

**Minutes of a Meeting of the Environmental Authority  
Held on Tuesday, 25 May 2021  
At the Department of Environment and Natural Resources, Botanical Gardens, Paget  
and Remotely using Webex Teleconference**

**PRESENT:** Ms. Davida Morris, Chair, (by remote access)  
Mr. Eugene Saunders, Member  
Mrs. Susan Armstrong, Member, (by remote access)  
Mr. Andrew Barnes, Member, (by remote access)  
Mr. Willie Ferguson, Member  
Mr. James Morrison, Member, (by remote access)  
Mr. Jonathan Starling, Member, (by remote access)

**ADVISORS:** Dr. Geoff Smith, Environmental Engineer, DENR  
Dr. Shaun Lavis, Hydrogeologist, DENR  
Mr. Kirk Outerbridge, Chief Engineer, Public Works, remote access  
Mr. Tarik Christopher, Principal Engineer (Water & Sewage), Public Works  
(by remote access)  
Ms. Patricia Hollis, Environmental Officer, DENR, Recording Secretary

**ABSENT:** Mr. Paul McDonald, Acting Senior Planner, Dept. of Planning  
Mr. Tom Crossan, Chief Environmental Health Officer  
Mr. Armell Thomas, Senior Environmental Health Officer

**GUESTS:** Representatives of BELCO:  
Mr. Mark Pacheco, Director, OHSE & Business Continuity Director, Belco  
Mr. Matt Thompson, Environmental Engineer, iEPC  
Mr. Andrew Rothwell, OHSE Coordinator, Belco

**1. Confirmation of Minutes**

Confirmation of the Minutes of the meeting held on 27 April 2021 was deferred. They are to be considered at the next in-person meeting.

**2. BELCO Presentation: Response to Authority's Letter Dated 26 March 2021**

Members were reminded that on 4 March 2021, at the Authority's request, DENR sent a letter to BELCO requesting information on their progress on addressing exhaust fume complaints. Complaints specifically from the Ocean Lane, Pembroke area, have been received by DENR since the commissioning of the North Power Station during 2020.

On 26 March 2021, BELCO's draft response was received; this was circulated to Environmental Authority Members and Advisors on 5 May 2021. It was also shared with the Regulatory Authority for comment.

BELCO Representatives were invited to this meeting to explain their responses to the Authority's four main requests:

- 1a) Details of their current understanding of the 'downrafting' phenomenon at Ocean Lane, Pembroke;
- 1b) The latest air quality data with comparison to the Bermuda Clean Air Act Regulations and the UK Air Quality Objectives;
- 1c) Sources and causes of the pollutants measured in the ambient air at Ocean Lane, Pembroke;
- 1d) Mitigation options that are available to BELCO to improve the air quality at Ocean Lane. Details of the expected improvement in air quality should be provided for each mitigation option together with an approximate timeline, if considered for implementation and any other relevant consideration.

**1a) Current Understanding of the "Downrafting" Phenomenon at Ocean Lane**

Belco stated that both the North Power Station (NPS) and the East Power Station are contributing to the poor air quality at Ocean Lane, Pembroke.

**Wind directions** of 218° (*i.e.* SSW) are suggested to cause odours at the Ocean Lane area that originate from the new NPS engines, whereas wind directions of 211° (*i.e.* SSW) are

suggested to cause odours that originate from the EPS engines that have been in place since 2005. BELCO presented data that demonstrated measurable sulphur dioxide concentrations detected at the new monitoring station at #14 Ocean Lane (*i.e.* BDA4) for wind directions between compass bearings of  $\sim 200^\circ$  (*i.e.* S) and  $\sim 235^\circ$  (*i.e.* SW) with the peak roughly coinciding with the  $218^\circ$ , which is the bearing to the NPS engines from BDA4. It was suggested by BELCO that the reason for the greater numbers of complaints and associated readings of sulphur dioxide in the Ocean Lane area are expected to be due to the following reasons:

- **Terrain** - where two terrain induced effects are believed to be occurring: Funnelling effect caused by the 'notch' in the ridgeline between Mount Hill and Langton Hill and a downdrafting effect on the lee side of the hill, and
- **Atmospheric Turbulence** - which is suspected to cause the exhaust plume to loop or dip rather than rise steadily.

