



**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004**

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**SECTION A. General description of project activity****A.1 Title of the project activity:**

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Title of Project Activity: Wigton Wind Farm Project (WWF).

Version Number of the Document: Version 2.0

Date: Jan. 6th, 2006.**A.2. Description of the project activity:**

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The purpose of the project is to implement the first commercial grid connected wind power plant in Jamaica. The project will lead to reduced greenhouse gas emissions because it will be displacing a largely fossil fuel based electricity generating system.

The project will also support the Governments objectives of:

- Fostering, facilitating and encouraging the development of new renewable energy sources, with one of the key renewable technologies listed being wind.
- Reducing reliance on fossil fuel imports and developing indigenous power resources, which will have added economic benefits.

The 20.7 MW project will comprise 23 turbines, with each machine having a capacity of 900kW. The planned output is 62.97 million kW hours per year. The turbine supplier will be NEG Micon Holland B.V. The plant will be grid connected. The purpose of the project is to generate competitively priced renewable electricity. The 20.7 MW project should generate enough electricity to feed 25,000 homes. The fact that the electricity is renewable and does not require imports of fuel makes the project even more important to Jamaica.

Contribution to sustainable development

Many of the benefits of wind energy are strategic and long term and are therefore difficult to ascribe a particular value to. However, strong Government support shows that the economic rationale for developing wind energy is a central component of the overall strategy. The Government's energy policy objective is to ensure secure, diverse and sustainable supplies of energy at competitive prices.

Another advantage of the project is that it produces renewable energy that does not contribute to global warming, has a never-ending supply of, and uses, free fuel. It has no requirement for the transportation of fuel. As the wind energy displaces the use of imported fossil fuels, the Jamaican economy will benefit through a corresponding saving of imports.

Other benefits include:

- Increase of employment. The Wigton Wind Farm will endeavour to ensure that wherever possible local contractors and employees are used in all aspects of the wind farm development. Employment would be created during the construction phase when local firms would be invited to bid for a significant portion of the construction work on roads, foundations and the building. Construction materials would be sourced locally and local transport and plant hire companies used wherever possible. Up to 40 jobs would be created during the 6 month construction stage



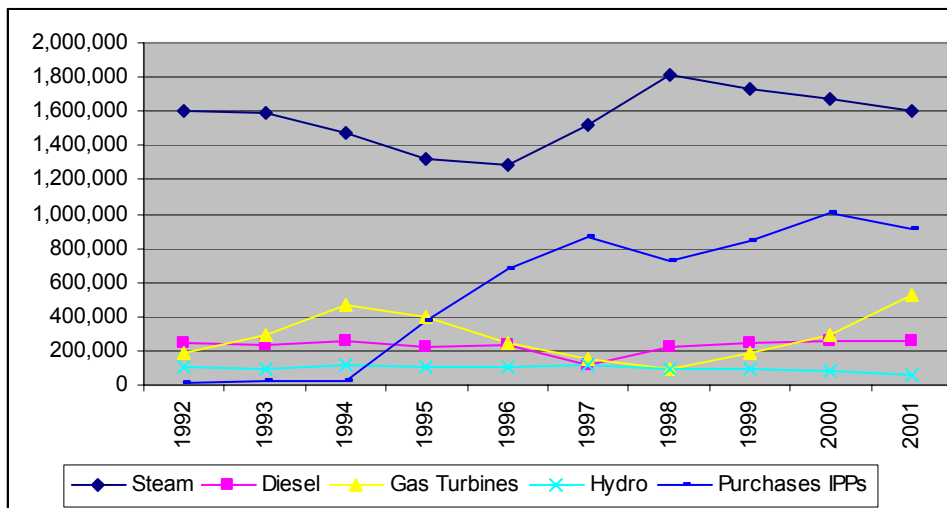
and 2 equivalent full-time jobs during operation. It is anticipated that over 80% of the construction jobs would be filled locally and the operation and maintenance jobs.

- Foreign investment is likely to attract other investors. Around a quarter of the approximately US\$ 20 million to construct the project would be invested in Jamaica through local contractors for civil engineering works, purchase of local materials, electrical installation and the grid connection.
- Local shops and hotels will benefit from increased customers during the construction and operational phase.
- Wind farms are an excellent environmental friendly use for an area designated for mining.
- It is expected that the wind farm leads to interest to tourists as it will be the first commercially operational wind farm in Jamaica and the Caribbean. The visiting of tourists will benefit the local economy. Economic benefit accrues to the local area both directly and indirectly and the effect of the wind farm on the local economy is considered to be a positive benefit.
- The wind farm will act as a valuable educational resource. Most schools and colleges now have energy and the environment on the curriculum, and wind farms make an ideal study for technical, social and environmental projects.

Information on the electricity sector in Jamaica

Jamaica’s power mix is largely dependent on diesel and heavy fuel oil. Both fuels have to be imported. The majority of the power is generated using heavy fuel oil fired steam turbines. Figure 1 below presents the historic trends of the Jamaican power mix over the past 10 years.

Figure 1 – Output per technology in MWh



Source: grid operator data.

The sector is suffering from a severe shortage of generating capacity. Demand currently outstrips supply, and the result is frequent load-shedding and media campaigns encouraging households to use less power. Based on historic data, the demand is expected to grow with 5-6 % annually.



In Jamaica JPSCo (the Jamaica Public Service Company) is involved with the generation, purchase and distribution of electricity. JPSCo is a distributor of electricity in Jamaica since 1923 and serves more than 500,000 customers. The Office of Utilities Regulation (OUR) monitors JPSCo with respect to various aspects of its business including rates charged, standards of service and management efficiency. In the year 2001 JPSCo was privatised as Mirant Corporation acquired 80% of the shares of JPSCo (EIA, 2002). The Jamaican government maintains a 20% interest in JPSCo. Mirant, a U.S. energy company became the new majority owner on 1 April 2001. JPSCo is in the process of expanding its generating capacity and putting measures into place to improve its ability to meet the needs of a growing customer base. Mirant has stated that it will make progress in reducing the number of blackouts currently affecting Jamaica, due to lack of capacity (EIA, 2002).

JPSCo owns and operates 27 generating units. Most of these units are located at four main power plants operated by JPSCo: Rockfort and Hunts Bay in Kingston, Old Harbour in St. Catherine, and Bogue in St. James. Out of the 27 generating units, there are 8 hydropower generating units. Additional power is purchased from a number of independent power producers, including Jamalco, JEP, JPPC, Jamaica Broilers and Munroe. The total installed capacity in 2003 was approximately 785 megawatts (MW), which includes 158 MW provided by Independent Power Producers (see also www.jpSCO.com).

A.3. Project participants:

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Name of Party Involved	Private and Public Entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant
Jamaica (host)	Wigton Wind Farm Limited (WWF)	No
The Netherlands	Corporación Andina de Fomento (CAF)	Yes

Further details on the project participants are provided in Annex I.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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Jamaica

A.4.1.2. Region/State/Province etc.:

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The project will be located at the Manchester Plateau area, about 15km SSW of Mandeville in Jamaica.



A.4.1.3. City/Town/Community etc:

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The project will be located at Wigton, Manchester Plateau area.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

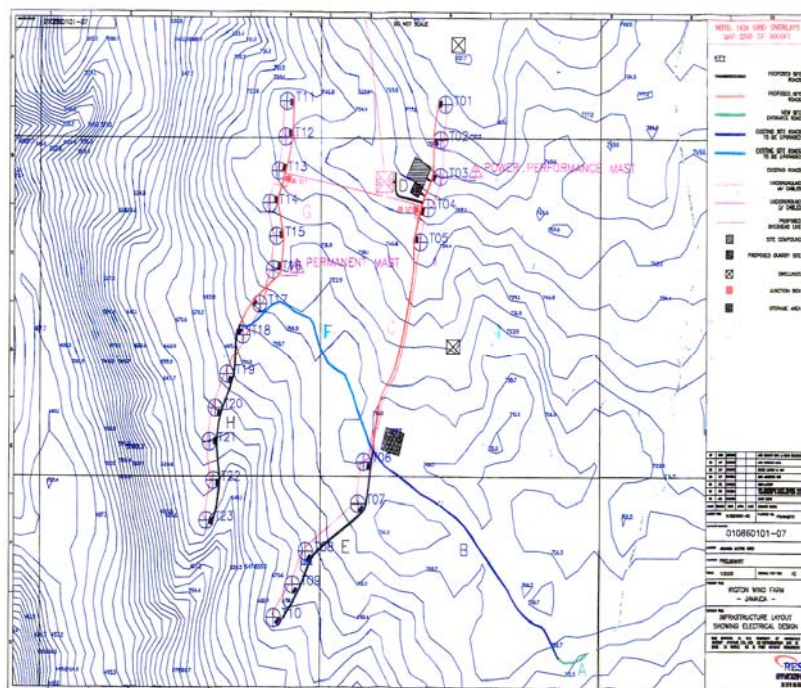
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The project will be located within a bauxite mining area on land owned by the mining company - ALCOA Minerals of Jamaica LLC. Geographical coordinates are 18.05°N and 77.48°W. The elevation of the project site is 750 m and the turbine area expands 4.2 km². See also the map below.

