

**Minutes of an Extraordinary Meeting of the Environmental Authority
Held on Thursday, 23 March 2023
At the Department of Environment and Natural Resources, Botanical Gardens, Paget**

PRESENT: Ms. Davida Morris, Chair
Mr. Eugene Saunders, Deputy Chair
Mrs. Susan Armstrong, Member
Mr. Andrew Barnes, Member
Mr. Willie Ferguson, Member
Mr. Jonathan Starling, Member

ADVISORS: Dr. Geoff Smith, Environmental Engineer, DENR
Dr. Shaun Lavis, Hydrogeologist, DENR
Ms. Patricia Hollis, Environmental Officer, DENR
Mr. Kirk Outerbridge, Chief Engineer, Public Works
Mr. Paul McDonald, Acting Senior Planner, Dept. of Planning
Mr. Armell Thomas Acting Chief Environmental Health Officer
Ms. Crystal Baxter, Acting Senior Environmental Health Officer

BELCO REPRESENTATIVES:

Mr. Wayne Caines, President
Mr. Nadir Wade, Managing Director, Bulk Generation
Mr. Mark Pacheco, Director, OHSE & Business Continuity
Ms. Shelly Leman, Managing Director, Transmission, Distribution & Retail
Ms. Christa Barnes, Director, Communications & Sustainability

ABSENT: Mr. James Morrison, Member
Mr. Tarik Christopher, Principal Engineer (Water & Sewage), Public Works

This meeting was called to discuss BELCO's response to the letter sent from the Environmental Authority to BELCO on the 21st December 2022. It is noted that for many of the requests raised by the Authority that BELCO stated it '*wished to discuss further with the Authority in order to understand the best information it can provide and how it aligns to the proposed licences.*' This letter was the sixth (6th) sent from the Authority to BELCO in relation to the associated environmental issues with the North Power Station (NPS). The issues relate specifically to BELCO's efforts to address complaints of soot emissions, down-drafting of exhaust fumes in Ocean Lane/Whitney Avenue, Pembroke, and hot-fuel odours near St. John's Road, Pembroke.

1. BELCO representatives made a presentation on the history of the challenges of the NPS from installation to the situation today:

1.1 Operational Adjustments—Bulk Generation

Mr. Nadir Wade gave an update on changes to operational procedures since the commissioning of the North Power Station in August 2020. He said that within several months of operation, it became apparent that there was some emissions fallout and that some modifications were necessary. He described changes to the piston crowns and shims to optimise the NPS to run on heavy fuel oil rather than natural gas. It took 14 months to complete installation (*i.e.* Jan 2022) of the shims and piston crowns due to supply chain challenges, manufacturing and installation delays due to COVID-19, in addition to the need to maintain an electrical supply that could meet demand.

Mr. Wade added that in late April 2023, a team from the engine manufacturers (*i.e.* MAN) will arrive in Bermuda to adjust governor settings (*i.e.* the system used to control the rate of fuel supply). The start-up programme is expected to be modified to reduce the amount of fuel used for combustion and to limit the amount of fuel used in the engine. This should result in more complete fuel combustion (*i.e.* a "cleaner burn"). [*Authority Question: What is the estimated completion date of the leaner fuel regime adjustments to address soot?*].

1.2 Odour from Fuel Farm

Mr. Wade described how the complaints of hot-fuel odours from the new fuel farm located along St. John's Road were investigated, how the likely odour sources were identified, and the efforts made to date by BELCO to mitigate the odours. Most of the passive vents have been fitted with bespoke activated carbon filters designed and built in Sweden. Due to some continued complaints further investigation by BELCO has revealed that there are an additional two vents that see product less frequently. These additional two passive vents will have activated carbon filters installed shortly. BELCO has also rerouted all of the waste oil activities to the oily wastewater treatment plant that is located in a more central part of the BELCO facility, as some of these processes also produce oily odours. Testing of volatile organic carbons (VOCs) in the surrounding air using BELCO hand-held sensors has shown a reduction of up to 90% VOCs due to the filters. VOC monitoring will be continued and twice daily operator inspections are undertaken to ensure the oil odours are being minimised.

