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ENERGY AUDIT

PANDA WASTE SERVICES

RATHDRINAGH

NAVAN, COUNTY MEATH

WASTE LICENCE NO. W0140-03

Prepared For: -

Panda Waste Services,
Rathdrinagh,
Beauparc,
Navan,
Co. Meath

Prepared By: -

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October 2012

Project	Energy Audit Panda Waste Services Rathdrinagh, Co Meath.
Client	Panda Waste Services Ltd W0140-03

Report No	Date	Status	Prepared By	Reviewed By
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1. INTRODUCTION

Nurendale Ltd Trading as Panda Waste Services (Panda) appointed O' Callaghan Moran & Associates (OCM) to carry out a Energy Audit at their Materials Recovery Facility (MRF) at Rathdrinagh, Navan, County Meath. The facility is a non hazardous MRF, which operates under Waste Licence (W0140-03) issued by the Environmental Protection 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.

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 Location

The facility is in the townland of Rathdrinagh, Beauparc, Navan County Meath. It is bordered to the west by the N2 and to the north by the Knockcommon Road.

2.2 Site Layout and Description

The current licensed area is 4.7 hectares and the site layout is shown on Drawing No 101-102 in Appendix 1, with details of the infrastructure presented in Table 2.1. Buildings 1 & 2 were operational for the entire 12 month period (2011). Building 3 was constructed in 2010 and 2011 and only began operations in September 2011.

Table 2.1 – Site Infrastructure

Ref	Infrastructure	Details
1	Administration Building	Located adjacent the site entrance at the northern boundary.
2	2 No Weighbridge and associated office	Located close to the facility entrance in the north of the facility – Approximately 60 office based employees in 2011.
3	Building 1	Waste processing building (2800 m^2) – Timber shredding & DMR Storage. Composting tunnels not in use in 2011.
4	Building 2	Waste processing building (2600 m^2) – Construction & Demolition Wastes processing
5	Building 3	Waste processing building (4,248 m^2) - Processing of mixed wastes and source separated dry recyclables (RDF production).
	Lean-To	There is a covered 'flip-flop' unit to further process the C&D trommelled fines located adjacent to Building 2 as well as a rubble crusher and picking line.
	Skip Repair Building	The skip repair building (372m^2) is located between Buildings 2 and 3 and is used for the repair of damaged skips but was not operational in 2011.
6	2 No Dust suppression system	Building 1 and Building 2 have water sprayers installed to restrict dust generation within the Buildings.
7	2 No Drying Tunnels	Located adjacent to Building 1 – **Not** in use during 2011
8	Above ground water reservoir	660 m^3 capacity
9	Truck wash	Located to the east of Building 1. Handheld power washer.

Ref	Infrastructure	Details
10	Paved Yards	35,000m^2
11	Underground surface water storage tank and associated pump	72m^3
12	Underground Wastewater storage tanks (X3) and associated pumps	Serving B1 – 11m^3 Serving B2 – 3m^3 Serving B3 – 3m^3
13	Oil Storage Tanks and dispensers	Diesel Oil – 59,000 litres Gas Oil – 14,000 litres

2.3 Activities:

2.3.1 Main Processing Activities

The main activity is the processing of non-hazardous wastes to recover materials suitable for recycling, and to minimise the quantity of treated waste disposed to residual landfill. Ancillary activities include vehicle washing, fuel/oil storage and administration. A skip repair building and a waste processing building are under construction but are not yet operational, but the proposed uses has been taken into consideration in the assessment.

2.3.2 Building 1 – Municipal Solid Waste Processing

Building 1 was historically used for all domestic, commercial and industrial mixed waste and dry recyclables. The mixed waste was mechanically treated using a shredder, magnet and trommel to separate out the organic fraction which was then sent to the drying tunnels which extend from Building 1. In 2011, Building 1 was only used for the storage of Dry Mixed Recyclables (DMR) which was carried out in the southern section of the building, and timber shredding which was carried out at the northern section of the building. Timber is shredded using a Doppstadt DZ-750 diesel power shredder.

