

# BERMUDA ELECTRIC LIGHT COMPANY LIMITED

## ANNUAL OPACITY MONITORING REPORT

For the period

JANUARY 1<sup>ST</sup>, 2022 – DECEMBER 31<sup>ST</sup>, 2022



Submitted: March 1, 2023

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### Contents

Introduction .....	1
In-Stack Opacity Monitor Exceedances.....	1
Figure 1: Comparison of Opacity Monitor Regulatory Exceedances 2010–2022 ..	2
Data Availability .....	2
Figure 2: Annual Data Availability of In-Stack Opacity Monitors 2022.....	3
Opacity System Calibration and Maintenance.....	3
Visible Emissions Monitoring.....	4
Operation of Non-Compliant Engines (NCEs).....	4
Conclusion.....	4

### List of Appendices

#### Appendix I – VIM Opacity Maintenance Trip Reports

- a) March 2022 Report
- b) September 2022 Report

#### Appendix II – Visible Emissions Certificates

**Bermuda Electric Light Company Limited**  
**Annual Opacity Monitoring Report**  
(January 1<sup>st</sup>, 2022 through December 31<sup>st</sup>, 2022)

## **Introduction**

This report summarizes BELCO's Continuous Opacity Monitoring System for the period **January 1<sup>st</sup>, 2022 to December 31<sup>st</sup>, 2022** as required under Conditions 5.3 and 6.3 of BELCO's Operating Licence (OL-114). The report presents information related to BELCO's Opacity Monitoring program previously reported in 2022 Quarterly Reports to the Environmental Authority and includes: summary data collected from the in-stack opacity instruments on the E7, E8, N1, N2, N3 and N4 engines; availability statistics and maintenance performed on all operating opacity instruments; the results for monthly visible emissions (VE); as well as a Non-Compliant Engine (NCE) summary for the year.

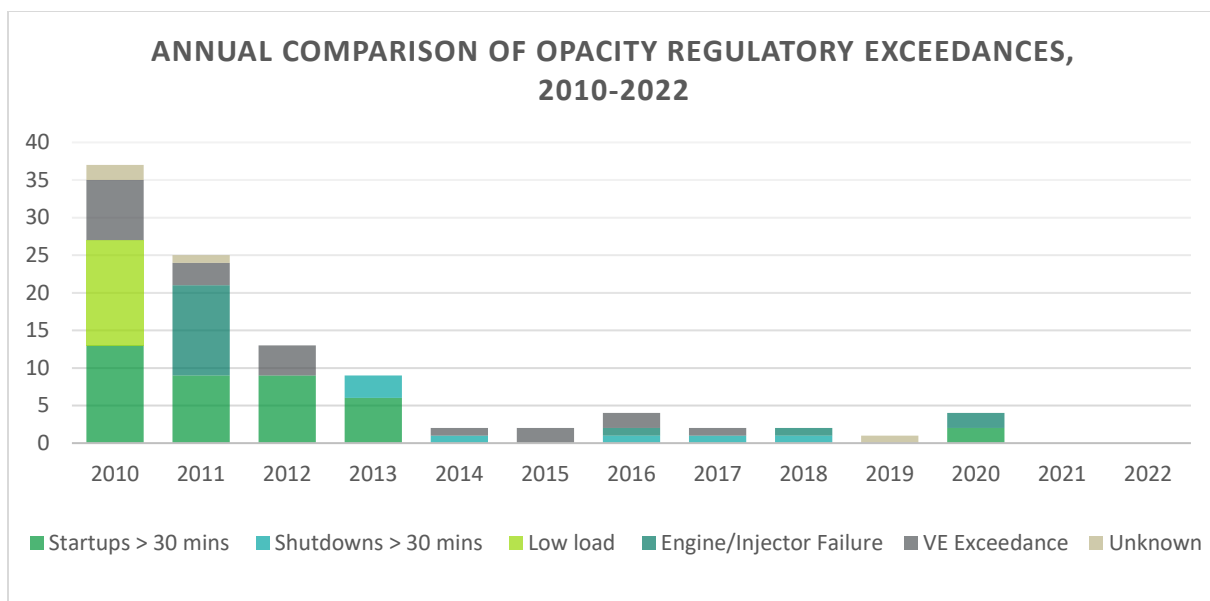
## **In-Stack Opacity Monitor Exceedances**

Bermuda Clean Air Regulations 1993 limits emissions to a standard of 20 percent opacity over a six-minute average. However, BELCO's Operating Licence OL-114, limits emissions to a regulatory standard of 15 percent opacity over a six-minute block average as described in Section 5.3.2. Opacity emissions are presently measured using in-stack Continuous Opacity Monitoring Systems (COMS) on six (6) of BELCO's diesel engines (E7, E8, N1, N2, N3 and N4).