1.3 Soot Emissions

Mr. Wade reported that they have determined the soot emissions events coincide with NPS engine startups. Engineering and operational changes have been made to reduce the soot emissions, including:

- Starting engines on LFO rather than HFO [*Authority Question: Since when? And for all engines at all times?*]. BELCO is mindful of the additional costs of electricity to the public that result from using LFO instead of HFO and works towards a balance between costs and emissions reduction during electricity production.
- Where practical, starting engines and undertaking routine maintenance when the weather conditions are favourable (*i.e.* when the wind is not blowing from the south). When engines need to be started to satisfy increasing electricity demands, however, it is not always possible to wait for more suitable weather conditions
- BELCO has ordered air drying equipment to be installed in Q3 or Q4 2023. This will be placed in front of the engines to dry the intake air and is expected to result in less particulate matter being formed and adhering to the flue to be later liberated as soot during engine start-up.

The DENR Environmental Engineer agreed that the data supported that soot emissions are typically ejected from the stack during engine start-up but questioned whether engine 'start-up' was the 'cause' of the initial deposition of unburned hydrocarbons on the inner surfaces of the flues. He said that since there are no complex organic compounds in the soot (as determined from analysis of the soot), it is likely that it is being deposited as unburned hydrocarbons on the flues continually whenever the engine is running on HFO, and not just during start-up. The soot is then 'baked' in the hot conditions, which converts any complex organic compounds to 'inorganic' carbon and minerals. Once the engine is turned off the temperature of this particular flue will be reduced somewhat and the lack of combustion air, with its associated high humidity, will probably result in some drying of the inorganic soot coating. Then upon the next engine start-up the soot layer will be easier to liberate from the sides of the flue and blown out of the stack. Knowing the combustion of all fuels will generate both water and carbon dioxide as by-products in equal proportions, he questioned the effectiveness of drying the air before combustion. He asked if it would be more meaningful for BELCO to investigate the point when the unburned hydrocarbons are being initially deposited on the flues and to assess and change those combustion conditions accordingly.

1.4 Communications with Public

Mr. Caines confirmed that the mitigation plans will be shared with the public. He agreed that there have been some shortcomings with BELCO's communications with residents and said that BELCO will try to improve this. He said that the comments in the press about it seeming like BELCO was "sitting on their laurels" when addressing the environmental issues, were incorrect. BELCO are taking active measures to reduce the adverse impacts.

Mr. Caines confirmed that affected roofs are still being painted. In 2022, BELCO received 160 requests for roof painting, an increase from 150 in 2021. Some are for repeat paintings of the same roof, which is justifiable in more soot-impacted areas.

1.5 Future Plans

Mr. Caines reported that for the longer term, BELCO is actively looking for more renewable energy sources, especially wind. He said that the parent company, Liberty, has expressed willingness to invest \$300 million for renewable energy sources in Bermuda.

2 Following the BELCO presentation, DENR made a presentation of each of the various requests that were made by the Environmental Authority of BELCO in their letter dated 21st December 2022.

2.1 BELCO Standard Operating Procedure (SOP) 11

BELCO confirmed that the Draft ENV SOP 11, in which fuel switching from HFO to LFO would be undertaken if adverse weather conditions were predicted, has not been adopted to date. BELCO's current ENV SOP 11 is to wait until adverse weather conditions are recorded at the Bermuda #2 Monitoring Station (*i.e.* Langton Hill) and complaints are received before fuel switching will occur. Mr. Caines said that it is very costly to switch to LFO (*i.e.* Ultra Low Sulphur Diesel – Road Diesel), especially considering the high rate of taxes paid for fuel.

Mr. Caines added that the practice of switching fuels is not a good long-term strategy. It does have adverse consequences for plant operations, equipment, fuel purchasing and fuel storage.

The Chair said that it is important for the Authority to be provided with the dates and times of fuel switching so that it can better fulfil its obligations under the Clean Air Act 1991. It was also noted that the previous fuel switching process was based on monitoring data at Ocean Lane to the UK/EU Air Quality Objective 'Target levels.' It was understood that after 18-months of air quality monitoring at this location together with meteorological data from the station at Cemetery Lane that BELCO would have sufficient meteorological data to be able to predict when downdrafting was occurring at Ocean Lane. DENR had only recently become aware that the Draft ENV SOP 11 procedure was not being adhered to. DENR noted that less than 15 properties are impacted by the downdrafting at Ocean Lane and Whitney Avenue with respect to the exceedances of the 'target levels' of the UK/EU AQ Objectives. Also, during the monitoring period there had not been any exceedances of the Bermuda Clean Air Regulations or equivalent UK statute (*i.e.* UK Environmental Protection - Air Quality Standards Regulations 2010).