2.3.3 Building 2 – Construction & Demolition Waste Processing

Building 2 is used to segregate the C&D waste using a shredder, trommel, wind blower, magnet, ballistic separator, conveyors and a picking line to recover ferrous and non ferrous metals, rubble, timber and inorganic fines. The recovery system is electrically powered. Diesel powered front loading shovels are used to load the shredder, and two grabs are used to pick out large pieces of steel etc and load the waste for consignment. Recovered materials are sent off-site for further recycling and recovery, while non recoverable residuals are sent to landfill.

There is a tyre bay located immediately north of Building 2 which is supplied with an electrically powered air compressor for rimming tyres.

2.3.4 C&D Lean To

There is a 'flip-flop' unit, magnet and conveyors system to further process the C&D trommelled fines located adjacent to Building 2. This system removes stones, wood, metal and residual material from the fines. Adjacent this there is a magnet, picking line and rubble crusher, which are all electrically powered.

2.3.5 Building 3 – Dry Recyclables Processing & Refused Derived Fuel production

Building 3 was constructed in 2010 and is located at the southern boundary of the site. It was not fully operational during 2011 but plant commissioning and waste processing occurred between September and December 2011. The building is used for processing of mixed and source separated dry recyclables and for the manufacture of Refuse Derived Fuel (RDF).

The plant in Building 3 is extensive, state of the art and is all electrically powered. The building is divided in to two sections, the 'wet side' of the building which is to the west and the 'dry side 'which is to the east. The 'wet side 'is used for the initial processing of the mixed wastes. The waste is processed using shredders, trommells, magnets, splitters, ballistics (x2), density separators and a series of conveyors. On the 'dry side' the waste is re-shred, trommelled and conveyed to a baler for production of the finished bales.

2.3.6 Fuel/Oil Bund

Diesel (59,000 litres) and gas oil (14,000 litres) are stored in above ground tanks in two bunds located along the eastern boundary close to Building 1. The panda vehicle fleet and plant items are serviced from the bunds which use relatively small electrically powered pumps.

2.3.7 Skip Repair Building

The skip repair building is not yet in use but will be used for the repair of damaged skips. It will contain a welder and work stations.

2.3.8 Administration Building & Weighbridge

The administration and weighbridge offices are at the northern site boundary and contain open plan offices, toilets and canteen facilities. There are approximately 60 office based employees at the facility. The internal lighting is provided by low watt (12w) bulbs (approximately 75 No.). There are four air conditioning units (Hitachi), approximately 60 PCs, photocopiers, fax machines etc.

2.3.9 External Lighting

The facility operates 0730 and 1900 Monday to Friday inclusive and 0830 and 1700 on Saturdays (approximately 3,500 hours per annum). There are 16 No. external lights located on the sides of the main buildings directed to the yard and vehicle manoeuvring areas. The lights are manually operated and are turned off once operations cease, in 2011 this was generally 18.30.

2.3.10 Internal Lighting – Recycling Buildings

There are approximately 11 No roof mounted halogen lights in Building 1, 23 in Building 2 and 24 in Building 3. These lights are operated manually and for health and safety reasons are on at all times during operational hours.

2.3.11 Vehicle & Plant Garage workshop

There is a vehicle and plant workshop located adjacent the site which is outside the licensed area. The electricity supplied to this unit is sourced from the facility and contributes to the overall electricity consumption figures and is therefore included in the assessment.

The workshop contains a number of bays for vehicle and plant maintenance and is heated using a Kroll diesel boiler. There is an electrically powered overhead crane and six ventilation exhausts to provide extraction from the building. Other energy users included 16 No roof mounted halogen lights and a number of handheld electrically powered tools.

2.3.12 Miscellaneous Items

There is an electric vehicle power washer that is run using two motors located in the yard. There is also a groundwater well at the site which pumps using two motors groundwater to an above ground storage tank. Sanitary wastewater is treated in an onsite biocycle unit, which is electrically powered. The pump house, a substation and a small canteen are also located in a block adjacent Building 1. This block is provided with double fluorescent lighting.