A.4.2. Category(ies) of project activity:

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Grid connected power generation. According to the UNFCCC, this project fits in Sectoral Scope 1, Energy Industries (renewable/non renewable).



**A.4.3. Technology to be employed by the project activity:**

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State-of-the-art wind power technology. Horizontal axis wind turbines with upwind rotors will be utilised on this site and rotor power control will be by stall regulation

The 20.7 MW project will comprise 23 turbines. The supplier of the wind turbines, NEG MICON, was selected by competitive bidding, and will supply 23 of its NM900/52 model wind turbines. These turbines are rated at 900kW and have a rotor of 52.2 m diameter at a hub height of 49m. The average annual wind speed is 8 m/s. The planned output is 62.97 million kW hours per year for the total 23 turbines.

The plant will be grid connected – cabling underground leading to a substation on the site, housing metering, switchgear, and protection equipment.

NEG MICON will provide operational training for the owner of the wind farm. They will also provide a full operations and maintenance contract for the owner of the wind farm for the first 5 years (renewable for further periods). A maintenance base will be set up in the vicinity of the site and local staff employed and suitably trained. This base is likely to be the base for his support to other Caribbean installations.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

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Explanation of how the projects anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity:

The electricity generated by the Wigton Wind Farm will displace grid electricity generated from existing fossil fuel plants. Wind generated electricity does not produce greenhouse gas emissions, therefore the project will reduce greenhouse gas emissions by displacing more carbon intensive electricity from the grid i.e. electricity generated from fossil fuels. This has been demonstrated in the baseline analysis (see sections B and E below).

Why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

The purpose of the project is to implement the first commercial grid connected wind farm in Jamaica and the English Caribbean. There is no evidence of other renewable energy projects being planned in Jamaica that could provide an alternative option to reduce greenhouse gas emissions by displacing fossil fuel based grid electricity.

Whilst the Jamaican Governments' environmental and energy strategy objectives call for the development of renewable energy, there is no policy framework or system of support measures to realize this objective.

Since the project is the first commercial scale wind project in Jamaica this can be considered a risky investment. The additional support, in terms of financial revenues from the CER sales and the political commitment that CDM registration provides, gives the project investors greater confidence in implementing a risky first time activity. Further details are provided in Section B.3 below.



A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

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The estimated amount of emission reductions over the 10 year crediting period are 525,400 t CO₂. Please refer to section E for a detailed calculation of the emission reductions.

Years	Annual estimation of emission reductions in tonnes of CO ₂ e
2004	52,540
2005	52,540
2006	52,540
2007	52,540
2008	52,540
2009	52,540
2010	52,540
2011	52,540
2012	52,540
2013	52,540
Total estimated reductions (tonnes of CO₂e)	525,400
Total Number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO₂e)	52,540

A.4.5. Public funding of the project activity:

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The Dutch Development and Environment Related Export Transactions Programme (ORET/MILIEV) awarded a subsidy to the Wigton Wind Farm project. The purpose of these subsidies is to enable developing countries to purchase capital goods, services and works. Only a Dutch company can apply for a subsidy. The subsidy equates to approximately 20% of the total turnkey price for the Project. The subsidy is at a rate of 35% of the value of the supply of wind turbines and ancillaries from Holland.

The ORET/MILIEV programme aims to promote employment and enterprise in developing countries. ORET/MILIEV channels subsidies to developing countries, enabling them to import capital goods, works, and services from the Netherlands. Netherlands Development Finance Company (FMO) executes the programme on behalf of the Ministry of Foreign Affairs (Development). Once an application has been approved, a subsidy is awarded to the government of the country subject to the application. Its budget amounts to €100 million per year. The main criteria of the programme are:

- The ORET programme subsidizes a maximum of 35% of the total value of a transaction, the amount of which may not be less than EUR 45 million;
- The project is commercially non-viable according to OECD regulations;
- The project ties in with the aims of development policy;
- The transaction contributes to sustainable economic relations between the Netherlands and the developing country;
- The beneficiary country is mentioned on the ORET/Miliev list of eligible countries.



For further information, see also: <http://www.fmo.nl/en/products/capitalgoodsexport.php>

As can be concluded from the above, the ORET/MILIEV subsidy is related and linked to the transfer of a technology and not strict Official Development Assistance (ODA). The Dutch government does not claim or require any compensation for the provision of the subsidy in the form of Certified Emission Reductions. The ORET/MILIEV subsidy does not constitute a diversion of official assistance and is not counted towards any financial obligation from The Netherlands.

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the project activity:

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ACM0002. - “Consolidated baseline methodology for grid-connected electricity generation from renewable sources.”

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

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The consolidated baseline methodology for grid-connected electricity generation from renewable sources is justified as:

- the proposed project involves an electricity capacity addition of a renewable source providing power to the grid;
- the geographic and system boundaries for the relevant electricity grid can be clearly identified; and
- information on the characteristics of the grid are available.

B.2. Description of how the methodology is applied in the context of the project activity:

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The consolidated baseline methodology for grid connected electricity generation projects describes step by step how to apply the methodology to a specific project. This section describes how the emission factor (EF_y) of the Wigton project has been determined based on the instructions for calculating the emission factors of the operating margin (OM) and build margin (BM).

Step 1 – Calculation of the Operating Margin emission factor (OM)

The ACM0002 consolidated methodology provides four options to calculate the operating margin. For the proposed project activity, option (a), simple OM, has been chosen. This is because undertaking a dispatch data analysis (the preferred methodological option) cannot be done at a reasonable cost for the project developer, since the data is not readily available from the relevant authorities, and the analysis is a very time-consuming task. The simple OM can be used in the case of the proposed project activity since low-cost/must-run sources constitute less than 50% of the total grid generation. For example, in 2003 more than 95% of Jamaican generation is based on fossil fuels – see also the data provided in Annex 3. The simple OM emission factor has been calculated based on a 3-year vintage (2001-2003), as required by the methodology.

The OM is calculated as the generation-weighted emissions per electricity unit of all generating units serving the system, excluding low-operating cost and must-run power plants. Low-operating cost and



must run power plants include typically hydro, low cost biomass and geothermal. The OM is calculated as follows:

$$EF_{OM, simple, y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}}$$

where

$F_{i,j,y}$ is the amount of fuel (mass or volume) i consumed by relevant power sources i in year(s) y ,
 j refers to the power sources delivering electricity to the grid not including low-operating cost and must run plants, including imports to the grid,
 $COEF_{i,j}$ is the CO₂ emission coefficient of fuel (tCO₂/volume) taking into account the carbon content of the fuels used by the relevant power sources j and the percent oxidation of the fuel in year(s) y , and
 $GEN_{i,j}$ is the electricity (MWh) delivered to the grid by source j .

The CO₂ emission coefficient $COEF_i$ is obtained from:

$$COEF_i = NCV_i \cdot EF_{CO_2} \cdot OXID_i$$

where

NCV_i is the net calorific value of the unit of fuel i ,
 $OXID_i$ is the oxidation factor of the fuel,
 EF_{CO_2} is the CO₂ emission per unit of energy of the fuel i .

The OM was calculated using the data of all operational fossil fuel fired power plants providing electricity to the grid for the years 2001, 2002 and 2003. The data are provided in the tables presented in Annex 3. Details of the calculations are provided in sections E.4 and E.6.

Note:

- The COEF for all units operated by JPSCo is calculated using data on the amount of fuel consumed per unit;
- JPSCo does not provide data on fuel consumption for the plants operated by Independent Power Producers. To take a conservative approach, these plants are assumed to have the same emission factor as the most efficient plant operated by JPSCo, which is the Rockfort plant (see Annex 3 below). For the cogeneration plants, a specific formula has been used to define the heat-power ratio. See also Annex 3 for further details.

