will be incorporated into the Schedule of Environmental Objectives and Targets

PANDA appointed O'Callaghan Moran & Associates (OCM) to conduct the audit. The objective was to identify all opportunities for energy use reduction and efficiency. The audit was carried out in accordance with the guidance published by the Agency – "*Guidance Note on Energy Efficiency Auditing* (2003)" and was based on energy consumption for the 12 month period from 1st January 2011 – 31st December 2011.

1.1 Audit Process

The audit included a site visit on 19th January 2012 and a review of energy consumption data. At the time of the site visit, the facility was fully operational.

The site inspection included all areas of the site including the waste processing and storage and administration areas. The Environmental Manager, Mr. David Naughton, was interviewed and provided information on facility activities, energy usage and resource consumption.

2. SITE LAYOUT & ACTIVITIES

2.1 Site Layout and Description

The site is located on the Cappagh Road, approximately 2.5km South West of Dublin Airport. It encompasses approximately 2.5 hectares (ha). There is one Recycling Building located at the north eastern site boundary, as shown on Drawing No. 07.07.9.01, with the remaining areas comprising open concrete yard areas. The Building encompasses approximately 1,620 square metres (m^2).

It is intended to expand the site in the future which will involve the construction of the Dry Recycling and Paper & Cardboard Recycling Buildings, which will encompass approximately 2,800m^2 and 4,608m^2 respectively.

2.2 Activities:

2.2.1 Overview

The facility opened in 2006. In 2011, approximately 50,000 tonnes of non hazardous Construction and Demolition and Commercial and Industrial wastes were accepted for temporary storage and transfer to other recycling facilities. The majority of the wastes went to Panda's facility at Beauparc, County Meath (W0140-03).

2.2.2 Main Processing Activities

All waste handling (unloading and loading) is carried out inside the Recycling Building. The bulking up operation is carried out with one front loading shovel, a 12 tonne excavator and one forklift. Baled dry recyclables (plastic, paper and cardboard) are stored externally on the open paved areas while awaiting transport off-site. In 2011, there was also a small electrically powered cloths hanger recycling unit located in a small portacabin type structure in the yard.

2.2.3 Offices & Canteen

The reception area and offices are housed in portakabins located between the weighbridges close to the site entrance. These spaces contain standard office equipment, PCs, printers, fax machines etc and are heated using electric heaters. The canteen and toilet adjacent to the weighbridge contains a water boiler and water heaters for the sinks. Lighting is provided by double fluorescent lights which are manually controlled.