3. CURRENT ENERGY USE

3.1 Electricity Consumption

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

- Building 1 – Lighting only
- Building 2 – C&D Recycling plant & lighting. See Appendix 2 for the full list of plant items and motor ratings (Kwh)
- Building 3 – Mixed waste recycling plant (September – December 2011 only) & lighting. See Appendix 2 for the full list of plant items and motor ratings (Kwh)
- Administration Areas including weighbridge
- Vehicle maintenance workshop
- C&D recovery plant items at Lean To.
- Internal and External Lighting
- Miscellaneous less significant Items

Airtricity Ltd supplied the electricity to Buildings 1 and 2 for all of 2011 and to Building 3 from September. The remaining areas of the site were supplied by Energia Ltd. There are two associated electricity meters for the facility which allows for the energy associated with the processing activity to be assessed separately to the ancillary activities. 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 1,029,894 kWh at the waste processing buildings and 607,378 kWh for the remaining activities. The cost of the electricity, determined from the bills issued by the utility companies, was €145,263 for the processing activity and €81,698 for the ancillary activities. This includes standing charges but excludes VAT. Details on electrical usage is shown in Appendix 3.

The opening of Building 3 in September led to significant rise in electricity consumption increasing from an average of 37,575 units per month to 147,800 units per month.

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

Energy System	kW/year estimates	% of total	Comments
BUILDING 2			
2 x 132kwh	264000		
9 x 4kwh	36000		
1 x 2.2kwh	2200		
1 x 5.5kwh	5500		
1 x 75kwh	75000	46.9	Facility is operational approximately 3,500 hours per annum. It is assumed that the major plant items (shredder, trommel and associated plant) are in operation 1,000 hours per annum.
2 x 30kwh	60000		
1 x 18.5kwh	19000		
1 x 13kwh	13000		
1 x 7.5kwh	7500		
SubTotal	**483,000**		
BUILDING 3			
37 x 7.5kwh	83,000		
5 x 3kwh	4500		
1 x 10kwh	3000		
6 x 5.5kwh	9900		
1 x 15kwh	4500		
17 x 4kwh	20400		
1 x 9.5kwh	2850	49	Building 3 operated between September and December 2011 (1,200 hours approximately). It is assumed that the plant operated for 300 hours.
3 x 18.5kwh	16800		
2 x 70kwh	42000		
1 x 200kwh	60000		
2 x 250kwh	150000		
1 x 315kwh Unta	94500		
1 x 45kwh	13500		
SubTotal	**504,950**		
BUILDING 1 Lighting Only	38,500	3.7	Lighting Only. 11 1,000 watt for 3500 hours in 2011
Other	3,444	0.4	Miscellaneous items unaccounted for.
Total	**1,029,894**	**100**	

Table 3.2 - Energy Use – 1st January 2011 – 31st December 2011 – Ancillary Activities

Energy System	kW/year estimates	% of total	Comments
Vehicle & Plant Garage workshop	194,378	32	Electrically powered overhead crane, six ventilation exhausts, 16 No roof mounted halogen lights and a number of handheld electrically powered tools.
Admin/Canteen	312,000	51	60 Office based Staff members in 2011. Office equipment, PCs, printers, fax etc, small kitchen equipment, etc. Lighting & Heaters. (5,200 kwh/employee)
Lighting (External)	56,000	9.2	16 No. external lights – 3,500 hours@1,000 watt.
Other	45,000	7.8	Miscellaneous items, bund, groundwater pumping etc
Total	**607,378**	**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. 278,492.11 litres of diesel were used in the on-site plant and equipment, costing €206,000. 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 Beauparc facility and approximately 1,472,331.56 litres was used in 2011, costing €1,694,947. 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	1,472,331.56	1.1512	1,694,948
On site Plant	278,492.11	0.74	206,084

Table 3.3 Onsite Diesel Users

Vehicle Type	No Items
Volvo L120	3
Teleporter	1
Volvo L60	1
Fuchs Grab	1
Doppstadt Shredder	1
Scarab Roadsweeper	1
Kobelco Track	2
Hoists	2
Forklift	1
Shunter	1

3.3 Carbon Footprint

The carbon footprint associated with the diesel and electricity consumption is estimated at 5,500 tonnes for the reporting period. A copy of the carbon footprint report is included in Appendix 4.