Step 2 – Calculation of the Build Margin (BM)

According to ACM0002, project participants can choose between two given options for calculating the build margin for the project. In this case, option 1 has been chosen (i.e., calculate the build margin emission factor based on the most recent information available on plants already built at the time of PDD submission). The data for 2003 is used to calculate the Build Margin.

By taking the 5 power plants most recently built, the sample would only represent 10% of total MWh produced in 2003, where the ACM0002 methodology requires at least 20% of the electricity generation to



be included in the Build Margin. A sample of the most recently built 8 plants (between years 1996 and 2003) is therefore taken, representing 23% of total MWh produced. An overview of the data on the performance of the 8 selected generating units for the BM is presented in Annex 3.

The Build Margin emissions factor (BM) is calculated as the generation-weighted average emission factor of the 8 most recently built plants, using the following formula:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_m GEN_{m,y}}$$

The details of calculation of the BM are presented in section E.4 and E.6 below.

Step 3 - Calculation of the baseline emissions factor

The final step in applying the consolidated methodology for the baseline determination of the Wigton project is to calculate the baseline emission factor. This has been calculated as the weighted average of the emissions factor of the OM and the BM. The formula that has been used to calculate this weighted average emission factor is as follows:

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$

The emissions factors of the OM and BM in Jamaica have been weighed equally, each 50% (as determined in ACM0002). Sections E.4 and E.6 below provide details of the calculation and results.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

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The determination of the additionality is done by using the Tool for the demonstration and assessment of additionality, as published in Annex 1 of the sixteenth meeting of the Executive Board (EB-16). The CDM consolidated tool for demonstration of additionality, includes the following steps:

Step 0. Preliminary screening of projects started after 1 January 2000 and prior to 31 December 2005

The project has started construction on 17th of September 2003, which is prior to the registration of the first CDM project activity and prior to 31st of December 2005. However, it can be clearly demonstrated that CDM revenue has been considered from the early stages of development of the project, and it is an integral part of the financial package of the project.

In a first economic analysis of the project in 1999 the revenues from avoided CO₂ emissions have already been taken into account (Planet, 1999). In the first half of 2000 an eligibility study with regard to CDM has been carried out. The study was supported by the United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF) programme “Promoting Commercial Investments in Energy Efficiency and Renewable Energy Technologies”. The work was carried out during the April-May 2000. The report of this feasibility study is available on request (EcoSecurities, 2000). In the following years, the project has been submitted to the PCF (July 2001) and the Dutch CERUPT programme (August



2002). This information has been publicly available, and the documents submitted can be demonstrated on request. Furthermore, also internal cash flow models taking into account the carbon value of the Wigton project are available from the period prior to signature of the Purchasing Power Agreement (PPA) and construction of the project, as well as internal correspondence between the project partners.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

The following alternatives to the project have been considered:

Alternative 1 - The proposed Wigton Wind project: construction of a new wind energy plant with installed capacity of 20.7 MW connected to the local grid, not undertaken as a CDM project.

Alternative 2 - A diesel or bunker oil fired power plant;

Alternative 3 - A third alternative would be the continuation of the current situation, where no other alternatives to build a power plant are undertaken.

Sub-step 1b. Compliance with applicable laws and regulations:

All the alternatives comply with the laws and regulatory requirements for electricity generation in Jamaica. See also the Office of the Utility Regulations Act of 1995, (http://www.mct.gov.jm/office_of_utilities_regulation_act.pdf) and the new policy with regard to electricity generation. The policy focuses on the diversification and conservation on the use of fossil fuels for power generation. The aim is to increase renewable energy and cogeneration power sources. Below is a summary of the government's electricity policy (<http://www.mct.gov.jm/Revised%20Electricity%20Policy.pdf>):

- ensure stable, secure, diverse and sustainable supplies of energy at least economic cost (renewable exempted) in a deregulated and liberalised environment;
- reduce independence on imported energy through continued exploration for and development of indigenous energy resources where economically viable and technically feasible, especially by the private sector;
- reduce the energy intensity while seeking to promote economic growth and minimise any negative environmental or macro economic impact on the economy;
- establish and maintain an appropriate multi-sector regulatory framework where market failure exists to protect the consumer and to ensure that government's policy objectives are addressed.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

The option chosen to prove additionality is Option III – “Benchmark Analysis”, since the plausible alternatives defined in the previous step do not include investments of a comparable scale and decision making context. The project developer is a petroleum company that would not have invested in a different type of renewable energy project. Since the project developer PCJ is not a utility or independent power producer responsible for the electricity generation, the construction of another type of power plant cannot



be considered an alternative for PCJ. Therefore, alternative 2 is not a plausible alternative for the project developer.

Sub-step 2b. Option III – Apply Benchmark Analysis

The financial indicator chosen most suitable for the project type and decision context is the Internal Rate of Return (IRR). The most plausible benchmark to compare the project IRR has been derived from government bond rates. The government bond rate in Jamaica is between 10-12%¹. The average bond rate for 2003/2004 was 10.79%.² The Consolidated Tool for additionality states that for use as a benchmark, the government bond rates shall be increased by a suitable risk premium to reflect private investment and/or the project type”. In order to account for private investment risk, risk related to hurricanes and the technology risk, an IRR of 15% can be considered a conservative benchmark. In this regard it should be noted that, when looking for investment at the international market, IFC was the only serious potential investor asking for an interest rate of 18-20%.

Sub-step 2c. Calculation and comparison of financial indicators

The next step is to calculate the IRR for the proposed CDM activity. In this case, the IRR has been calculated as a project IRR. Renewable Energy Systems developed a cash flow analysis model for the Wigton Wind Farm, which includes a cash flow without the expected CDM revenues of the project. This analysis consists of confidential information and therefore the details of the financial analysis have only been made available to the DOE.

The assumptions made in the analysis include:

- the project will generate 63,000 MWh per year;
- a decreased electricity price (US\$/KWh) after 5 years of operation, in line with what has been agreed in the PPA;
- the electricity generated and sold will be paid 3 months in arrears;
- total construction costs paid before the start of the project;
- CDM consultancy fees, validation and verification have not been included as costs in the cash flow analysis.

The results of the IRR analysis for the Wigton project are presented in the table below.

Table B.3.1. Project IRR for scenarios

Altv. #	Description	Project IRR
1	Wigton project without the MILIEV subsidy ³ and without CDM	6.13%
3	Wigton project, including the MILIEV subsidy but no CDM	10.22%
5	Benchmark	10.79%

¹ See <http://www.mof.gov.jm/dmu/bonds/ratesheet.htm>

² See <http://www.mof.gov.jm/dmu/download/2004/icm/Moody.pdf>

³ The MILIEV subsidy is a technology export subsidy from the Dutch government, which has been awarded to the Wigton project. See also Section A.4.5.



	Government bond rate for Jamaica in 2003/2004	
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The two indicators that need to be compared are the Alternative 1 (defined in step 2b) with the Benchmark. As stated above, the Benchmark is the government bond rate. Alternative 1 is the proposed Wigton wind project without the CDM. The comparison indicates that the government bond rate (without any corrections to reflect private investment) is higher than the IRR of the Wigton project, not including CER revenues (being 10.22%). If the bond rate would be corrected with technological, hurricane and private investor risks, the IRR of the Wigton project will be substantially lower than the selected benchmark.

Based on the information provided above, it is clearly demonstrated that the Wigton project can not be considered as financially attractive.

Sub-step 2d. Sensitivity Analysis

A sensitivity analysis was conducted by altering the following parameters:

- The amount of energy generation (plus and minus 10%);
- The energy price (plus and minus 10%);
- A change in project operation costs (plus and minus 10%)

Financial analyses were performed altering each of these parameters and assessing what the impact on the project IRR would be (see Table below). As it can be seen, the IRR of the project will increase to above 10.79% in case the price for electricity will increase with 10% or in case the amount of energy generated by the project will increase with 10%. With regard to an increase of the energy price, it should be noted that energy price fluctuations are very unlikely to happen, considering the fact that there will be a fixed price based on a 20 year power purchase agreement contract. So only in case of an increase in power generated the project IRR can be higher than 10.79%. This is still lower though than 15%, which can be considered as the Benchmark as this is the government bond rate corrected with related private investor risks.

Scenario	Parameter change	Project IRR %	Change in IRR %
Base case		10.22	
Energy prices	plus 10%	12.64	2.42
Energy prices	minus 10%	7.66	-2.56
Energy generation	plus 10%	12.64	2.42
Energy generation	minus 10%	7.66	-2.56
Project operation costs	minus 10%	10.61	0.39
Project operation costs	plus 10%	9.82	-0.40

After the completed investment comparison analysis, it has been clearly demonstrated that the proposed CDM project activity is unlikely to be considered as a financially attractive course of action, since all the alterations in the chosen parameters generate a project IRR lower than the selected benchmark.

