

**ENVIRONMENTAL MANAGEMENT PLAN
FOR THE OPERATION OF THE
LAMBERTS EAST WIND FARM**

Submitted to:

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**August 2006
TV 61036**

TABLE OF CONTENTS

	PAGE
1.0 INTRODUCTION	3
1.1 Purpose	3
1.2 Description of Plant and Scope of Environmental Management Plan.....	3
2.0 ENVIRONMENTAL PLANNING	5
2.1 Conditions of Approval.....	5
2.2 Environmental Aspects	5
2.3 Noise Emissions	6
2.3.1 Applicable Standards	6
2.3.2 Monitoring.....	6
2.3.3 Operational Considerations	6
2.4 Waste Management.....	6
2.4.1 Applicable Standards	7
2.4.2 Waste Minimization.....	7
2.4.3 Waste Disposal.....	8
2.4.4 Hazardous Materials Management and Spill Prevention	8
3.0 IMPLEMENTATION AND OPERATION	9
3.1 Responsibilities	9
3.1.1 Generation Manager	9
3.1.2 Safety, Health and Environmental Coordinator	9
3.1.3 Other Staff	9
3.2 Procedures	9
3.2.1 Standards	9
3.2.2 Operational Procedures.....	9
3.3 Emergency Preparedness	10
3.4 Environmental Training Programs.....	10
4.0 PERFORMANCE MONITORING	11
4.1 Monitoring Programs.....	11
4.2 Environmental Audits	11
4.3 Documentation.....	11
5.0 MANAGEMENT REVIEW.....	12
5.1 Environmental Reporting	12

1.0 INTRODUCTION

1.1 Purpose

The Barbados Light & Power Company Limited (BLPC) recognises its responsibility to minimize the effects of its operations on the environment, and seeks to provide leadership by promoting environmental awareness and accountability.

BLPC operates its facilities in accordance with good industry practices to minimize the effects on the environment. The Company will commit the necessary resources to meet the following environmental objectives:

- a) **Use of Resources** - To conserve non-renewable resources through efficient use and, where appropriate, to use renewable resources.
- b) **Waste Reduction & Disposal** - To minimise the creation of waste by reuse and recycling of materials and by implementing the use of recyclable materials. Procurement procedures will recognize the need to minimize waste where practical by purchasing supplies with minimal packaging, substituting hazardous products with less hazardous products and using recyclable products. To dispose of all waste in a safe and sustainable manner and to minimise the release of substances which cause damage to the natural environment.
- c) **Product Safety** - To ensure the safe and secure supply of electricity to the consumer.
- d) **Risk Reduction** - To minimise the environmental, health, and safety risks to employees and the public, by employing safe technologies and operating procedures and by constantly being prepared for emergencies.
- e) **Education and Training** - To increase the awareness and understanding of environmental issues by our employees.
- f) **Public Information** - To keep employees and the public informed on environmental issues relating to Company operations.
- g) **Quality Management** - To establish regular inspections and periodic audits of the Company's operations by suitably qualified persons.

1.2 Description of Plant and Scope of Environmental Management Plan

The Lamberts East Wind Farm will comprise of 11 wind turbines to generate approximately 10MW of power to the grid. Each turbine will have a tubular tower of up to 55m height, and three rotor blades with a maximum rotor diameter of 56m. The rated output of each turbine will be approximately 900 kilowatts (kW) at optimum wind speeds. A small transformer enclosure will be located at the base of the turbines, and there will be a small building on the site to house the control and metering equipment. A wind monitoring mast with instrumentation will complete the site installation.

Underground power cables will link the turbines to the control building and there will be an overhead transmission line from the control building to connect the plant to the grid at the Trent GS. This line will be at 24 kilovolts and consist of 4 wires carried on wooden poles.

The wind farm will feed approximately 30 million kWh annually into the local grid system, producing over 4% of the island's electricity and equivalent to meeting the electricity needs of 11,000 homes.