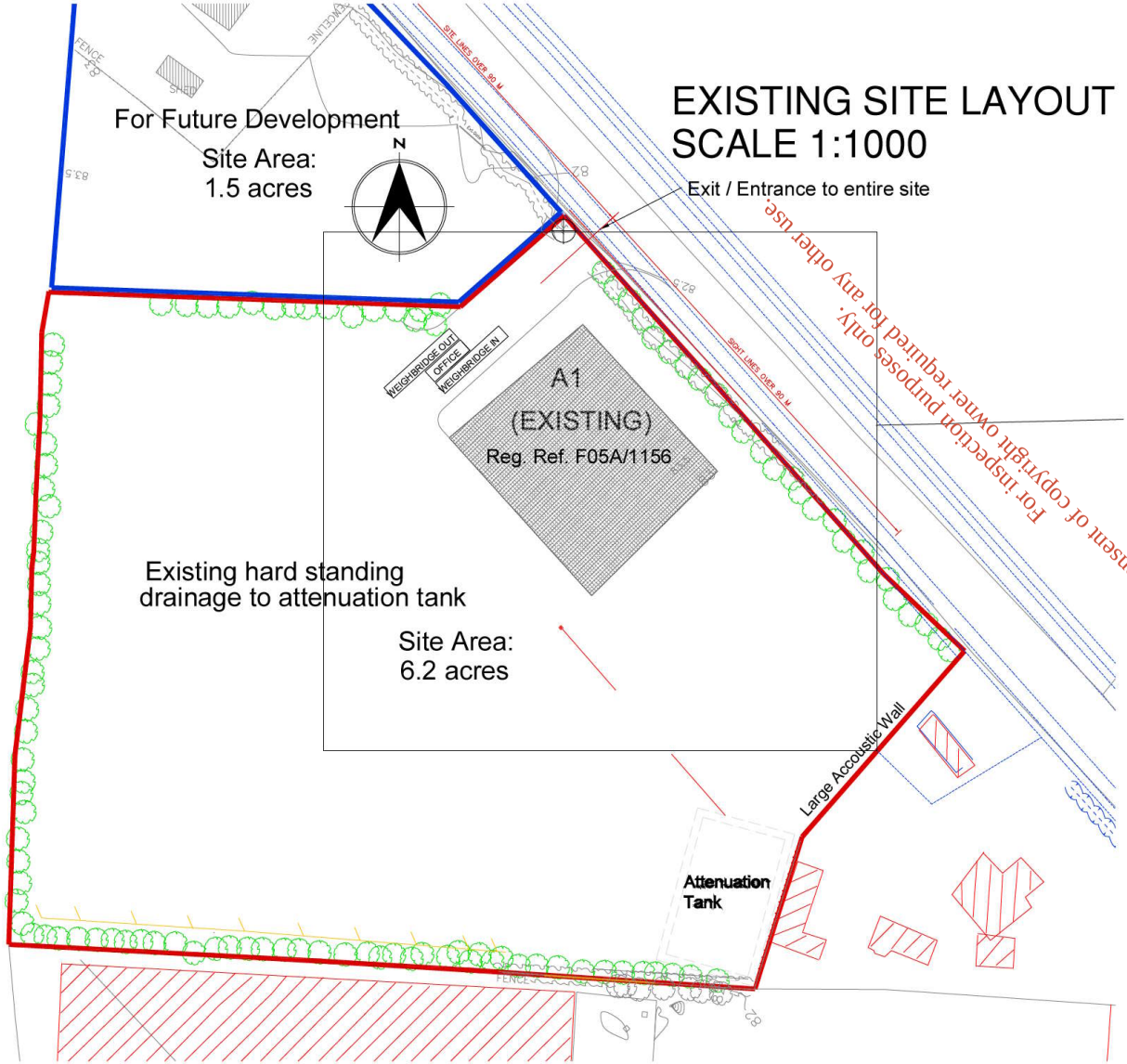
2.2.4 External Lighting

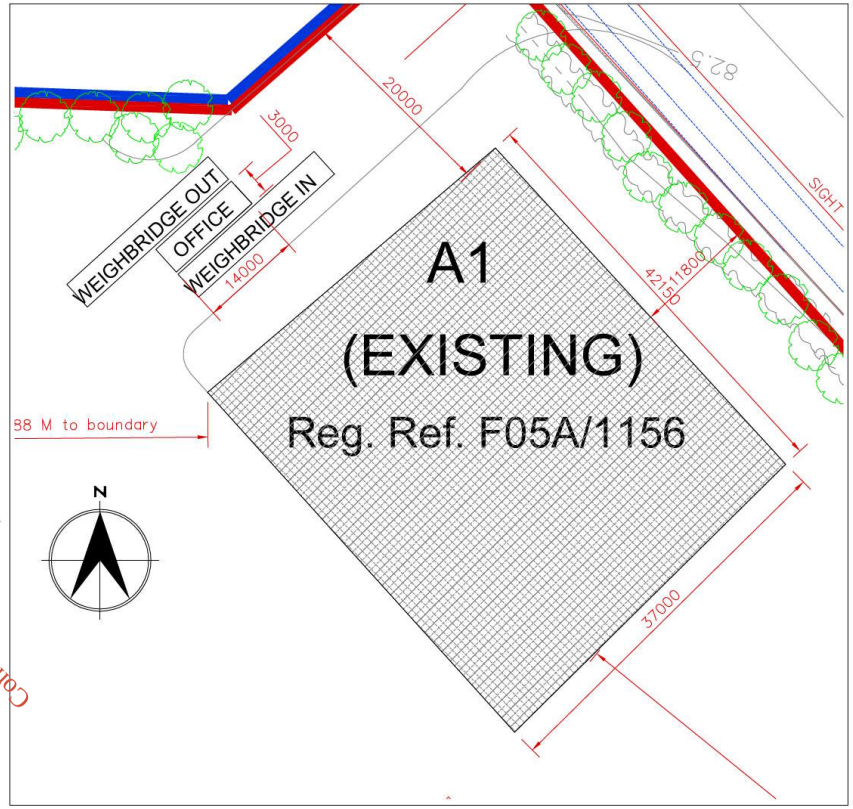
The normal facility operating hours were 06:00-17:00 (Monday-Friday) & 06:00-14:00 (Saturdays). There are 3 No. external lights located on the eaves of the Recycling, 2 No. on the portakabin weighbridge offices and a further 2 No. in the yard area. All are manually operated and only used during winter months.