Step 3. Barrier Analysis



Even though the previous step has clearly demonstrated that the proposed project activity is not an economically-sound course of action, some barriers have been identified to wind project development in Jamaica and the English Caribbean, which can enforce the conclusion of additionality from the previous step. The following barriers have been identified:

(a) Investment barriers

- It has been proven very difficult to find an investor for the Wigton project due to the perceived risks associated with wind energy in an area where no wind farms are commercially operated. Initially, Renewable Energy Systems Ltd. (an initial partner in the development of the project) and PCJ planned to jointly own the Wigton Special Purpose Company. However, after a lot of efforts they did not succeed in securing project finance for the Wigton project. This was due to the high interest rates that the potential investors were asking, which was related to the fact that Wigton project was the first of its kind in the whole English Caribbean region. The only party that came close to making an offer was the International Finance Corporation (IFC), but they never made an official offer.

Due to the problems in finding an investor in the project, Renewable Energy Systems in the end withdrew from the project.

- Alternative 2 is easier to finance as it is a well-established technology, with well known returns, more secure fuel supply and less risk as perceived by investors.
- The continuation of current practices (Alternative 3) does not pose any investment barrier as it does not require any additional investment (it is the business as usual scenario).

(b) Technological barriers

- As stated earlier, the Wigton wind project will be the first commercially operational wind project in Jamaica, and the first in the English Caribbean region. Thus wind power is not a common practice in the region. This implies that various barriers exist in the operation and maintenance (O&M) of the project. It is difficult to find trained staff and therefore initially staff from the EU has to be used for O&M.
- In the case of Alternative 2 (construction of a diesel/bunker oil fired power plant) and Alternative 3 (continuation of the current situation), there are no technological issues as this simply represents a continuation of current practices or development of thermal plants which are prevalent in Jamaica.

(c) Other barriers

- Barrier due to prevailing practice: The Wigton project is the first of its kind from 2 perspectives. Firstly, as stated above, because there is no commercially operational wind project in Jamaica or the English Caribbean region. Secondly, as stated in step 1 above, the Wigton wind project will be the first power generating project developed by PCJ, with all related barriers.
- Resource uncertainty. Wind energy involves relatively high risks compared with fossil fuel forms of energy or hydro energy because it is an intermittent source of energy. The estimated output is based on wind measuring data and assumptions made. There is no wind farm operational yet in the region, based on which estimates can be made. Another uncertainty is related to the fact that Jamaica suffers from hurricanes. The website <http://www.joyousjam.com/jamaicashurricanehistory/id1.html> provides an overview of the hurricanes that have hit Jamaica over the last five centuries. The hurricanes can



have an impact on the security due to the fact that there is a risk that the wind farm will be out of service due to the strong winds.

- The other 2 defined alternatives, being the development of a fossil fuel plant (Alternative 2) or the continuation of the current situation (Alternative 3) are not facing any of the above barriers. Developing fuel oil or diesel fired power plants is common practice in Jamaica.

Step 4. Common Practice Analysis

4a - Other activities similar to the Wigton project in Jamaica;

There is currently only one other wind project in Jamaica, the 225 kW Munroe project. The project was founded by and has been pursued throughout by the Past Students Association of Munro College. The total installed cost of the facility is US\$300,000, which was funded primarily by the Environmental Foundation of Jamaica. Moreover, much of the local services, such as JPSCo's services and Alpart's crane services, were donated free of cost.

The project started to generate power in 1996. In 1997, its best year of production so far, total energy generated amounted to 527 MWh. In 2001, the project generated 20 MWh and no power was generated in 2002 and 2003.

Taking the characteristics of the Munroe project into account, it cannot be considered a similar project activity as Wigton. It is a lot smaller in size (Wigton is a factor 100 bigger), is almost fully financed with donations and does not operate commercially.

4b – Discussion of similar options that occur

No similar activities are widely observed in Jamaica, since Wigton will be the first commercially operational wind farm in Jamaica.

Step 5. Impact of CDM registration

As shown in Step 2 and 3 above, the Wigton wind project is not a financially attractive project. If the project is compared with other power generation projects, it can be concluded that the price for electricity paid by JPSCo to the Wigton project is less than the costs at which JPSCo produces power or purchases energy from Independent Power Producers.

If the project developer was able to sell certified emission reduction (CERs) from the project activity, the additional revenue generated by carbon sales would make the project more attractive. The financial analysis indicated that the IRR can be increased to 12.04% if the credits will be sold at a price of 6 US\$/CER. CDM thus makes the project financially more attractive.

B.4. Description of how the definition of the <u>project boundary</u> related to the <u>baseline methodology</u> selected is applied to the <u>project activity</u>:

>>

As referred to in ACM0002 the project boundary has to be assessed in terms of the emission sources and spatial extent.



- *Emission sources*: the emissions sources of the project activity have to be taken into account. For wind energy projects like Wigton these are zero and have not to be taken into account. For the baseline determination only CO₂ emissions from electricity displaced due to the project are accounted for.
- *Spatial extent*: The spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the Wigton power plant is connected to. The Jamaican grid is a national grid and interconnected to other grid systems. Therefore, all power plants providing electricity to the Jamaican grid system are included in the project boundary. These include the power plants operated by JPSCo and the power provided to the grid produced by the Independent Power producers.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

>>

The CDM project developer is CAF acting on behalf of the CAF Netherlands CDM Facility (CNCF), who in turn has contracted EcoSecurities B.V. to determine the baseline for the proposed project (www.ecosecurities.com). The person at EcoSecurities B.V. developing the baseline is Véronique Bovée (nl@ecosecurities.com). The data that have been used to developing the baseline were provided by JPSCo and PCJ. See baseline information in Annex 3.

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

29/04/2004

C.1.2. Expected operational lifetime of the project activity:

>>

The expected lifetime of the Wigton Wind Farm is 20 years.

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

29/04/2004

**C.2.2.2. Length:**

>>

10 years and 0 months.

SECTION D. Application of a monitoring methodology and plan**D.1. Name and reference of approved monitoring methodology applied to the project activity:**

>>

Approved Monitoring Methodology ACM0002, which is the consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources.

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

>>

This monitoring methodology is used in conjunction with the approved baseline methodology ACM0002 (Consolidated baseline methodology for grid-connected electricity generation from renewable sources) and applies to electricity capacity additions from wind energy sources. The geographic and system boundaries for the relevant electricity grid can be clearly identified, information on the characteristics of the grid is available and data to calculate project emissions is also obtainable.

**D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario****D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:**

ID number <i>(Please use numbers to ease cross-referencing to D.3)</i>	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

>>

Not applicable, as Option 2 below has been selected

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number <i>(Please use numbers to ease cross-referencing to table D.3)</i>	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment



D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

>>

Not applicable, as option 2 below was selected.

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number <i>(Please use numbers to ease cross-referencing to table D.3)</i>	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How and how long will the data be archived? (electronic/paper)	Comment
1. EG_y	Net electricity supplied to the grid	Project proponent data	MWh	Directly measured	Continuously	100%	Both electronic and paper until 2 years after the crediting period	Data will be aggregated monthly and yearly Double check by receipt of sales.
2. EF_y	CO ₂ emission factor of the Jamaican grid	Grid operator data (JPSCO)	tCO ₂ /MWh	c	At the beginning of the crediting period	100%	Both electronic and paper until 2 years after the crediting period	Calculated as the weighted sum of OM and BM emission factors. Given a 10 year crediting period was selected and the use of 3 year vintage data, it will be calculated and recorded just once at the beginning of the crediting period.
3. $EF_{OM,y}$	CO ₂ OM emission factor of the grid	Grid operator data (JPSCO)	tCO ₂ /MWh	c	At the beginning of the crediting period	100%	Both electronic and paper until 2 years after the crediting period	Calculated as indicated in the relevant OM baseline method. Given a fixed 10 year crediting period was selected, it will be recorded just once at the beginning of the crediting period.