The COMS utilized in all installations consist of Teledyne Monitor Labs' Lighthawk Model 560 Compliance Opacity Monitors. It is noted that diesel engines E5 and E6 were not fitted with in-stack opacity meters and therefore BELCO's opacity emissions from these diesel engines were monitored in 2022 using monthly visual opacity observations as per EPA Alternative Method 9 & ALT-082.

During the 2022 monitoring period there were zero (0) exceedances of the regulatory standard recorded by the in-stack opacity monitors.

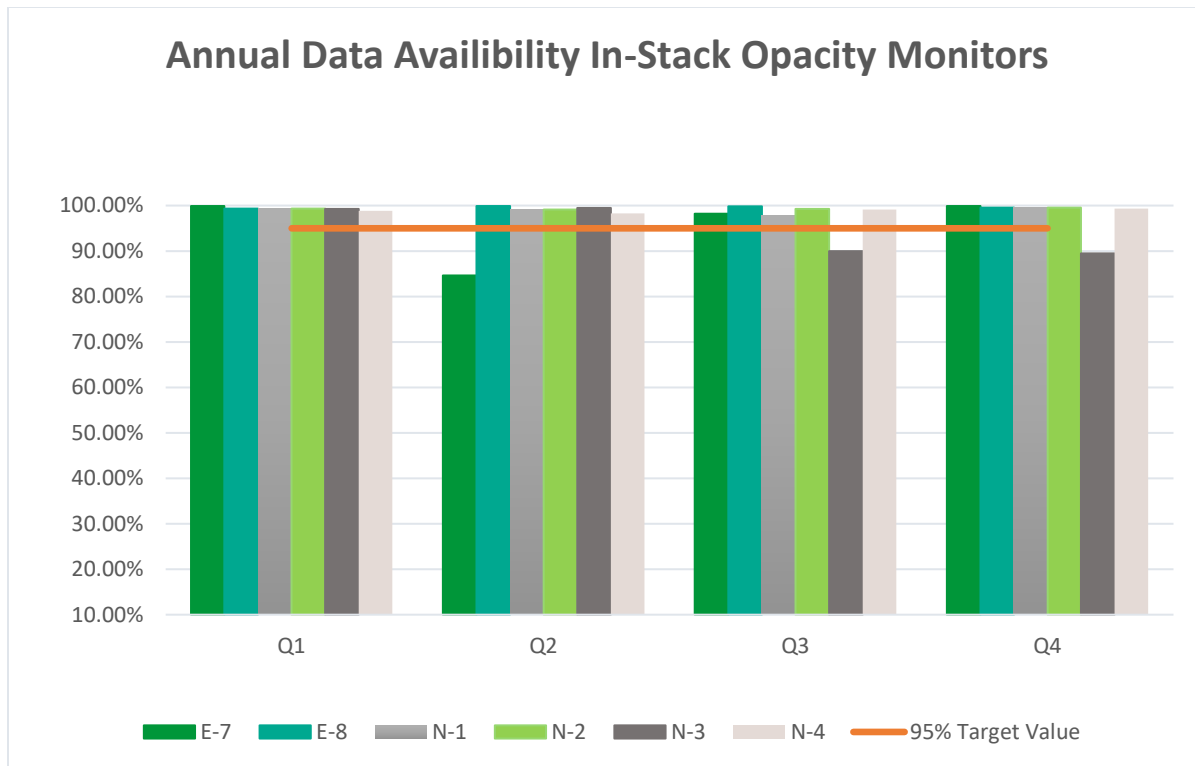
Since 2010, there has been a significant reduction in the number of opacity exceedances reported (**Figure 1**). Year to year opacity exceedance records have decreased by over 99% since 2010 which is an example of BELCO's continued effort to improve our Standard Operating Procedures (SOP's) and operate more efficiently. All remaining exceedances recorded by the in-stack opacity monitors presented in the quarterly reports are permitted under Section 5.3.2. of BELCO's Operating Licence.



**Figure 1: Comparison of Opacity Monitor Regulatory Exceedances 2010-2022**

## Data Availability

Data availability throughout the reporting period was considered generally high on all in-stack opacity units in 2022. The 2022 annual cumulative availability average for each unit was 95.67%, 99.64%, 98.94%, 99.32%, 94.54% and 98.90% for opacity monitors on E7, E8, N1, N2, N3 and N4 respectively. **(Figure 2)**. As such, all COMS yearly average values met the 95% data availability target for 2022.