This Environmental Management Plan (EMP) provides a framework for addressing environmental issues for the operation of the new facilities in a repeatable, organized and responsible manner consistent with the policy of the Company to be a good corporate citizen. It identifies the scope of the environmental requirements, provides implementation guidelines, sets quantifiable targets and includes provision for checking and corrective action and management review to ensure compliance with the stated regulations.

2.0 ENVIRONMENTAL PLANNING

2.1 Conditions of Approval

The plant approval is subject to conditions as may be set out in the approval from the Chief Town Planner. Where there is a difference in the conditions of approval and the environmental guidelines and standards presented herein, the conditions of approval take precedence. The operator must refer to the approval document to ensure that all conditions are met.

2.2 Environmental Aspects

Environmental management involves compliance with: local planning requirements and environmental regulations; adherence to the company's own guidelines, practices and procedures; and conformity with good management practices and standards of the industry.

The environmental aspects of the new plant operations are as follows:

- a) Noise emissions;
- b) Waste disposal; and
- c) Spills.

The mitigating measures which will be implemented to reduce the impact of these plant operations are outlined as follows:

- a) There is a limited opportunity to reduce noise emissions through improvements to operational procedures. These are typically dependent on the characteristics of the generating equipment installed and the separation distance to the closest receptor.
- b) The generation of power by wind turbines does not produce significant quantities of wastes for disposal. The wastes produced are incidental to the operations and related to maintenance activities and office wastes.
- c) Spills can be prevented from causing an adverse environmental impact by storing lubricants in secure containment areas, and by the adherence to good management practices. BLPC has an existing spill response procedure to the company with a mechanism for emergency preparedness.

2.3 Noise Emissions

2.3.1 Applicable Standards

There are no noise emission standards in Barbados. However, the WBG and WHO have established guidelines for ambient noise of 45dBA at off site receptors based on night time conditions.

For wind farms, turbine noise increases with wind speed but wind-induced background noise also increases. To compensate for this, the Province of Ontario in Canada has developed a noise guideline specific for use on wind farm projects titled; Interpretation for Applying MOE NPC Technical Publications to Wind Turbine Generators (See EIA - Appendix B). The guideline recognizes that baseline noise levels at nearby sensitive receptors also increases with wind speed.

It is proposed to use 45dBA as the acceptable noise level for wind speeds of 8m/s or less in accordance with World Bank and World Health Organization guidelines. At higher wind speeds the ambient noise level increases at a greater rate than the turbine noise, thereby masking the sound emitted from the wind farm.

2.3.2 Monitoring

1. Sound levels should be taken at the Lamberts East plantation house prior to and following commissioning to confirm that sound levels do not exceed the above standards.
2. The monitoring program should be repeated at the time of each plant expansion.

2.3.3 Operational Considerations

1. To prevent noise from open doors impacting the community, engine room doors should normally be kept closed.
2. Complaints about noise will be followed up promptly so that the problem can be witnessed, the cause assessed and corrective action taken. A response should be provided to the complainant and a report provided to the Generation Manager.

2.4 Waste Management

There are few sources of waste from a wind farm these are incidental to the generation of power and related to maintenance activities, such as spent lubricating oils. These will be removed from site and incinerated at Trents Generating Station or reused as fuel for the steam boilers at Spring Garden.

¹ L_{eq} : the equivalent continuous noise level is a notional steady noise level, which over a given time, would provide the same energy as the intermittent noise. Noise standards often specify the length of time over which noise should be measured.

2.4.1 Applicable Standards

The Government of Barbados has signed the Basel Convention on the control of trans-boundary movements of hazardous wastes and their disposal. The first version of a document entitled "*Methodological Guide For the Undertaking of National Inventories of Hazardous Wastes Within The Framework Of The Basel Convention*" (August, 2000), referred to generally as the "Basel Convention Guideline", is being used by the Barbados Government as a framework for reporting on the national inventory and classification of wastes.