D.2.2.1. Data to be collected in order to monitor emissions from the <u>project activity</u>, and how this data will be archived:								
4. $EF_{BM,y}$	CO_2 BM emission factor	Grid operator data (JPSCO)	tCO_2/MWh	c	At the beginning of the crediting period	100%	Both electronic and paper until 2 years after the crediting period	Calculated as indicated in the relevant BM baseline method. Given a fixed 10 year crediting period was selected, it will be recorded just once at the beginning of the crediting period.
5. $F_{i,y}$	Amount of fuel consumed by each fossil fuel plant on the grid	Grid operator data (JPSCO)	Mass	m	At the beginning of the crediting period	100%	Both electronic and paper until 2 years after the crediting period	Obtained from the power producers. Includes the latest local statistics for the selected 3 year vintage per power plant operational. Given a fixed 10 year crediting period was selected it will be recorded just once at the beginning of the crediting period
6. $COEF_i$	CO_2 emission coefficient of each fuel type i	Data from EIA	T CO_2/MWh	m	At the beginning of the crediting period	100%	Both electronic and paper until 2 years after the crediting period	For diesel and fuel oil fired plants, EIA default carbon emission factors have been used.
7. $GEN_{j/k/n,y}$	Electricity generation of each power source/ plant	Data from grid operator (JPSCO)	MWh	m	At the beginning of the crediting period	100%	Both electronic and paper until 2 years after the crediting period	Obtained from the power producers. Includes the latest local statistics for the selected 3 year vintage per power plant operational. It will be recorded just once at the beginning of the crediting period as a fixed period of 10 years has been selected.
8. $GEN_{imports}$	Electricity quantity	Data from grid operator (JPSCO)	MWh	m	At the beginning of the crediting period	100%	Both electronic and paper until 2 years after the crediting period	Includes the latest local statistics on imports for the selected 3 year vintage per power plant operational. It will be recorded just once at the beginning of the crediting period as a fixed period of 10 years has been selected.

Measurement of electricity output

Project electricity generation will be monitored through the use of on site metering equipment at the substation (interconnection facility connecting the facility to the grid). The Main Metering System equipment will be owned, operated and maintained by JPSCO, and the Backup Metering System equipment will be owned, operated and maintained by Wigton Wind Farm Company (WWF). Both meters will have the capability to be read remotely through a

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communication line. Both JPSCo and WWF have the right to read either meter. Both meters will have the provisions to record on memory the accumulated kilowatt-hours. Both meters will be read. The results from the Main Meter will be supplied by JPSCo to WWF on a monthly basis.

The monitoring tasks are to measure WWF's electric output, and steps to derive the emissions reductions are:

- JPSCo reads main meter and records result – monthly – within 3 working days of month end
- JPSCo supplies reading to WWF
- WWF supply reading to RES and file for Verifier
- JPSCo accumulates readings for payment period, calculate CERs for sale, and invoices for the sale of CERs
- JPSCo file paperwork for Verifier

The meter reading records will be readily accessible for auditors, Calibration tests records will be maintained for the auditors.

Calibration of meters & metering dispute resolution procedures

The Power Interchange Agreement between WWF and JPSCo defines the metering arrangements and the required quality control procedures to ensure accuracy. These are copied below:

- The metering equipment will be properly calibrated and checked periodically for accuracy. The metering equipment will have sufficient accuracy so that any error resulting from such equipment shall not exceed +0.5% of full-scale rating.
- Both Meters shall be jointly inspected and sealed on behalf of the parties concerned and will not be interfered with by either party except in the presence of the other party or its accredited representatives.
- All the meters installed shall be tested by JPSCo within 10 days after (a) the detection of a difference larger than the allowable error in the readings of both meters, (b) the repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications, and/or each anniversary of the Commercial operations date. If any errors are detected the party owning the meter shall repair, recalibrate or replace the meter giving the other party sufficient notice to allow a representative to attend during any corrective activity.
- Should any previous months reading of the Main Meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the Net Energy output shall be determined by (a) first, by reading Backup Meter, unless a test by either party reveals it is inaccurate; (b) if the backup system is not with acceptable limits of accuracy or is otherwise performing improperly the WWF and JPSCo shall jointly prepare an estimate of the correct reading; and (c) if JPSCo and WWF fail to agree then the matter will be referred for arbitration according to agreed procedures.
- The Net Energy Output registered by the Main Meters alone will suffice for the purpose of billing and emission reduction verification as long as the error in the Main Meter is within the permissible limits.

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Calibration will be carried out by JPSCo with the records being supplied to WWF, and these records will be maintained by WWF, by Richard Bailey and James Everad.

All of the above data collected will be kept until two years after the last issuance of CERs for the Wigton project activity.

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.):

>>

Not applicable as the project activity has no emissions.

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number <i>(Please use numbers to ease cross-referencing to table D.3)</i>	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment

Not applicable as no sources of leakage have been identified.

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

>>

No sources of leakage have been identified.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

>>

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$$ER_y = BE_y - PE_y - L_y$$

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data (Indicate table and ID number e.g. 3.-1.; 3.2.)	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1. EG_y	Low	<i>This data will be directly used for calculation of emission reductions. The metering equipment will be properly calibrated and checked periodically for accuracy, to ensure that any error resulting from such equipment shall not exceed +0.2% of full-scale rating. To guarantee QA/QC, it will be double checked by receipts of electricity sales.</i>
All others	Low	<i>Default data (for emission factors) and grid statistics data will be used. All the sources where data were obtained are cited and come from reputable sources.</i>

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

>>

Not applicable, as no leakage was identified.

D.5 Name of person/entity determining the monitoring methodology:

>>

The monitoring plan was concluded in October 2004. The entity determining the monitoring plan and participating in the project as the Carbon Advisor is EcoSecurities B.V., Netherlands, listed in Annex 1 of this document.

**SECTION E. Estimation of GHG emissions by sources****E.1. Estimate of GHG emissions by sources:**

>>

The project boundary is defined to include those emissions that are related to the direct on-site activities. There are no emissions associated with the production of electricity using wind energy.

The total project emissions are also zero, because all other emissions related to the project activity are excluded from the project boundary and thus not further accounted for.

E.2. Estimated leakage:

>>

No potential emission sources of leakage were identified for Wigton.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

>>

Given that the project emissions are zero and no leakage has been identified, the result of the sum is zero emissions.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

>>

The equation for calculating **emissions in the baseline** (BE_y) is:

$$BE_y = EG_y * EF_y$$

Where:

 BE : Baseline emissions (t CO₂e) EG_y : Annual electricity supplied by the project to the grid (MWh) EF : baseline emission factor (tCO₂e / MWh) y : refers to a given year

The baseline emission factor calculations will be based on the combined margin using the “Simple Operating Margin”, option (a) of the ACM0002.

$$BE_y = \omega_{OM} * EF_{OM}_y + \omega_{BM} * EF_{BM}_y$$

Where:

 EF : baseline emission factor (tCO₂e / MWh) ω_{OM} : Operation Margin weight, which is 0.5 by default EF_{OM} : Operational Margin emission factor (tCO₂e / MWh) ω_{BM} : Build Margin weight, which is 0.5 by default EF_{BM} : Build Margin emission factor (tCO₂e / MWh) y : refers to a given year

The Operating Margin emission factor (EF_{OM}_y) is calculated using the following equation:



$$EF_{OM_y} (tCO_2 / MWh) = \frac{\sum_{i,j} F_{i,j,y} * COEF_{i,j}}{\sum_j GEN_{j,y}}$$

Where:

$F_{i,j,y}$ is the amount of fuel i (in GJ) consumed by power source j in year y ; j is the set of plants delivering electricity to the grid, not including low-cost or must-run plants and carbon financed plants;

$COEF_{i,j,y}$ is the carbon coefficient of fuel i (tCO_2/GJ);

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j .

Using the approach above, and the data shown in Annex 3, the baseline emissions will be 52,540 $tCO_2e/year$ or 525,402 $t CO_2e$ for the entire 10-year project duration.

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

>>

Given that E.3 is equal to zero, the emission reductions of project activity are equal to E.4.

E.6. Table providing values obtained when applying formulae above:

>>

Year	Estimation of Project activity emission reductions (tonnes of CO2e)	Estimation of baseline emission reductions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of emission reductions (tonnes of CO2e)
2004 (as of 29/04)	0	35,027	0	35,027
2005	0	52,540	0	52,540
2006	0	52,540	0	52,540
2007	0	52,540	0	52,540
2008	0	52,540	0	52,540
2009	0	52,540	0	52,540
2010	0	52,540	0	52,540
2011	0	52,540	0	52,540
2012	0	52,540	0	52,540
2013	0	52,540	0	52,540
2014 (until 28/04)	0	17,513	0	17,513
Total (Tonnes of CO2e)		525,400	0	525,400

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>

The Ministry of Land and Environment is the most senior Government department with responsibility for the environment. Its agency, the National Environmental Planning Agency is responsible for the Jamaican Environmental Impact Assessment and permitting procedures. Under Jamaican environmental and



planning law (Natural Resources Conservation Authority Act (1991); Natural Resources Conservation (Permits and Licences) Regulations, 1996, and Natural Resources (Prescribed Areas) (Prohibition of Categories of Enterprise, Construction and Development) Order, 1996) an environmental impact assessment (EIA) is required before a permit is issued. All electricity generation plants, electrical transmission lines and substations have to be assessed, and this includes wind farms.