### **Wind Speeds and Directions**

BELCO determined that when analysing atmospheric pollutant concentrations against wind speeds and directions, winds from southerly directions were more accurately measured by the meteorological station on Cemetery Lane (*i.e.* next to BDA1) than from the new meteorological station at BDA4 on Ocean Lane. This is probably due to the wind shadow effects of Langton Hill (*i.e.* the hill causes localised changes to the prevailing wind speed and directions). Using meteorological data from near BDA-1, it was shown that elevated levels of sulphur dioxide were measured at BDA4 site during periods of medium-strong winds (*i.e.* greater than 15 knots) from the SSW.

**Downdrafting**, and its extent, was apparent when comparing the horizontal wind speed to the vertical wind speed when sulphur dioxide concentrations were readily measured at Ocean Lane, Pembroke. It was shown that the downward vertical wind speed was directly proportional to the horizontal wind speed such that as the wind speed increased, the rate of downdrafting also increased in the Ocean Lane area.

### **1b) The latest air quality data at BDA4 and its comparison to BAAQS and UK Air Quality Objective**

Belco reported that there have not been any exceedances of the Bermuda Ambient Air Quality standards recorded to date. Also there have not been any exceedances of the 1-hr or 24-hr pollutant concentrations listed in the UK statutes or Air Quality Objectives. However, there have been 41 exceedances of the 15-minute UK Air Quality Objectives for SO<sub>2</sub> since 2<sup>nd</sup> Nov. 2020. These exceedances were recorded on 9 days, ranging from 1 to 15 exceedances per day.

The BELCO representatives stated that the initial modelling undertaken in 2017 showed that there would be exceedances of the UK Air Quality Objectives for 1 hour SO<sub>2</sub>. Also to be considered is that the retirement of the short stack units in the Old Power Station has resulted in a significant improvement in air quality in the immediate vicinity of the BELCO plant.

It was noted by DENR, based on recent Air Dispersion Modelling from 2020, and subsequent air quality monitoring at BDA4 over 2021, that the normally over-predictive AERMOD modelling did, at the Ocean Lane site, under-predict the actual measured concentrations of sulphur dioxide being reported.

### **1c) Identify the sources and causes of pollutants measured in the ambient air at Ocean Lane**

BELCO confirmed that exhaust from both the North Power Station and East Power Station contribute to the poor air quality at Ocean Lane. Trends were identified by a review of hourly engine dispatch logs, 15-minute and hourly meteorological conditions and 15-minute and hourly ambient air pollutant concentrations measured at BDA4. High winds (greater than 15 knots) from the SSW direct the exhaust plume from the exhaust stacks towards "notch" between Langton Hill and Mount Hill. The plume is then drawn down the north facing side of Langton Hill at or close to grade level. Other contributing factors include operational practices such as: 1) long engine run-in periods at low load, which is required after significant maintenance is performed; and 2) long, or multiple, start up periods. Both of these operational factors probably adversely affect how high the exhaust gases are lofted above the stack resulting in higher exhaust gas concentrations at lower elevation than during routine operation of the engines.

#### **1d) Mitigation options available to BELCO**

It was understood that space constraints prohibit the installation of secondary abatement equipment (*i.e.* scrubbers). Also, extension of the stacks is impractical and expensive compared to alternative primary abatement methods by, for example, operating on lower sulphur fuels.