4. EXISTING ENERGY MANAGEMENT SYSTEM

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 site electrician is currently responsible for energy usage at the facility. However, the areas of responsibility are not clearly defined and the electrician 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 two electricity meters on-site, which provides data for the entire facility. The billing data provided by the electricity utility companies 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 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. 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.

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

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 site electrician 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 site electrician 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 site electrician 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 site electrician 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 site electricians 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 facility staff or contractors.

5.3.2 Recommendation

The site electrician 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. It can also be done formally during routine staff training and during inductions for visiting and new staff. 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 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 are two electricity meters on-site that provides data on total consumption. They do 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 (individual motors) 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 site electrician 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 site electrician 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 site electrician 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 buildings and offices are manually operated. The external lighting is fitted with timers, but not with photocells and motion detectors which is best practice.

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 be given to switching suppliers to renewable sources. This will potentially reduce the carbon footprint for the facility.

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

Consideration should be given to providing driver training (efficient driving practices) to all collection fleet drivers.

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	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 consumption data	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 kwh	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. Consideration to provide driver training (may not be relevant to the type of fleet)	Opportunity for investment	1	73,616 litres	84,740	216

NA: Not Applicable

* : Not possible to quantify as benchmark not established.

APPENDIX 1

Drawing 101-102

Existing Farmhouse

Existing Farm Out Buildings

Proposed Site

Existing House

Skip Repair Building

Building Under Construction

Floor Level 57.05

Building No.2

Building No.1

Garage

Garage/Shop

Building

Offices

Weigh Bridge Office

Garage Forecourt

N2 Dublin - Derry Raod

To Derry

To Dublin

Rathdrinagh Cross Roads

6' FF

No	REVISION	DATE

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Client:
Nurendale Ltd.
(PANDA Waste)
Rathdrinagh, Beauparc,
Navan, Co. Meath.

Job:
Phase IV
Recycling Facility

Title	Scale	Drawn
Existing Site Plan And Site Survey	1:500 @ A0 1:1380 @ A3	S. Hill
Dwg No: 2009-101-102	Rev.:	Date: Sept 2009
		Stage: EPA

APPENDIX 2

Electrical Plant Inventory

Plant Number	Plant Discription	kW motor
S2-000	Shed 2 general	
S2-001	Shredder	2x132
S2-002	Slat conveyor	4
S2-003	Transferbelt	4
S2-004	Magnet	2.2
S2-005	Metals belt	4
S2-006	Trommell infeed	5.5
S2-007	Trommell	75
S2-008	Trommell collection	4
S2-009	Short belt	3
S2-010	NiHot	total 30
S2-011	NiHot Fan	30
S2-012	Ballistic infeed	13
S2-013	Ballistic	2x4
S2-014	Ballistic Fan	18.5
S2-015	Ballistic collection	4
S2-016	Timber belt	7.5
S2-017	Flat Belt	4
S2-018	Magnet	4
S2-019		
S2-172	Control room	

Plant Number	Plant discription	KW motor
S3-100	Shed 3 General	
S3-101	RDF stockpile conveyor	7.5
S3-102	Magnet	3
S3-103	Magnet	3
S3-104	RDF fines conveyor	10
S3-105	RDF Fines collection	7.5
S3-106	Overs conveyor	5.5
S3-107	Overs conveyor	5.5
S3-108	Trommell 6x3	15
S3-109	M+J 6000 collection	4
S3-110	M+J 6000 infeed	7.5
S3-111	Pellenc coll RDF	4
S3-112	Pellenc coll PVC	
S3-113	Pellenc roller	0.25
S3-114	Pellenc conveyor	7.5
S3-115	Pellenc conveyor	7.5
S3-116	Pellenc conveyor	7.5
S3-117	Ballistic discharge	5.5
S3-118	SDS discharge	5.5
S3-119	Ballistic discharge	5.5
S3-120	SDS lights conveyor	9.2
S3-121	SDS Fan	18.5
S3-122	SDS heavies	4
S3-123	SDS drum	2.2
S3-124	SDS drum infeed	3
S3-125	Eddy Current Coil	5.5
S3-126	Aluminium coil	4
S3-127	Magnet	3
S3-128	Eddy Current infeed	4
S3-129	Rollies 2	4
S3-130	Rollies 1	4
S3-131	Ballistic 1	2x4
S3-132	Ballistic 2	2x4
S3-133	Vibro feeder 3	2x4
S3-134	Vibro feeder 2	2x4
S3-135	Vibro feeder 1	2x6
S3-136	Trommell CD1 Conveyor	4
S3-137	Fines transfer	
S3-138	Fines transfer	
S3-139	Fines collection	
S3-140	trommel infeed	18.5
S3-141	M+J 2000 discharge	7.5
S3-142	Eddy Current (fines)	7.5/4
S3-143	Eddy Current (fines)	7.5/4
S3-144	Eddy Current (rollies)	7.5/4
S3-145	Eddy Current (rollies)	7.5/4