The EIA was produced by Renewable Energy Systems (UK) and Environmental Solutions (Jamaica) in July 2002. It was then submitted to the statutory authority – National Environmental Planning Agency (NEPA) who reviewed it. The main NEPA approval committee approved the EIA and the required permits have been issued.

The complete EIA is available on request.

For more information regarding the operations of the wind turbines, refer to the certification awarded by DNV - http://www.dnv.com/binaries/A-64203404-4E_tcm4-28782.pdf.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

The main impacts of the projects that were identified in the EIA are temporary as they occur during the construction phase. Other concerns, and in particular the visual impacts and noise from the turbines are considered to be within acceptable parameters. Some on-going monitoring plans will be discussed with NEPA in due course, and these mainly relate to ensuring mitigation measures related to the construction phase are carried out.

SECTION G. Stakeholders' comments

>>

G.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

A meeting was advertised in the national and local newspapers, and also a town crier (mobile public address system) was used to inform all potential stakeholder of the consultation event.

Location, Timing, & Attendees

The public or local stakeholder event was held on the 25/7/2001, at the local school – Rose Hill All School, from 5.00 – 9.00 pm. Over 50 persons, including the local political and National Environmental Planning Agency (NEPA) representatives attended the event – a list of attendees with signatures is available. NEPA is responsible for administering local consultation processes under Jamaican planning regulations.

Format for the event

The consultation event entailed:

- An exhibition of the project to allow stakeholders to understand the project and its consequences;
- A series of presentation using overhead projections to present the project to the stakeholders;
- Following the presentation a question, answer and discussion process was initiated.



- The presentations and question, answer and discussion session was chaired by Dr R Wright, Managing Director of PCJ Group. Refreshments were supplied at both beginning and end of evening because some stakeholders had to walk many miles to attend the event.

The exhibition of project information included take-away leaflets on wind energy, information on the developers and the project, as well as information on the CDM and its consequences for Jamaica and the project. The exhibition information presented included information on:

- What a wind farm is;
- Photomontages of what the wind farm will look like on the landscape from various surrounding locations;
- Explanation about the CDM aspects of the project.

The series of 3 presentations involved - a). Introduction from Dr. Wright, Managing Director of PCJ, b) Explanation of project characteristics, by Richard Lord, RES Ltd, c) Explanation of the CDM and its role in the projects development by Paul Soffe, EcoSecurities Ltd.

The question, answer and discussion process that formed the second part of the event were summarized. The results are described in the next section.

G.2. Summary of the comments received:

>>

The following overall conclusions can be drawn from the comments of the local stakeholders event. The event was successful in that there was a large turn out of people and no major concerns or objections were raised by the stakeholders. In addition NEPA were satisfied with the meeting and its outcomes, which can be demonstrated by the fact that it has issued a notice of intention to issue a permit.

A summary of the comments, questions and responses made by local stakeholders is included in the stakeholder consultation report, attached as Appendix A. The main concerns raised during the meeting related to:

1. safety issues, since the turbines will be operating in areas where local farmers will be active; and economic and employment benefits for the local people.

G.3. Report on how due account was taken of any comments received:

>>

As stated under G.2 no major concerns or objections were raised by the stakeholders. The answers provided by PCJ, RES and EcoSecurities in relation to the safety and economic and employment issues satisfied the participants. In addition NEPA were satisfied with the meeting and its outcomes. The participants concluded that no further actions needed to be undertaken in order to resolve any problems or resistance. Although, PCJ said that they would consider in due course issues related to tourism and educational facilities as requested by some of the participants.

Please refer to the stakeholder consultation report, attached as Appendix A.

Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Wigton Wind Farm Limited (WWF) / Petroleum Corporation of Jamaica (PCJ)
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Annex 2**INFORMATION REGARDING PUBLIC FUNDING**

The Dutch Development and Environment Related Export Transactions Programme (ORET/MILIEV) awarded a subsidy to the Wigton Wind Farm project. The purpose of these subsidies is to enable developing countries to purchase capital goods, services and works. Only a Dutch company can apply for a subsidy. The subsidy equates to approximately 20% of the total turnkey price for the Project. The subsidy is at a rate of 35% of the value of the supply of wind turbines and ancillaries from Holland.

The ORET/MILIEV programme aims to promote employment and enterprise in developing countries. ORET/MILIEV channels subsidies to developing countries, enabling them to import capital goods, works, and services from the Netherlands. Netherlands Development Finance Company (FMO) executes the programme on behalf of the Ministry of Foreign Affairs (Development). Once an application has been approved, a subsidy is awarded to the government of the country subject to the application. Its budget amounts to €100 million per year. The main criteria of the programme are:

- The ORET programme subsidizes a maximum of 35% of the total value of a transaction, the amount of which may not be less than EUR 45 million;
- The project is commercially non-viable according to OECD regulations;
- The project ties in with the aims of development policy;
- The transaction contributes to sustainable economic relations between the Netherlands and the developing country;
- The beneficiary country is mentioned on the ORET/Miliev list of eligible countries.

For further information, see also: <http://www.fmo.nl/en/products/capitalgoodsexport.php>

As can be concluded from the above, the ORET/MILIEV subsidy is related and linked to the transfer of a technology and not strict Official Development Assistance (ODA). The Dutch government does not claim or require any compensation for the provision of the subsidy in the form of Certified Emission Reductions. The ORET/MILIEV subsidy does not constitute a diversion of official assistance and is not counted towards any financial obligation from The Netherlands.

Annex 3**BASELINE INFORMATION**

Data for calculating the COEF of the power units in the baseline

- COEF for plants from JPSCO

The data on fuel consumption of the plants operated by JPSCO are given in liters of diesel or fuel oil consumed. The COEF data come from EIA, 1605 Fuel and Energy sources Codes and Greenhouse gas Emission Coefficients, www.eia.doe.gov/oiaf/1605/factors.html.

- COEF for Cogeneration plants

Two power plants operated by Independent Power Producers (IPPs) generate electricity based on cogeneration. These are the Jamaloca and EAL power plants. For cogeneration plants the fuel intensity and therefore the CEF per KWh is lower than for a normal power plant, depending on the share of heat output. The calculation of the COEF also requires a division of the losses that occur in generation in reasonable shares over electricity and heat. The recommended way to perform this calculation is by subtracting the heat related energy-use from the total energy input to the power plant.

As stated, specific data on fuel consumption related to electricity production and heat production for both plants is lacking. One of the cogeneration operators (Jamalcoa) indicated they operated at a total efficiency of 80%, but they did not disclose the heat to power ratio. On the basis of expert opinion⁴ we assume 30% efficiency for electricity production and 50% efficiency for heat production. This results in a CEF of 0.348 t CO₂/MWh for the cogeneration plants.

The CEF for the cogen plants is calculated according to the following formula:

$$CEF_{\text{cogen}} = EFF_{\text{elec}} / EFF_{\text{total}} * \text{Fuel} * EF_{\text{fuel}} / EG_{\text{cogen}}$$

Where:

CEF_{cogen} = the emission factor in t CO₂/MWh

EFF_{elec} = total efficiency = 80%

EFF_{total} = efficiency for electricity production = 30%

Fuel = total fuel used by cogen plant (in GJ)

EF_{fuel} (kCO₂/GJ) = 77.4 for oil (IPPC 1996)

EG_{cogen} = total electricity generated by the cogen plant in MWh

As the actual fuel used by the cogen plants is not available, this is estimated based on the output in MWhs using the assumed 30% efficiency.

Table 1: Data on fuel consumption for plants in the Operating Margin

⁴ Mr. Koen Smekens, Energy Research Centre of the Netherlands, smekens@ecm.nl, +31 224 564347.



