



THE BARBADOS
LIGHT & POWER
COMPANY LIMITED

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29 August 2007

Mr Mark Cummins
Chief Town Planner
Town and Country Development Planning Office
Block C
Garrison
ST. MICHAEL BB 14038

Dear Mr. Cummins

**Re: Application 3262/11/04C – Construction of a Wind Driven Electrical
Generating Station at Lamberts East, Lamberts Plantation, St. Lucy**

Please find enclosed a response prepared by our environmental consultants,
AMEC Earth & Environmental, to your letter dated 19 July 2007.

Yours faithfully,
THE BARBADOS LIGHT & POWER COMPANY LIMITED


Hallam Edwards
Senior Manager Generation

RB:mk

Enc.

August 17, 2007

TV61036

The Barbados Light and Power Company Limited
Garrison Hill,
St Michael
Barbados

Attention: Mr. Roger Blackman

Dear Mr. Blackman,

RE: Comments on: Lamberts Windfarm - Letter from TCDPO

I am pleased to provide you with our response to the submission provided by the Josey Hill Residents Association: *"A critique of Environmental Impact Assessment for The Barbados Light & Power Company Limited Lamberts East Wind Farm Generating Station"*.

We have reviewed concerns of the residents to determine if the information presented by residents changes the conclusions of the environmental assessment study. The following is our review of the comments in the order presented:

Noise

AMEC agrees with the statement that *"The WHO recommends that 45dBA should be the limit for night time noise"* and chose that as the basis for evaluating acceptable noise levels.

Comments are made on the potential health effects of noise from wind turbines. This was addressed in the environmental assessment report. The environmental assessment compared predicted sound levels with levels set by WHO which considers health effects in its establishment of acceptable standards.

Accidents and Malfunctions

Information is provided on a range of accidents. The fatalities and injuries reported were largely of project personnel in industrial accidents which are preventable.

Accidents involving the public were mainly traffic accidents due to distracted drivers or road accidents during equipment delivery. None of these are unique to the operation of windfarms. The AMEC report made recommendations for equipment delivery overnight including road closures.

Additional examples of accidents involving the public include a low flying aircraft, a parachutist, an injury from falling ice and a fall from a tower. Comments were sought from the Civil Aviation Office during the completion of the EIA to cover air traffic; falling ice was not considered applicable for Barbados and falls from towers can be prevented by excluding public entry.

The summary of accidents does not change the conclusions of the environmental assessment report that "The wind industry has an excellent safety record".

Project Proposal

Comments are made on the estimated output and costs stated in the EIA. The information provided in the EIA was based on the engineering studies completed and it is not material to the conclusion of the environmental effects of the project.

Selected Project Standards and Guidelines

The submission does not agree with the statement in the EIA report that higher wind speeds increase background noise. The submission assumes that the EIA statement refers to induced noise from vegetation.

Figure 2-1 of the EIA report includes a graph showing the increase in background noise with increased wind speed. The graph has been prepared by the Government of Ontario and is included in the document "*Interpretation for Applying MOE NPC Technical Publications to Wind Turbine Generators*". That reference document is provided in its entirety in (Appendix B) of the EIA and is used as the basis of issuing environmental approvals for noise emissions from wind turbines.

Low Frequency Sound

The submission refers to reports on low frequency sound by: Dr. Amanda Harry, Dr. Bridget Osborne and Dr. Nina Pierpoint. The EIA already considered these reports.

An additional article has been supplied (authors AlvesPeriera and Branco) that suggests infrasound occurs from a wide range of sources, but no data has been provided to put it into context.

The submission takes exception to the suggestion in the EIA report that noise monitoring can be completed following installation. Monitoring is almost always a requirement of regulatory agencies as a means verifying that the environmental performance as predicted in the EIA and approved by the regulatory agency has been met.

Shadow Flicker

Shadow flicker was covered in the EIA report and comments have been provided on behalf of the Josey Hill residents by R. Bolton. AMEC provides a review of Mr. Bolton's comments as follows:

- The Table of Contents does not match the content of the paper.
- The author, Mr. R. Bolton, states on p.3 "Large scale shadow flicker is a new phenomenon, not experienced by people on an "industrial scale", with very large sized shadows moving across their home or through their local views." This is not correct.

Vehicles passing across a bridge can produce the same (actually larger) scale of shadows passing in front of, say, the window of a house aligned with the vehicles and the sun (or moon). There are many bridges with nearby communities in the world.