2.2.5 Internal Lighting – Recycling Building

There are approximately 17 No roof mounted halogen lights within the Recycling Building. These lights are operated manually and for health and safety reasons are on at all times during operational hours.

EXISTING SITE LAYOUT
SCALE 1:1000





No	REVISION	DATE

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Client: PANDA WASTE

Job: EXTENSION TO EXISTING WASTE FACILITIES AT CAPPAGH & ASSOCIATED SITE WORKS

Title:	Scale:	Drawn:
EXISTING SITE LAYOUT EXISTING BUILDING 'A'	1:1000 1:500	RAS
Dwg No: .07.07_9.01 Rev.:	Date: JULY.2007	Stage: LICENCE

3. CURRENT ENERGY USE

3.1 Electricity Consumption

The following mains supplied electricity consuming energy systems were operational in the reporting period: -

- Office /Canteen/Weighbridge
- Internal and External Lighting
- Handheld tools & hanger recycling

Energia are the electricity utility. There is one electricity meter for the entire facility and this is located inside the Recycling Building. In the absence of specific meter readings, the consumption of the various items of electrical equipment was estimated based on the kW/hr rating and operational hours (Ref Table 3.1).

The total electricity consumption during the reporting period was 164,016 kWh. The cost of the electricity, determined from the bills issued by the utility company, was approximately €32,182 including standing charges but excluding VAT. The average cost for electricity in 2011 was 13c for a day time unit, and 6c for a night time unit.

Table 3.1 - Energy Use – 1st January 2011 – 31st December 2011

Energy System	kW/year estimates	% of total	Comments
Admin/Weighbridge	37,224	23.5	Office equipment, PCs, printers, fax etc, small kitchen equipment, etc. Lighting & Heaters.
Lighting (Internal & External)	122,400	75.5	17 (600-1000watt) halogen roof mounted inside Recycling Building. On for 3,600 hours in 2011. External lighting (12 No), 600-1000 watt. On for 3,600 hours at night in 2011. 5 No. 400W external lights.
Other	1,640	1	Miscellaneous items unaccounted for. – Meteor Mast, hanger recycling, hand held tools etc.
Total	164,016	**100**	

3.2 Diesel

The volume and cost of diesel, calculated from the fuel company suppliers, is shown in Table 3.2, with the individual users shown on Tables 3.3 and 3.4. 41,612 litres of diesel were used in the on-site plant and equipment, costing approximately €30,792 (average litre cost €0.74). It is possible to quantify the volumes consumed by the individual plant items onsite as each plant item is provided with a dedicated key to access the fuel supply. Consumption analyses of the individual plant users is currently carried out in an informal ad-hoc manner.

The Panda waste collection fleet also refills at the Cappagh facility and approximately 335,117 litres was used in 2011, costing €385,786 (average litre cost €1.1512). It is possible to record the fuel usage of individual collection vehicles and the Miles Per Gallon (MPG) rates for each vehicle. Analysis of the individual fleet vehicle fuel usage is currently carried out in an informal ad-hoc manner.