S3-146	Trommel	2x70
S3-150	New Fines Conveyor	4
S3-170	M+J 2000 Shredder	200
S3-171	M+J 6000 Shredder	2x250
S3-172	Control room	
S3-173	Shutter Door	
S3-200	Shed 3 dryside general	
S3-201	RDF stockpile 1	7.5
S3-202	RdF stockpile 2	7.5
S3-203	RDF collection	7.5
S3-204	RDF collection	7.5
S3-205	RDF collection	7.5
S3-206	Untha	315
S3-207		
S3-208	Fine Collection	7.5
S3-209	Untha feeder	7.5
S3-210	overflow conveyor	7.5
S3-211	Trommel	18.5
S3-212	Trommel infeed 1	7.5
S3-213	Trommel infeed 2	7.5
S3-214	Eddy current	7.5/3
S3-215	Magnet	3
S3-216	transfer conveyor	7.5
S3-217	incline conveyor	11
S3-218		
S3-219		
S3-220	AC air compressor	45
S3-273	Shutter door	
S3-272	Control room	

APPENDIX 3

Consumption Data

Account	Account	Site Address	MPRN_(	Consumptior	Rates Sch	Day Units	Night Units	Total Units
1E+09	PANDA \	RATHDRINAGH	1E+10	Jan-11	LVMDIN	42872.7	20281.71	63154.41
1E+09	PANDA \	RATHDRINAGH	1E+10	Feb-11	LVMDIN	36451.89	17057.49	53509.38
1E+09	PANDA \	RATHDRINAGH	1E+10	Mar-11	LVMDIN	38224.84	17472.97	55697.81
1E+09	PANDA \	RATHDRINAGH	1E+10	Apr-11	LVMDIN	33963.75	15219.59	49183.34
1E+09	PANDA \	RATHDRINAGH	1E+10	May-11	LVMDIN	32274.81	14408.82	46683.64
1E+09	PANDA \	RATHDRINAGH	1E+10	Jun-11	LVMDIN	29700.67	12851.62	42552.29
1E+09	PANDA \	RATHDRINAGH	1E+10	Jul-11	LVMDIN	33086.89	14466.35	47553.24
1E+09	PANDA \	RATHDRINAGH	1E+10	Aug-11	LVMDIN	32927.12	14665.26	47592.39
1E+09	PANDA \	RATHDRINAGH	1E+10	Sep-11	LVMDIN	32628.52	14327.47	46955.99
1E+09	PANDA \	RATHDRINAGH	1E+10	Oct-11	LVMDIN	33524.86	14915.7	48440.56
1E+09	PANDA \	RATHDRINAGH	1E+10	Nov-11	LVMDIN	35711.53	14789.25	50500.78
1E+09	PANDA \	RATHDRINAGH	1E+10	Dec-11	LVMDIN	38974.01	16581.13	55555.14

APPENDIX 4

Carbon Footprint

Carbon Footprint Report

Company Name: Beauparc W0140-03

Date: 15/10/2012

Fuel: 5096.310161478

Electricity: 353.1526

Product/Transport: 0

Business travel:

Car: 0

Flights: 0

Total: 5449.462761478

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