- Mr. Bolton perhaps suggests on p.3 that the AMEC analysis of shadow flicker suffers from the "garbage in, garbage out syndrome". He does not prove this.
- Mr. Bolton states on p.3 that "...shadow flicker...is a new environmental pollutant." The reviewer would be pleased to receive proof of this.
- Mr. Bolton states on p.5 "AMEC doesn't disclose the model it used but it was apparently Wind Pro (Ref. 3)." The software used to calculate shadow flicker results was "WindFarm". Information on WindFarm can be found at www.ReSoft.co.uk
- Mr. Bolton states on p.5 "Also 83 m high turbines on elevated hill ridges will cast distinct shadows for thousands of feet, well above any vegetative screening", and later in the Conclusions on p.14) "AMEC's suggestion that vegetation can be erected to mask shadows is completely ludicrous". These statements refer to a statement in the AMEC Report on p.5 that proposes to mitigate shadow flicker effects "by planting trees in specified locations". It appears that Mr. Bolton believes that the mitigation proposed by AMEC is to plant sufficient vegetation to prevent any shadows at all from the wind turbines. This is not the case; AMEC proposes to plant vegetation (trees, shrubs) in strategic locations (generally in close proximity to the sensitive locations) in order to prevent shadows where they might be a nuisance.
- Mr. Bolton states on p.5 "Furthermore the AMEC discussion fails to include all flicker effects such as night-time flicker conditions as with moon shine". Moon shine, which, of course, is sunlight reflected from the moon's surface is much less intense than direct sunlight. As a consequence, moonlight shadows are quite limited in intensity and would not be expected to have the same impact as shadows cast by the sun.
- Mr. Bolton states on p.5 "Though biased toward wind farms it [the software] seems to allow appropriate input parameters and perform reasonably accurate predictions". It is not clear to the reviewer how a model that produces accurate predictions can be biased.
- On p.6 Mr. Bolton states "... the size of the visual impact depends on distance between the observer and the turbine". This statement is correct in some sense because Mr. Bolton does not define the "size of the visual impact". However it appears to be inconsistent in the context of the discussion in the paper that he provides on shadow flicker. For all practical purposes, on the surface of the earth sunlight is a collimated beam. The amount of solar energy intercepted by an obstacle and prevented from reaching the observer's eye is independent of the distance to the obstacle. (Note though, that there are mitigating effects such as refraction of the light around the obstacle (turbine blade in this case), and the contribution of diffuse light which will scatter into the path between the blade and the observer.) In addition, a discussion of what distance the observer should be at in order to see the turbine blades occluding the sun's disk is given as a precursor to calculating the shadow length. These two subjects are unrelated. The

shadow length has nothing to do with the spherical angle within which the observer sees the sun.

- Mr. Bolton states on p.7 "A simple geometric calculation shows the turbine shadow will cast 2 km, ..." His calculations show the distance from the obstacle to the projection of the line that comes from the sun to the tip of the obstacle and eventually to the earth's surface - this is not necessarily the length of the shadow. The shadow is the region in the field of the sunlight with a lower radiant intensity than surroundings. The human eye detects this difference and perceives the less radiant region as shadow. There is a threshold difference that can be sensed by the human eye. It is believed (as stated in the research article cited by Mr. Bolton) that shadows generated in sunlight can be detected no more than 1 km from the obstacle. Therefore, it is very unlikely that there will be shadows "well into the sea beyond the coast" (p.7) and consequently "over one hour impact" of flickering shadows on the coastal region, as stated by Mr. Bolton.
- Mr. Bolton states on p.8 "A 56 m diameter shadow is large ...", "... human acuity is about 0.3 mrad ...but at larger angles ... (~120 mrad) ... one would expect the shadows on the landscape to be easily distinct. This corresponds to ... $56/120 \text{ mrad} = 467 \text{ m}$ ". The author seems to state that the obstacle causing the shadow is the full 56 m diameter of the rotor disk. This is clearly not the case. If the full 56 m diameter disk were to occlude the sun, there would be no flicker. It is the individual turbine blades that generate the flicker. Using a typical blade chord dimension (2 m) for the size of turbine under consideration, Mr. Bolton's calculation results in $2/120 \text{ mrad} = 17 \text{ m}$, not 467 m.
- Mr. Bolton states on p.14 "The AMEC study is extremely naive and though an apparently sophisticated analysis was performed it was clearly without a competent or objective understanding of the problem and use of the modeling software. An objective and competent evaluation by a third party not associated with AMEC or wind industry should be contracted for this evaluation to be unbiased and fair". Given Mr. Bolton's treatment of the subject in this paper, it is not clear whether he is competent with regard to the determination of AMEC's competency. The reviewer invites Mr. Bolton to provide convincing proof of this lack of competency.

Lightning

Lightning strikes were covered in the EIA report.

Hurricanes

Wind turbines will lock out at high wind speeds to prevent damage.

Geology

Comments are made on the presence of caves and infer that these cause increased noise as traffic travels from Pie Corner to Date Tree Hill. This may be due to the added engine noise from vehicles as they climb the steep gradient, and would therefore not be relevant for wind turbines.



Health

The comments refer to other forms of clean energy including photovoltaic cells and nuclear plants that are being considered elsewhere and that BLPC should consider other alternatives.

Technology selection for power generation projects is based on detailed engineering studies that consider such factors as reliability, affordability and practicality. This is not a part of the scope of the EIA.

Closure

The comments provided by the residents of Josey Hill have been reviewed and do not change the conclusions of the AMEC report.

If you have any questions on the commentary provided, please call.

Yours truly,
AMEC Earth & Environmental Limited,
a division of AMEC Americas Limited

A handwritten signature in black ink, appearing to read "Peter Rostern".

Peter Rostern, M.B.A., P.Eng.
Principal Environmental Engineer

c.c. Mr. Ian Shepanik