Table 3.2 – Diesel Usage Totals 1st Jan 2011 – 31st Dec 2011

User	Volume (litre)	Average Cost €	Total Cost 2011
Collection Fleet	335,117.89	1.1512	385,786
On site Plant	41,612.50	0.74	30,792

Table 3.3 Onsite Diesel Users

Vehicle Type	No Items
Front Loading Shovel	1
2.5t Forklift	1
12t CAT Excavator	1

3.3 Carbon Footprint

The carbon footprint associated with the diesel and electricity consumption is estimated at 1,196 tonnes for the reporting period. A copy of the carbon footprint report is included in Appendix 2.

4. EXISTING ENERGY MANAGEMENT SYSTEM

The Agency's Guidance Note is targeted at large industrial sites, which typically have multiple and complex energy systems and high consumption rates of different energy sources (e.g. electricity, natural gas, fuels). In general, a facility such as a waste transfer facility has simpler and well defined energy systems. The Cappagh Road facility in particular has very simple electrical systems and a small number of onsite discrete diesel consumption users. The main diesel consumption associated with the facility is Panda's collection fleet.

4.1 Energy Management System

The objective of an Energy Management System is to make the best possible use of the energy consumed at a particular facility. Such a system may include: relevant policies, procedures, action plans, responsibility chains, training, awareness and motivation, and data collection and monitoring systems.

The Agency's Guidance Document presents an energy management matrix to assist in the assessment of the status of the different key elements that comprise the system and this was used to assess the existing Panda system.

4.2 Energy Policy

The Environmental Manager is aware of the importance of energy savings and does apply unwritten guidelines. However, a facility specific documented energy policy has not been prepared.

The purpose of an energy policy document is to provide the supporting framework for the implementation of measures to ensure that energy is actively managed in day to day activities and that the assessment of energy efficiency is an integral part of the procurement process for plant items.

To achieve the requirements of the policy, Panda should establish long-term goals, medium-term objectives, short-term targets, an action plan for achieving all goals, objectives and targets and an energy management plan to ensure continual review and improvement.

4.3 Organising

The Environmental Manger is currently responsible for energy usage at the facility. However, the areas of responsibility are not clearly defined and the Manager has not received any formal training in energy management issues.

4.4 Motivation

At present, the need for efficient energy management is not communicated to the key facility staff or contractors. Staff training and inductions are carried out and therefore there are already established channels of communication to ensure that facility staff can be adequately informed of energy management measures.

4.5 Information Systems

There is one electricity meter on-site, which provides data for the entire facility. The billing data provided by the electricity utility company allows an assessment of total consumption, broken down into daily and night time on a monthly basis that allows seasonal changes in usage patterns to be determined. As expected, less electricity is used in the summer months, when there is a reduced demand for lighting and heating.

The diesel storage tanks are replenished as required to ensure there is sufficient fuel to maintain plant and collection vehicle operations. Consumption figures are available for both plant items and collection fleet vehicles. Fuel usage is tracked using computer software however it is not routinely reviewed to allow an analysis of consumptions trends and consumption trends associated with individual collection vehicles is not currently in place. Targets for achieving energy reductions are also not currently in place.

4.6 Marketing

Although termed marketing, this element actually relates to the communication and 'selling' of the concept of energy management within an organisation. At present, there is no formal site specific training/awareness programmes on energy management for key site staff.

In the context of the energy usage and employee numbers, it is considered that a detailed formal training/awareness programme is not required; however there is the potential to improve awareness among key staff (collection fleet and plant item operators and managers). This could be incorporated into the routine annual training and awareness programmes implemented at the facility for key staff members.

4.7 Investment

While at present only low cost measures have been applied to energy consumption (e.g., timed external lighting), Panda is aware of the need for future investment to contribute to energy efficiencies as the facility expands. While not formally documented, the current procurement criteria do include an assessment of the energy efficiency of proposed plant items.

4.8 Overall Assessment

An overall assessment of the current level of performance of the facility's energy management system is included in Table 4.1. The Table, which is based on the Matrix in the Agency Guidance, includes levels (0 to 4) that represent the possible range of performance. Level 4 represents Best Practice; however the Agency Guidance recognises that this level of development may not be appropriate for all sites.