**Figure 2: Annual Data Availability of In-Stack Opacity Monitors 2022**

### Opacity System Calibration and Maintenance

Each COMS instrument is challenged daily and is required to pass a zero (0%) and span calibration (25-28%). Annual calibration drift data indicated that for the six active opacity monitors, 27 of a possible 2,190 total daily calibrations in 2022 failed. It is noted that Q1 had zero instances of calibration drift above 4%, Q2 had a total of 11 days of instrument drift above 4% for the E7 unit (i.e., either a zero, span or both), Q3 had 3 total failure days while Q4 had 13 instances of calibration drift above 4%. All reported opacity data that followed a failed calibration was flagged as invalid in CEMLink6 until such time a successful calibration was achieved. In many cases, the COMS instrument self-corrected while for more serious failures a maintenance visit was required for instruments that did not self-correct. In accordance with BELCO’s Operating License #OL-114, DENR was notified of all issues that resulted in significant data loss.

Regular bi-monthly maintenance was scheduled and executed by BELCO Bulk Generation Electrical Instrumentation & Control personnel on all operating COMS throughout the 2022 period. The Semi-annual maintenance of the opacity monitoring system and software was performed in March and September 2022 by VIM Technologies. During these service visits, VIM Technologies performed all maintenance and inspections required by the Teledyne Monitor Labs Lighthawk Opacity monitors installed on Engines E7, E8, N1, N2, N3 and N4

and the associated VIM CEMLink 6 Data Acquisition System (DAS). A summary of VIM's maintenance visits are provided in **Appendix I**.

## Visible Emissions Monitoring

Visible Emissions (VE) monitoring was completed monthly throughout 2022 for all active engines without dedicated COMS (i.e. E5 and E6) as well as the NPS engines for which there were no exceedances of the 15% regulatory standard recorded. Details of all visible emissions monitoring activities can be found in the quarterly reports previously submitted to the Environmental Authority.

BELCO maintained at least one certified visual opacity reader on staff at all times during 2022 as required under Conditions 5.3.4 of BELCO's Operating Licence #OL-114. All readers were certified by Eastern Technical Associates (ETA) in the case of U.S.E.P.A. Federal Reference Method 9, and Virtual Technology LLC in the case of U.S.E.P.A. Alternative Method 082 and utilizing ASTM D-7520-09 (ALT-082).

During the 2022 period BELCO held the following VE certifications:

Method 9: OHSE Coordinator, Date of Certification April 12, 2022 and September 28, 2022 Certification Expiration March 30, 2023

ALT-082: OHSE Coordinator, Date of Certification September 12, 2018  
OHSE Coordinator, Refresher Training September 12, 2018  
OHSE Coordinator, Date of Certification October 4, 2017  
Environmental Engineer, Date of Certification August 18, 2018

The ALT-082 certification from Virtual Technology LLC is maintained by the submission of a valid observation on a semi-annual basis. **Appendix II** contains copies of all Visible Emissions Evaluator and Digital Still Camera Operator Certificates.

## Operation of Non-Compliant Engines (NCEs)

The Environmental Authority's approval for NCE operation shall be requested on a case by case basis by BELCO as per the Appendix of BELCO's Operating License by the Department of Environment & Natural Resources' Environmental Authority. There were no engines assigned NCE status by BELCO for this reporting period. Therefore, there was no NCE operation in 2022.

## Conclusion

During the 2022 monitoring period there were zero (0) exceedances of the regulatory standard for opacity recorded by the in-stack opacity monitors. All six continuous opacity monitors passed daily calibration drift tests in 2022 with the exception of E7 in Q2, E7, E8,

N2 and N3 in Q3 and N3 and N4 in Q4 2022. There were a total of twenty-seven (27) failed daily calibration drift tests for all opacity monitors in 2022. Data availability throughout the period was high on all monitoring units. Each unit's data availability met US EPA data availability requirements and had a combined average of 97.83% at the end of 2022. Visible Emissions Monitoring was completed monthly throughout the period for which there were no exceedances of the 15% regulatory standard recorded. BELCO maintained a certified VE reader in both EPA Method 9 and/ or Alternative Method 082 specifications on staff at all times during 2022. Maintenance of the opacity monitoring system was routinely performed; bi-monthly by BELCO Instrumentation and Control personnel and semi-annually by VIM personnel that performed detailed on and off-stack calibrations for COMS in March and September 2022. There were no engines assigned NCE status in 2022 and therefore no NCE operations in 2022.