The general methodology set out in the Basel Convention Guideline is as follows:

- i. The preparation of the inventory;
- ii. The incorporation of the first results; and
- iii. The maintenance of the inventory (permanent inventory).

The Basel Convention Guideline defines a waste as the following: "Wastes are substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law".

Wastes can be classified as non-hazardous or hazardous. Identification of hazardous waste is based on five Annexes to the Basel Convention Guideline (see Appendix H).

In order to assist in the preparation of the inventory, the Basel Convention Guideline suggests that those industries involved in hazardous waste compile data on the generation, transportation and processing of wastes. The Guideline suggests a table that may be filled out by industry.

The Basel Convention Guideline also suggests that Government carry out inspections and audits of hazardous wastes.

2.4.2 Waste Minimization

1. The reduction, reuse or recycling of wastes is encouraged as a means of lowering the use of natural resources and the Company's impact on the environment.
2. The most effective option for dealing with wastes is source reduction (not to generate them in the first place). If wastes quantities cannot be reduced then efforts will be made to minimize their environmental effect.
3. Opportunities for recycling of other wastes such as scrap metals will be explored where possible.
4. Spent oils and non-halogenated solvents will be reused as fuel in the existing steam boiler where possible. The spent oil produced will be kept free of as much foreign material as possible so that it can be burned in the steam boiler.

5. Procurement procedures will recognize the need to minimize waste packaging in the purchase of supplies.
6. Chemicals will be purchased in returnable tote packs where practical.
7. Hazardous products will be substituted by less hazardous products where equivalent performance can be assured.
8. Recyclable products will be given preference to non-recyclable products.
9. Work methods will recognize the need to minimize wastes by:
 - a. Using complete contents of containers;
 - b. Keeping incompatible wastes separated to avoid cross contamination;
 - c. Using materials to the fullest extent possible;
 - d. Reusing containers and packaging materials;
 - e. Avoiding spoilage by adequately storing supplies;
 - f. Using the oldest supplies first to avoid expiry;
 - g. Ordering supplies in bulk containers, where practical; and
 - h. Using non-hazardous substitutes.

2.4.3 Waste Disposal

1. Wastes will be generated in small quantities consistent with routine maintenance. These wastes will be removed by maintenance personnel as they are produced and taken to the Trents Generating Station for appropriate disposal. Management of the wastes at Trents will follow the Environmental Management Plan for the station.

2.4.4 Hazardous Materials Management and Spill Prevention

Proper storage and materials handling are important to prevent adverse effects to the environment from accidental spillage, and to prevent unsafe conditions.

1. BLPC will design the plant to prevent spills to the environment. Diligent operational procedures are also required to avoid accidental losses.
2. Good management procedures to prevent accidental spills from leaving the site include:
 - a. Storing drums of chemicals in designated containment areas away from roadways; and
 - b. Storing all chemicals in closed containers. (To avoid spillage to the soil, waste oil should not be left in open top drums.)

3.0 IMPLEMENTATION AND OPERATION

3.1 Responsibilities

3.1.1 Generation Manager

The Generation Manager will bear overall accountability for ensuring that the environmental management program is in effect and adequately resourced.

3.1.2 Safety, Health and Environmental Coordinator

BLPC's Safety, Health and Environmental Coordinator will have responsibility for implementing the programs for the environmental management of the power plant. The following functions are required to fulfil this responsibility:

- a) Coordinate all safety, health and environmental management functions.
- b) Report on safety, health and environmental matters to the plant management.
- c) Monitor compliance with relevant safety, health and environmental standards.
- d) Act as a spokesperson on safety, health and environmental issues.

3.1.3 Other Staff

All staff will have a responsibility to be aware of and to comply with the corporate safety, health and environmental management procedures.