BELCO has been adjusting the cylinder operating pressures to fully optimise the North Power Station engines for liquid fuels such as heavy fuel oil (HFO) *i.e.* some engines have been converted from running on natural gas or liquid fuels to liquid fuels only. One of the optimisation steps involves the extension of the cylinder shafts using shims to increase the combustion pressure in the cylinders; this has been completed in all four 14-cylinder NPS engines. The second involves replacing cylinder crowns; to date, new cylinder crowns have been installed on two of the four NPS engines. The two remaining NPS engines will have their cylinder crowns replaced in the autumn after electricity demand eases. The aim of re-configuring the engines from dual-fuel to heavy fuel oil is to produce more efficient combustion of the HFO, and an exhaust plume that contains fewer unburned or partially burned hydrocarbon pollutants. Another goal from a more efficient burn is to generate greater exhaust temperatures and gas velocities in the stack. This should loft exhaust to higher elevations, reducing the amount of exhaust ultimately entrained into downdrafting air that is currently bringing exhaust gases to the Ocean Lane area.

**Primary abatement** is considered by BELCO to be the use of more refined fuels with lower levels of sulphur to address pollutant concentrations in the exhaust. This is expected to carry a significant cost. It has been estimated that a change to lower sulphur marine diesel oil (*i.e.* 1% sulphur) will increase the retail cost of electricity by approximately \$0.02 per kilowatt-hour. It is further noted that changing from the current 2% heavy fuel oil (HFO) to a 1% fuel oil would essentially halve the concentrations of sulphur dioxide detected at the Ocean Lane area.

**Partial primary abatement** is considered by BELCO to be the use of ultra-low sulphur diesel fuel (*i.e.* light fuel oil – LFO) at the East Power Station and/or North Power Station during weather conditions that are appropriate to cause impacts to the Ocean Lane area. Switching from HFO to LFO when the winds are from a SSW direction and at 15 knots or greater may be an alternative compromise.

The representatives stated that Belco has been actively seeking solutions to the complaints. They continue to make visit to homeowners; maintain a map of impacted areas, undertake tank water and water filtration testing, paint roofs of affected residences, and encourage communications with the public.

**Soot Fallout:** It is noted that soot fallout is an issue separate to the poor air quality complaints in and around the Ocean Lane area. The use of nutshells and water wash processes to remove soot from the engines is a practice that has the potential to increase soot fallout. With better combustion, this process may be optimised to reduce soot emissions. DENR has already noted that it wishes to participate with BELCO in a study to photograph downwind roof areas the day before and after a water wash in order to assess whether the soot loading to a roof increases significantly compared to suitable control sites.

The BELCO representatives were thanked for their presentation.

### **3. Applications for Construction Permits and Operating Licences (New)**

#### **3.1 CP-716, OL-1132 Edgewood Pediatrics**

The Authority **APPROVED:**

the application for a 20 kW propane genset at 13 Richmond Road, Pembroke subject to standard conditions, providing genset is enclosed in a covered 3-sided block wall sound enclosure, and providing neighbours' consent is received.

#### **3.2 CP-714, OL-1119 S. Talley**

The Authority **APPROVED:**

the application for a 22 kW propane generator at 16 Store Hill, Smith's, subject to standard conditions and providing a sound attenuating barrier is installed.

**3.3 CP-715, OL-1222 Mr. B. Kizer**

The Authority **DEFERRED**:

the application for a 20 kW diesel generator at 35 Grape Bay Drive, Paget, pending submission of more information.

**3.4 OL-1123-1131 MV Viking Orion**

Due to time constraints, consideration of Operating Licences for Meyer Agencies' "MV Viking Orion" was deferred to the next meeting.

**4. Applications for Operating Licences (Reissue)**

The Authority **APPROVED**:

the reissue of operating licences on the one-page printout, subject to standard conditions.

**5. Applications for Chemical Import Permit**

The Authority **APPROVED** Aircare's application to import refrigerants listed below:

- 40 cylinders each with 24 lbs R 404A
- 40 cylinders each with 25 lbs R 410A
- 40 cylinders each with 25 lbs R 438A
- 40 cylinders each with 30 lbs R 134A
- 4 cylinders each with 100 lbs R 123

**6. Applications for Water Rights (Reissue)**

The Authority **APPROVED**:

the issue of water rights as listed on the two-page printout, subject to standard conditions, with the exception of four indicated as withdrawn.

**7. Date of the Next Meeting**

The date of the next meeting was set for 8:30 am, Tuesday, 29 June 2021.



CHAIRMAN

26/10/2021

DATE