2.2 Reporting on the number of times the meteorological conditions were favourable for downdrafting in addition to the number of times that partial primary abatement (*i.e.* fuel switching) occurred, and its duration, each month.

BELCO considered this request onerous in terms of the amount of resources from their OHSE section that would be required to provide this data to the Authority/DENR on a monthly basis.

2.3. Potential for Minimising Down Drafting by extending the Stack or Flues

BELCO reported that the NPS stack foundation was not designed for a taller and heavier stack. Although extending the flues would provide less additional weight to the foundations its potential benefit to reducing the downdrafting to Ocean Lane could only be determined through air dispersion modelling. It would be expected that for every increment of increasing the height of the metal flues would effectively reduce the weather window for favourable conditions for downdrafting (*i.e.* increasing the height of the flues would increase in the minimum wind speed for downdrafting to greater than 15 knots). Mr Caines outlined the BELCO challenges of creating a potential shutdown window of all NPS engines in order to install such a flue extension system. It is noted that the four (4) NPS engine flues are adjacent to each other, and the heat generated may preclude flue installation unless all NPS engines were turned off and the flues allowed to cool (*i.e.* resulting in BELCO's generation capacity being not able to meeting Bermuda's demand).

Mr. Caines agreed that the potential for extending the flues had not been investigated by engineers. The Authority would wish to see evidence of this due consideration made, initially with respect to air dispersion modelling to determine what distance of flue extension would be required to give a meaningful increase in the minimum wind speed necessary to cause downdrafting.

2.4 Reducing the Orifice Diameter of the Flue Exit to Increase Exhaust Plume Velocity.

The above action can be used to increase the exhaust velocity of the exhaust plume as it exits the top of the stack. DENR is aware that such a change would increase the static pressure (*i.e.* back pressure) in the stack and would require due consideration by the engine manufacturer, MAN. BELCO stated the same issue. The Authority would wish to see evidence of this due consideration made.

2.5 Lack of Ambient Air Monitor in Ocean Lane Area

It is acknowledged that homeowners in Ocean Lane/Whitney Avenue area that are impacted by downdrafting do not want large monitoring equipment with security fences located on their properties. BELCO agreed to look at the suitability of pole mounted sensors but were advised by their US consultants not to use them because that equipment does not comply with US Environmental Protection Agency regulatory standards for data quality.

Mr. Caines confirmed that any additional monitoring stations would require prior approval of the Regulatory Authority for the expenditure. Getting budget and RA approval generally takes a considerable time. The Authority would wish to see due consideration made of using pole-mounted non-regulatory sensors being used as a screening method prior to consideration of locations for the portable regulatory monitoring station.

2.6 Details of Additional Operational and Secondary Abatement Options (*i.e.* Electrostatic precipitators – ESPs) being considered by BELCO.

It was noted by DENR that BELCO had been forthcoming with requests for technical data that were made within the first five (5) letters from the Authority to BELCO on the NPS. However, it has more recently become apparent that there was a lack of technical information from BELCO to the Authority/DENR about the current technical focus of the operational changes to address the soot and potential to use ESP's. The Authority requests that more technical information on the goals and timescales of BELCO to abate the soot be provided.

2.7 Submission of Complaints Information to DENR

BELCO informed the Authority that it must be in compliance with PIPA (public access to personal information) before submitting complainants and addresses to the Environmental Authority. BELCO agreed to ask and get documentation from each complainant confirming release of appropriate personal information in addition to the nature of the complaint to DENR.

2.8 Alternative Fuels

It was noted that BELCO is preparing the next draft Integrated Resource Plan (IRP), due for submission to the Regulatory Authority in November 2023. Mr. Caines said that BELCO is considering the use of LNG as a bridging fuel until a wind farm could be installed. He said that great progress had been made worldwide to simplify LNG transport and use and that the parent company was committed to assist with this transition.

BELCO and the Environmental Authority **AGREED:**

to continue written correspondence to reach agreement in what can and cannot be supplied as part of the requests made by the Authority in their sixth letter of December 2022.

Date of the Next Meeting

The date of the next meeting was set for 8:30 am, Tuesday, 28 March 2023.



CHAIRMAN

30 May 2023

DATE