Annual fuel consumption data	2001	2002	2003
In litres			
Bunker 'C'	563,311,822	608,924,535	600,113,385
Hunts Bay	136,846,728	135,630,153	127,189,277
Rockfort	61,763,705	53,214,551	47,563,431
Old Harbour	364,701,389	420,079,831	425,360,677
Diesel Fuel	216,636,056	164,897,404	225,685,202
Hunts Bay Gas Turbine	123,308,371	64,074,146	66,830,896
Bogue Gas Turbine	93,327,685	100,823,258	105,329,203
Combined Cycle	-	-	53,525,103
Total Consumption	779,947,878	773,821,939	825,798,587

Source: JPSCo. Note: no data available for the IPPs

Table 2 – Plants included in the Build Margin

Plant	Unit Nr	Year installed	MWh	%	Cumulative
Bogue	14	2003	45,240,373	0.013	0.01
Bogue	12	2002	56,458,813	0.038	0.03
Bogue	13	2002	85,119,018	0.048	0.05
Bogue	12	2002	74,949,620	0.021	0.07
Bogue	13	2002	84,017,895	0.024	0.10
Bogue	11	2001	2,745,505	0.001	0.10
Jamaica Broilers		1998	5,091,463	0.001	0.10
JPPC		1996	448,063,352	0.128	0.23

Table 3- Annual and total emission reductions in t CO₂

	Annual Emissions in tonnes of CO ₂	Total over 10 years in tonnes of CO ₂
Operating Margin	56,218	562,176
Build Margin	48,863	488,629
Combined Margin	52,540	525,402



Annex 4

MONITORING PLAN

This Monitoring plan will set out a number of monitoring tasks in order to ensure that all aspects of projected greenhouse gas (GHG) emission reductions for the (WWF) project are controlled and reported. This requires an on going monitoring of the project to ensure performance according to its design and that claimed Certified Emission Reductions (CERs) are actually achieved.

What is a monitoring plan?

The Wigton Wind Farm (WWF) Project monitoring plan is a guidance document that provides the set of procedures for preparing key project indicators, tracking and monitoring the impacts of the WWF project. The monitoring plan will be used throughout the defined crediting period for the project (2005-2014) to determine and provide documentation of GHG emission impacts from the WWF Project.

This monitoring plan fulfils the requirement set out by the Kyoto Protocol that emission reductions projects under the Clean Development Mechanism have real, measurable and long-term benefits and that the reductions in emissions are additional to any that would occur in the absence of the certified project activity.

What is required by the monitoring plan?

Managers of the WWF Project must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to maintain the information required for an audit of an emission reduction project. These records and monitoring systems are needed to allow the selected Operational Entity to verify project performance as part of the verification and certification process. This process also reinforces that CO₂ reductions are real and credible to the buyers of the Certified Emissions Reductions (CERs). The only significant emission source identified relates to the generation of electricity. Emission reductions will be achieved through avoided power generation of fossil -fuel based electricity in Jamaica due to the power generated by the WWF project. The amount of electrical output from the WWF project is therefore defined as the key activity to monitor.

The monitoring plan provides the requirements and instructions for:

- Establishing and maintaining the appropriate monitoring systems for kWh generated by the project;
- Quality control of the measurements;
- Procedures for the periodic calculation of GHG emission reductions;
- Assigning monitoring responsibilities to personnel;
- Data storage and filing system;
- Preparing for the requirements of an independent, third party auditor/verifier.

Who uses the monitoring plan?



Corporation of Jamaica (PCJ), who is developing the Wigton Wind Farm (WWF), will use this document as guide in monitoring of the project emission reduction performance and will adhere to the guidelines set out in this monitoring plan. This plan is designed to be used in parallel with the monitoring (i.e. metering) of the kWh, under Schedule 5 – Metering and Telecommunications, of the Power Interchange Agreement signed by WWF with the electricity supply company – Jamaican Public Service (JPSCo) Company.

Key definitions

The monitoring plan will use the following definitions of monitoring and verification.

- **Monitoring:** the systematic surveillance of the WWF project's performance by measuring and recording performance-related indicators relevant in the context of GHG emission reductions.
- **Verification:** the periodic ex-post auditing of monitoring results, the assessment of achieved emission reductions and of the project's continued conformance with all relevant project criteria by a selected Operational Entity.

PROJECT INFORMATION

Overview of project

PCJ is developing a 20.7 MW wind farm (comprising 23 wind turbines, a sub-station and access roads) on land at Wigton in the parish of Manchester, Jamaica. The development also involves the erection of an overhead, pole mounted, grid connection line from the Wigton site sub-station to the JPSCo substation at Spur Tree. Every year the wind farm should feed into the local grid system about 63 million kWh, enough to meet the overall electrical energy requirements of around 25,000 homes. The project developers currently estimate that the project will be operational in last quarter of 2003, with the crediting period likely to start from 2004. The electricity will be sold to the Jamaican Public Services (JPSCo).

The project boundaries define the technical extent to which the effects of the project must be measured, monitored and verified. The monitoring plan follows the project boundaries as defined in Section B.4 of the PDD.

Crediting Period

The crediting period for the WWF project is 10 years, starting 1st of January 2005 and ending 31 December in 2014. At the end of each calendar year annual electricity sales will be monitored. The monitoring results and subsequent emission reductions will be verified on a bi-annual basis as well by the selected Operational Entity.

CO₂ emissions reduction calculation estimation

This section presents the method for calculating CO₂ emission reductions. The emission reductions from the project are generated due to the displacement of electricity generated from existing grid energy technologies by electricity generated by the WWF Project.



The CO₂ emission reductions from the project will be calculated as follows:

Determine the net electric output for the period from the WWF project by accumulating the monthly results from the measurements made by WWF and Jamaica Public Services Company. (in GWh)

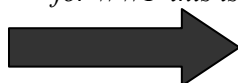


Multiply this by the average carbon emissions factor as defined in the Baseline and validated by the Operational Entity (tCO₂ / GWh)



Net annual CO₂ emissions displaced by WWF (tonnes CO₂ equivalent)

Deduct emissions from project (CEF project multiplied by net monitored electric output project) for WWF this is nil, as agreed in the baseline



Total CERs generated by the project for the period

Measurement of Electricity Output

Project electricity generation will be monitored through the use of on site metering equipment at the substation (interconnection facility connecting the facility to the grid). The Main Metering System equipment will be owned, operated and maintained by JPSCo, and the Backup Metering System equipment will be owned, operated and maintained by WWF. Both meters will have the capability to be read remotely through a communication line. Both JPSCo and WWF have the right to read either meter. Both meters will have the provisions to record on memory the accumulated kilowatt-hours. Both meters will be read. The results from the Main Meter will be supplied by JPSCo to WWF on a monthly basis. The monitoring tasks are to measure WWF's electric output, and steps to derive the emissions reductions are:

- JPSCo reads main meter and records result – monthly – within 3 working days of month end
- JPSCo supplies reading to WWF
- WWF supply reading and file for Verifier
- PCJ accumulates readings for payment period and calculate CERs for sale, and invoice Buyer
- PCJ file paperwork for Verifier

The meter reading records will be readily accessible for auditors, Calibration tests records will be maintained for the auditors.

Calibration of Meters & Metering Dispute Resolution Procedures

The Power Interchange Agreement between WWF and JPSCo defines the metering arrangements and the required quality control procedures to ensure accuracy. These are copied below:



- The metering equipment will be properly calibrated and checked annually for accuracy. The metering equipment shall have sufficient accuracy so that any error resulting from such equipment shall not exceed +0.5% of full-scale rating.
- Both Meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.
- All the meters installed shall be tested by JPSCo within 10 days after (a) the detection of a difference larger than the allowable error in the readings of both meters, (b) the repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications, and/or each anniversary of the Commercial operations date. If any errors are detected the party owning the meter shall repair, recalibrate or replace the meter giving the other party sufficient notice to allow a representative to attend during any corrective activity.
- Should any previous months reading of the Main Meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the Net Energy output shall be determined by (a) first, by reading Backup Meter, unless a test by either party reveals it is inaccurate; (b) if the backup system is not with acceptable limits of accuracy or is otherwise performing improperly the WWF and JPSCo shall jointly prepare an estimate of the correct reading; and (c) if JPSCo and WWF fail to agree then the matter will be referred for arbitration according to agreed procedures.
- The Net Energy Output registered by the Main Meters alone will suffice for the purpose of billing and emission reduction verification as long as the error in the Main Meter is within the permissible limits.

Calibration is carried out by JPSCo with the records being supplied to WWF, and these records will be maintained by WWF, by Richard Bailey and James Everad.

DATA MANAGEMENT SYSTEMS

This provides information on record keeping of the data collected during monitoring. Record keeping is the most important exercise in relation to the monitoring process. Without accurate and efficient record keeping, project emission reductions cannot be verified. Below follows an outline of how project related records will be managed.