3.2 Procedures

3.2.1 Standards

It is the policy of The Barbados Light & Power Company Limited to comply with all the Laws of Barbados. Where specific laws, regulations, and guidelines addressing particular procedures, processes and practices exist, these will be adhered to. In some instances, these may establish only minimum standards, and it might be more appropriate for the Company to adopt more stringent standards, which are in force internationally. In the absence of any laws or regulations being in force in Barbados, the most practical, technologically appropriate and cost effective international standards shall be adopted.

3.2.2 Operational Procedures

1. The Company will implement procedures for ensuring compliance with Company policy and agreed environmental standards. A compliance monitoring record shall be included in the Company's files.
2. Environmental Audits of the operations shall be conducted by suitably qualified BLPC personnel annually (see also Section 4.2.1).

3. In those areas of our operations where there is a risk of significant unplanned events occurring, such as "spills", appropriate systems will be put in place to minimize such risk. These systems will form part of the Company's Contingency and Emergency Plans.
4. In all instances where the Company is planning the installation of major new facilities or equipment which could generate significant environmental impacts, an environmental study of the effects shall be conducted.
5. Records shall be maintained of the costs associated with environmental works, including audits, studies, EIAs, and any remedial and mitigative measures taken.

3.3 Emergency Preparedness

Despite the best efforts of operating staff, unexpected incidents can arise as a result of accidents, equipment failures or "Acts of God". To manage such incidents, BLPC has developed a Spill Contingency Plan for the Trents Generating Station that should be applied.

3.4 Environmental Training Programs

Appropriate training and familiarization of plant personnel will help ensure that environmental regulations are followed and corporate requirements are met. Appropriate operating staff shall be informed of the project environmental requirements during their initial employee orientation. The following training will be provided as required:

1. All employees who handle chemicals should have training in their safe use and any dangers relating to fire, reactions, etc.
2. The environmental coordinator and other members of the spill response team should have training through BNRT.
3. The Safety, Health and Environmental Coordinator will have basic awareness training in wastewater treatment, air emissions management, waste management, noise and environmental auditing.

4.0 PERFORMANCE MONITORING

4.1 Monitoring Programs

The Company will fulfil all of the compliance monitoring requirements of the site approval. In addition to the regulatory requirements of approval, the Company will complete monitoring programs as described in Section 2 of this EMP.

4.2 Environmental Audits

Environmental audits should be carried out in accordance with the recommendations of the Trenchs EMP.

4.3 Documentation

For operations and maintenance of the power plant, the following environmental records and information will be maintained:

1. Information on applicable environmental legislation and regulations;
2. Environmental approvals and/or permits;
3. Inspection reports and operator log;
4. Maintenance reports and action undertaken;
5. Incident reports and action undertaken;
6. Training records;
7. Complaint records and response;
8. Pertinent contractor agreements/contracts and information;
9. Information on emergency preparedness and response;
10. Records of significant environmental impacts;
11. Internal/external audit results and details of non-compliance; and
12. Management review.

5.0 MANAGEMENT REVIEW

To enable continual improvement and to ensure effective implementation of the Environmental Management Plan, BLPC management will annually review the plan. The first review will include a comprehensive examination of all the elements in the EMP.

After the first review period, it is expected that not all elements of the EMP will require a comprehensive review every year, as some elements, due to their nature, may not significantly change.

Key information to be reviewed by BLPC management includes:

1. Results of the internal monitoring / environmental audits;
2. Level of compliance with environmental legislation;
3. Extent of which environmental objectives and targets that have been achieved;
4. Concerns of relevant external agencies and parties; and
5. Means for improving performance.

To facilitate a continual improvement process, the conclusions and recommendations from the management review will be documented to identify areas that require corrective action and for the purpose of identifying opportunities to improve the Environmental Management Plan.

5.1 Environmental Reporting

The Company will implement procedures for preparing an annual environmental report covering the results of monitoring with the agreed environmental standards. A compliance record will be included in the Company's files.

The Company will also develop a procedure for handling and recording environmental incidents and near misses. This will include the response and follow up to complaints, an investigation of the root cause and recommendations to prevent reoccurrence.