While the facility is at the Lower Levels in the Matrix, Panda is aware of the need for the implementation of an energy management system. A framework to allow for the effective communication and promotion of an energy management system is in place. It should also be borne in mind that the energy systems at the facility in particular the electricity users are simple and of a small scale and that the energy costs comprise a small percentage of the overall operational costs.

Table 4.1 Energy Management Matrix

Level	Energy Policy	Organising	Motivation	Information systems	Marketing	Investment
4	Energy policy, Action Plan and regular review have commitment of top management as part of an environmental strategy.	Energy management fully integrated into management structure. Clear delegation of responsibility for energy consumption.	Formal and informal channels of communication regularly exploited by energy manager and energy staff at all levels.	Comprehensive system sets targets, monitors consumption, identifies faults, quantifies savings and provides budget tracking.	Marketing the value of energy efficiency and the performance of energy management both within the organisation and outside it.	Positive discrimination in favour of 'green' schemes with detailed investment appraisal of all new-build and refurbishment opportunities.
3	Formal energy policy, but no active commitment from top management for energy.	Energy manager accountable to energy committee representing all users, chaired by a member of the managing board.	Energy committee used as main channel together with direct contact with most users.	M&T reports for individual premises based on sub-metering, but savings not reported effectively to users.	Programme of staff awareness and regular publicity campaigns.	Same pay back Criteria employed as for all other investment.
2	Un-adopted energy policy set by energy manager or senior departmental manager.	Energy manager in post, reporting to ad-hoc committee, but line management and authority are unclear.	Contact with most users through ad-hoc committee chaired by senior departmental manager.	Monitoring and targeting reports based on supply meter data.	Some ad-hoc staff awareness training.	Investment using short-term payback criteria only.
1	An unwritten set of guidelines.	Energy management is the part-time responsibility of an office staff.	Informal contacts with a few users.	Cost reporting based on invoice data. Engineer compiles reports for internal use within technical department.	Informal contacts used to promote energy efficiency.	Only low cost measures taken.
0	No explicit policy.	No energy management or any formal delegation of responsibility for energy consumption.	No contact with users.	No information system. No accounting for energy consumption.	No promotion of energy efficiency.	No investment in increasing energy efficiency in premises.

5. CONCLUSIONS & RECOMMENDATIONS

The energy consumption systems at the facility are relatively simple. Given the nature of the operations, there is no need to achieve Level 4 Best Practice as defined in the Agency's Guidance. However there are opportunities to improve energy efficiency performance.

5.1 Energy Policy

5.1.1 Conclusion

A documented energy policy statement has not been prepared. A policy statement is fundamental to the successful implementation of any management system, as it provides the framework for the introduction and maintenance of energy efficiency and conservation measures in the day to day operations.

5.1.2 Recommendation

An energy policy statement should be prepared and communicated to all staff members. The policy should emphasise a commitment to reduce energy consumption at the facility. The statement should be referenced in the facility's Environmental Management Programme.

5.2 Organising

5.2.1 Conclusion

Effective energy management requires the assignation of responsibility to a senior member of the facility management team for the implementation of the energy policy and monitoring performance. This has not yet been done.

5.2.2 Recommendation

It is recommended that the Environmental Manager be assigned overall responsibility for energy management and be provided with the appropriate training. The level of training can be assessed using the training and awareness matrix included in the facility's Environmental Management System.

The Environmental Manager should prepare a list of objectives and targets based on the recommendations contained in this report. These should be incorporated into the overall Schedule of Objectives and Targets set out in the facility's Environmental Management Programme.

The Environmental Manager should conduct quarterly reviews of energy usage in particular fuel consumption; assess progress towards achieving objectives and targets and prepare a summary report for inclusion in the Annual Environmental Report. The Environmental Manager should be involved at the initial stage of the procurement of all items of plant and equipment to ensure that energy efficiency is one of the key elements assessed.