Proposed information management system for emissions reduction monitoring

Overall responsibility for monitoring of greenhouse gas emissions reduction will rest with WWF, and which will be located at PCJ's central office, located at 36 Trafalgar Rd in Kingston, Jamaica. The following section sets out the procedures for tracking information from the primary source to the end-data calculations, in paper document format. WWF will provide the CERs and necessary data to allow it to transfer to the Buyer.



Paper-based Documentation

Physical documentation such as paper-based maps, diagrams and environmental assessments will be collated in a central place, together with this monitoring plan. In order to facilitate auditors' reference of relevant literature relating to WWF project and WWF Company, the project material and monitoring results will be indexed. All paper-based information will be stored by James Everad and Richard Bailey at the office of PCJ at 36 Trafalgar Rd in Kingston, Jamaica. The person with overall responsibility for the documentation of the WWF project at PCJ in Jamaica will be Dr Raymond Wright, Managing Director of PCJ, to whom James Everad and Richard Bailey will report.

Table 1 sets out the key documents relevant to monitoring and verification of the emissions reductions from the project.

Table 1 - Data Storage Table

Document index reference number	Document title	General description of document	Individual or department submitting this information	Date entered
	PDD, including the electronic spreadsheets and supporting documentation (assumptions, data estimations, measurement methods, etc.)			
	CO ₂ ER Calculations & Monitoring Plan			
	Validation Report			
	Dispatch Meter calibration Reports.			
	Documentation related to assessments and any site visits carried out by Operational Entity for verification of the annual emission reductions			
	Monthly Meter reading reports			
	Records on CO ₂ emission reductions (CERs)			
	Records on project management, including data collection and management systems			

VERIFICATION AND MONITORING RESULTS

The verification of the monitoring results of the WWF project is a mandatory component, which is required for all CDM projects. The main objective of the verification is to independently verify that the project has achieved the emission reductions as reported and projected in the PDD. It is expected that the verification will be done on a bi-annual basis.

The responsibilities for verification of the WWF project are as follows:



- Contract an Operational Entity and agree a time schedule for carrying out verification activities throughout the crediting period in accordance with the Buyer and the CDM Executive Board requirements. WWF will make the arrangements for the verification and will prepare for the audit and verification process to the best of its abilities.
- WWF will facilitate the verification through providing the Operational Entity with all the required necessary information, before, during and, in the event of queries, after the verification.
- WWF will fully cooperate with the Operational Entity and instruct its staff and management to be available for interviews and respond honestly to all questions from the Operational Entity.
- The selected Operational Entity must be an Accredited Entity with a proven track record in environmental auditing and verification, experience with CDM projects and work in developing countries. The Operational Entity should be accredited by the CDM Executive Board.

Raymond Wright (Managing Director of PCJ) will have the overall responsibility for the monitoring and verification process and act as the contacting point for the Operational Entity.



Appendix A

Wigton Wind Farm Public Consultation Exercise

Context

Under the terms of both national regulations (administered by National Environmental Planning Agency) and according to the rules of the CDM a consultation exercise was required.

Procedures & Results of the Exercise:

Advertising

The meeting was advertised in the national and local newspapers, and also a towncrier (mobile public address system) was used to inform all potential stakeholders of the consultation event.

Location, Timing, & Attendees

The public or local stakeholder event was held on the 25/7/2001, at the local school Rose Hill All School, from 5.00 – 9.00 pm. Over 50 persons, including the local political and National Environmental Planning Agency (NEPA) representatives attended the event – a list of attendees with signatures is available.

Format for the event.

The consultation event entailed:

- An exhibition of the project to allow stakeholders to understand the project and its consequences.
- A series of presentations using overhead projections to present the project to the stakeholders.
- Following the presentation a question, answer and discussion process was initiated.
- The presentations and question, answer and discussion session was chaired by Dr R Wright, Managing Director of PCJ Group. Refreshments were supplied at both beginning and end of evening because some stakeholders had to walk many miles to attend the event.

Exhibition

Exhibition of project information, including take-away leaflets on wind energy, information on the developers and the project, as well as information on the CDM and its consequences for Jamaica and the project. The exhibition information presented included information on:

- What a wind farm is
- Photomontages of what the wind farm will look like on the landscape from various surrounding locations
- Explanation about the CDM aspects of the project.

Presentations.

The series of 3 presentations involved - a) Introduction from Dr Wright, b) Explanation of project characteristics, by Richard Lord, RES Ltd, c) Explanation of the CDM and its role in the projects development by Paul Soffe, EcoSecurities Ltd.

General introduction



Dr Wright introduced the event with some comments, including:

- The project is now likely to include a hospitality centre as part of the overall project package. They thought a third party (hopefully local) would be brought in to run the centre, which would also serve refreshments etc.
- There will be increased employment in the area especially during the construction phase of the projects development, with a few maintenance jobs once the project was operational.
- The project would make Wigton a nationally known place once the project was being built because there would be a lot of media interest in the project because it will be the first of its kind in Jamaica. This will change the life of the community forever.

Wind energy and project presentation

Richard Lord explained the technical aspects of wind energy projects in general and more specifically in relation to the project. This included descriptions on:

- Erection of 23 turbines, their size
- Upgrade of existing roads/tracks,
- Building of concrete pole linked transmission lines
- Building of a substation
- Construction of the foundations
- Transportation of turbines
- Noise impacts
- Visual impacts

CDM presentation

This presentation focused on:

- What the CDM is
- How the CDM affects Jamaica & what Jamaica can get out of the CDM
- What the CDM means for the project
- What the steps are in making the project into a CDM activity

Summary of Comments, Questions and Responses

1. Question - What was construction period?

Response – 1 year.

2. Question - How do local people see the money benefits from the project being a CDM project. How do they benefit from the carbon credits?

Response – They will get slightly lower electricity costs, but most of the benefits will be more national in nature, i.e. less reliant on imported fuels, and there is a capacity shortfall that the project can help solve.

3. Question - What harm will the project do to people in the region, is there any dangerous radiation?

Response – There is no radiation from wind farms

4. Question - What are the equal opportunity measures with regards to the employment?



Response – The project company will be an equal opportunity employer and take this approach with regards to all jobs

5. Question - Can existing farming activities continue on the site?

Response – Yes, there will be no pollution and the turbine take up very little space.

6. Question - The bauxite mining is likely to have negative impact because landscape could be ruined?

Response – The bauxite company will restore the land.

7. Question - Will there be a tour guide to show visitors around?

Response – Depends on the number of the tourists visiting the site.

8. Question - The local visitor centre should be run by locals?

Response – Possibly, but it must be controlled and of a high standard – no dirty wooden shacks.

9. Question - How much will the electricity cost and will be get cheaper electricity?

Response – well, in the electricity contract the supplier will pay 5.6 US\$ cents per MWh, with the following 15 years for 5 US\$ cents per MWh. But the price the public has to pay is decided by the electricity supply JPS.

10. Question - Please elaborate on distribution?

Response – The electricity distribution or feed to the grid will mainly be along the Parish roads, which will be in total 11km from the project to the grid connection.

11. Question - Will the project reduce black outs and increase the reliability of electricity supplies?

Response – No guarantees on this can be supplied, this is up to JPS, but it should help.

12. Question - Will lightening be a problem?

Response – No, all the turbines are designed to cope with strikes.

13. Question - Will noise not be a problem - we have heard that accumulatively they can be noisy?

Response – No, not really, the background noise will be louder than the noise the turbines make.

14. Question - What about the safety? Could the turbines fall on anyone?

Response – Very unlikely, the turbines are class 1, which is the strongest class, which should withstand hurricanes.

15. Question - What are the benefits of the carbon payments to the local community?

Response - No direct benefits, they are indirect because the carbon helps finance the project, which will in turn supply cheaper electricity and supply local jobs too.

16. Question - Can there be a local education programme in the local school, to help educate the local children about the project, renewables, and the environmental problems of fossil fuels?

Response – This is a good idea and will be considered. RES offered to give some of the exhibition materials to the local schools, which was accepted by the Headmistress.

17. Question - NEPA (National Environmental Planning Agency) representative announced to the audience that should they have other issues they wanted to raise they could speak with him at anytime over next two weeks, by which time they would have decided on whether to issue the environmental and planning permit.



Conclusions

The event was successful in that there was a large turn out of people and no major concerns or objections were raised by the stakeholders. In addition NEPA were satisfied with the exercise, which can be demonstrated by the fact that it has issued a notice of intention to issue a permit.