It is expected that, energy management will take less than 5% of the Environmental Managers time annually. The cost of the time invested should be quickly recouped from efficiencies in and the avoidance of unnecessary costs during any expansion or replacement of these systems.

5.3 Motivation

5.3.1 Conclusion

At present the need for efficient energy management is not communicated to the key facility staff or contractors.

5.3.2 Recommendation

The Environmental Manager should be made responsible for the communication of energy management issues to key facility staff (improved plant operating practices) derived from the review of energy management practices (Ref Section 5.2.2).

This can be done informally through direct discussion with individual staff members and by posting memoranda and notices on office notice boards and in the canteen and changing areas. The facility currently carry out monthly 'tool-box' talks which involves discussions on work practices, health and safety, fire drills etc. It is recommended that Energy Efficiency be included in these talks.

As the Panda waste collection fleet is refuelled at the facility it is recommended that consideration be given to driver training with emphasis on energy efficiency practices.

5.4 Information Systems

5.4.1 Conclusion

At present, there is one electricity meter on-site that provides data on total consumption. It does not allow an assessment of the consumption by the different mains supply powered energy systems. However it is neither necessary nor practical to introduce sub-meters as the significant energy users are known.

There is a system in place to monitor diesel consumption and to determine the efficiency of the diesel powered plant items and the usage of individual collection fleet vehicles. The volume of diesel used by individual plant items is recorded as each plant item is provided with a dedicated fuel access key. An estimate of the run-time on particular plant items can be made to gain an understanding on the plant efficiency. Panda have fuel tracking software which allows for MPG data on individual plant items to be recorded. Analysis of the fuel efficiencies is not formally carried out.

5.4.2 Recommendations

Electricity consumption should be assessed based on the monthly utility company bills. The data should be analysed and discussed with the electrical contractor to identify possible opportunities for efficiencies, which may include the following: -

- Identification of unnecessary loads,
- The potential for Power Factor Correction
- Load shifting to lower tariff periods, and
- Reducing peak demand.

Diesel consumption should be recorded for each plant item and estimates for their run-times be provided to the Environmental Manager on a monthly basis. This will allow for an assessment on the efficiency for individual plant items and may flag problems which can be quickly rectified. The fuel usage and efficiency for individual collection fleet vehicles should be tabulated and reported to the Environmental Manager to allow for an assessment of any unusual consumption trends. The reports could also be used to assess the benefits of staff training relating to changed operational practices including driver training.

Consideration should be given to link both diesel and electricity usage to the waste volumes handled at the facility in order to generate an Energy Performance Indicator (EPI). The EPI could then be used to assess any measures introduced to reduce energy usage.

5.5 Marketing

5.5.1 Conclusions

At present, energy awareness training is not provided to any staff members. It is considered that there are key staff members at the facility and targeted awareness training would be more productive being directed to them (plant operators, individual collection drivers). Awareness is crucial in the implementation of an effective energy management system and the achievement of changes to operational practices that will reduce energy consumption.

5.5.2 Recommendations

The Environmental Manager should be responsible for the implementation of the awareness programme. The awareness training should start after the adoption of the energy policy statement and the provision of the monitoring and targeting system so that it is possible to monitor the success or otherwise of the programme. The results of the programme should be communicated regularly to the key staff members so as to maintain a high level of awareness.

5.6 Investment

5.6.1 Conclusions

The lights in the Recycling Building and offices are manually operated. The external lighting is fitted with timers, but not with photocells and motion detectors which is best practice. There are a number of 400w external lights which could be replaced with 140w LED lighting.

5.6.2 Recommendations

Consideration should be given to the installation of photocell and motion detectors for the external lighting. These could achieve up to 30% savings with a pay back time of 2 - 3 years. It is understood that lighting is always required inside the building while operations are ongoing for health and safety reasons and so these should remain manually controlled. Consideration should also be given to switching utility supplier to one with a larger mix of renewable energy, which would reduce the carbon footprint of the facility.

A change to biodiesel would reduce the facility's carbon footprint, the Environmental Manager should investigate the possibility of switching to biodiesel.

Consideration should be given to providing driver training (efficient driving practices) to all collection fleet drivers. Potential saving are estimated at 5-10% of the collection fleet fuel bill.

Consideration should be given to replacing the 400 w external always on lights with 140 W LED lights. Potential saving are estimated at €800 per annum and would be paid back in 1-2 years.

5.7 Summary Recommendations

A summary of the recommendations is presented in Table 5.1. The table, which follows the format set out in the Agency's Guidance Document, includes projected cost savings and reductions in carbon dioxide emissions.

Table 5.1

	Action	Investment Cost Category	Payback (years)	Annual Energy Savings (kWh)	Annual Energy Savings (€)	Annual CO_2 Emissions Savings if non renewable source (Tonnes)
Energy Policy	1.Adopt Energy Policy Statement	No Cost	NA	NA	NA	NA
Organising	2. Provide appropriate training	Low Cost	NA			
	3. Maintain targets and objectives	Low Cost	NA			
	4. Annual summary on performance in AER	Low Cost	NA			
	5. Assessment of energy efficiency of future plant and equipment	Low Cost	Immediate	*		
Motivation	6.Communicate policy objectives to staff	Low Cost	Immediate	*		
Information Systems	7. Monthly data analyses and identification of efficiency opportunities.	Low Costs	NA	*		
	8. Data analysis to allow for measuring improvements (EPI – Energy Performance Indicators)	Low Cost	NA	*		
Marketing	9. Provide awareness training to key staff based on the energy consumption data records.	Low Cost	Immediate	*		
	10. Provide feed back to staff.	Low Cost	Immediate	*		
Investment	11. Provide photocell/motion detector lighting for external areas	Low Cost	2-3 years	2128	274.51	1.65
	12. Consider switching utility supplier to renewable energy supplier.	No Cost	NA			
	13. Consider introducing bio-diesel for mobile plant	No Cost	NA			
	14. Consider providing driver training	Medium Cost	2-3 years	5-10% collection fleet fuel bill (varies)	5-10% of 2011 cost – up to €19,000	Every 380Litre of Diesel saved equals approximately 1 tonne of CO2.
	15. Investigate replacing 400W lighting with 140 W LED flood lighting. (5 lights)	Low	1-2 Years		€800	

NA: Not Applicable

* : Not possible to quantify as benchmark not established.

APPENDIX 1

Consumption Data

Account Name Site Address	MPRN_or_GPRN	Consumption Mon	Rates Schedule	Day Units	Night Units	Total Units	Excess Ca
PANDA WAST CAPPAGH ROAD FINGLA	10303894930	Mar-11	LVMDX	4920	3360	8280	0
PANDA WAST CAPPAGH ROAD FINGLA	10303894930	Apr-11	LVMDX	9960	6720	16680	0
PANDA WAST CAPPAGH ROAD FINGLA	10303894930	May-11	LVMDX	9840	6360	16200	0
PANDA WAST CAPPAGH ROAD FINGLA	10303894930	Jun-11	LVMDX	6960	4680	11640	0
PANDA WAST CAPPAGH ROAD FINGLA	10303894930	Jul-11	LVMDX	6960	4680	11640	0
PANDA WAST CAPPAGH ROAD FINGLA	10303894930	Aug-11	LVMDX	6120	4440	10560	0
PANDA WAST CAPPAGH ROAD FINGLA	10303894930	Sep-11	LVMDX	6240	4440	10680	0
PANDA WAST CAPPAGH ROAD FINGLA	10303894930	Oct-11	LVMDX	7560	4320	11880	0
PANDA WAST CAPPAGH ROAD FINGLA	10303894930	Nov-11	LVMDX	7920	4560	12480	0
PANDA WAST CAPPAGH ROAD FINGLA	10303894930	Dec-11	LVMDX	17160	9480	26640	0

APPENDIX 2

Carbon Footprint Report

Carbon Footprint Report

Company Name: Cappagh Road

Date: 24/09/2012

Fuel: 1101.557963746

Electricity: 95.4245088

Product/Transport: 0

Business travel:

Car: 0

Flights: 0

Total: 1196.982472546

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