



Memorandum



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To: The Honorable Carlos A. Gimenez, Mayor, Miami-Dade County
The Honorable Audrey M. Edmonson, Chairwoman
and Members, Board of County Commissioners, Miami-Dade County

From: Mary T. Cagle, Inspector General

Date: November 13, 2019

Subject: *OIG Final Report Re: Review of Safety Concerns and the County's Procurement of CNG Buses for the Department of Transportation and Public Works; IG19-0015-O*

Attached please find the above-captioned Final Report issued by the Office of the Inspector General (OIG) addressing publicly-expressed concerns regarding the safety of compressed natural gas (CNG) buses. In July 2019, when some of these allegations were first publicly raised, the Mayor requested the OIG examine the veracity of these claims. The attached report also provides historical context to the current procurements for additional CNG 40-foot buses. On September 4, 2019, when controversies involving both the safety allegations and the Administration's procurement efforts re-surfaced, the Board of County Commissioners (BCC) expressed concern for how this was playing out in the public. The BCC asked the OIG to provide it with a report prior to making prospective contract-award decisions for additional CNG buses.

The OIG's review resulted in four specific safety-related recommendations, all of which have been accepted by the Department of Transportation and Public Works (DTPW). As it relates to the procurement of additional CNG buses and the County's overall CNG program, our report poses several policy questions for consideration by the BCC. DTPW, in its response to the OIG's draft report, provides some context and explanations to our policy questions, however, we believe that further discussion by the BCC is warranted. To that end, the OIG suggests that current procurement initiatives be postponed until the BCC is able to more fully consider the policy questions posited by the OIG.

The OIG requests that DTPW provide the OIG with a status report in 90 days, on or about, February 11, 2020, advising of the implementation status of the safety recommendations. The OIG would like to thank the staffs of DTPW and the Internal Services Department, as well as representatives from bus manufacturers New Flyer and Gillig, and representatives from the Transport Workers Union Local 291, for their cooperation and courtesies extended to the OIG during this review.

For your reading convenience, an Executive Summary follows.

Attachment

Cc: Abigail Price-Williams, County Attorney
Edward Marquez, Deputy Mayor
Jennifer Moon, Deputy Mayor
Alice Bravo, Director, Department of Transportation and Public Works
Tara C. Smith, Director, Internal Services Department
Yinka Majekodunmi, Commission Auditor

OIG EXECUTIVE SUMMARY

Review of Safety Concerns and the County's Procurement of Compressed Natural Gas Buses for the Department of Transportation and Public Works

This Final Report of the Office of the Inspector General (OIG) addresses the safety concerns and procurement history of CNG buses. It is being presented in order to facilitate pending and future policy decisions by the Mayor and Board of County Commissioners (BCC). As illustrated in the Table of Contents, the report is organized by Sections (I through VII). Following the Introduction (**Section I**), we have included the response to the draft report from the Department of Transportation and Public Works (DTPW) in **Section II**. The objectives, scope and methodology of our review process is presented in **Section III**. In **Section IV**, the background of the CNG bus program and the current status of the fleet and facilities are detailed.

The OIG addresses each and every one of the safety-related allegations raised by representatives of the Transport Workers Union Local 291 in **Section V** of the report. The most alarming statement – suggesting that CNG buses are flammable hazards – is found to be without merit. As Section V makes clear, the conditions for CNG to burn require a very controlled environment to contain a specific range of concentrated gas. These conditions are nearly impossible to establish on the open road, which is why no such incidents have ever been reported anywhere in the country. A second allegation suggesting that the brand new CNG buses were arriving with leaks was also determined to be unfounded.

Notwithstanding the spurious nature of most of the allegations, the OIG makes multiple recommendations to clarify the testing standards and operating procedures pertaining to CNG leak detection. These suggestions have been embraced by DTPW. The OIG will continue to monitor the policies and procedures of the department to ensure best practices are adopted.

In **Section VI**, the OIG examines the history of CNG bus procurement, beginning with the outsourced process that was embedded in the award of the Master Developer Agreement (MDA) for CNG transit fueling facilities. During negotiations, and incorporated in the final award to Trillium, the number of CNG buses to be acquired through the MDA was capped at 300. New Flyer prevailed over Gillig in that outsourced competition when Trillium requested both vendors submit best and final offers.

After the award of the Trillium MDA, DTPW staff worked throughout 2017 to purchase 181 additional CNG buses. The Trillium award recommendation from the Mayor explicitly noted that other methods of acquiring additional CNG buses would be employed. It was well known that LYNX, the Central Florida Regional Transportation Authority, had a bus contract that DTPW was a party to and could access for the acquisition of additional CNG buses. Gillig was the awarded vendor to provide CNG buses under the LYNX contract. In October 2017, after months of procurement discussions between the County and Gillig, a Letter of Agreement to purchase 181 CNG buses was transmitted to Gillig for its execution, which it returned signed a few days later. Upon return to the County, no further action was taken to advance the procurement item. In other words, the proposed purchase was never presented to the BCC.

The Director of DTPW candidly acknowledged stopping the 2017 executed agreement with Gillig from moving forward. At the time, the Director believed additional buses could be procured from New Flyer through the Trillium MDA. Upon realizing the MDA had specifically

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precluded any additional purchases beyond the commitment to acquire 300 CNG buses from New Flyer, staff was directed to explore amending the Trillium contract to buy more buses from New Flyer. Following input from the County Attorney's Office, amending the Trillium MDA was not deemed a viable alternative.

Gillig representatives were not directly informed of the decision to withhold the executed agreement from consideration by the BCC. For several months the company unsuccessfully sought meetings with the Director to gather insight and remedy any concerns. Out of frustration, in 2018, Gillig hired a local lobbyist.

Late in 2018, DTPW's Deputy Director assembled staff to discuss another effort to replace aging diesel buses with CNG buses. Again, staff noted the availability of the LYNX contract. The Deputy Director informed departmental procurement personnel that developing a competitive bid, based on the experience with the CNG buses in use, would be in the best interest of DTPW. Before the department's intentions to seek competitive bids was publicized, the BCC approved a resolution, sponsored by Commissioner Edmonson with input from the Mayor, that 1) directed staff to utilize the LYNX contract to acquire additional buses, and 2) look to other jurisdictions for contracts that could be accessed to buy more CNG buses.

The multi-pronged procurement directive to access and "piggy-back" competitively awarded contracts from other jurisdictions, including a contract expiring within days of the BCC action, introduced a level of expediency that is atypical of multi-million-dollar procurements. This accelerated process to access existing contracts, uninhibited by the rules of the County's highly regulated competitive bidding process, resulted in a highly charged public contest among CNG bus manufacturers. Not having a "Cone of Silence" in place allowed for unbridled communications between and among a host of parties with vested interest in the outcome of the selection process.

The OIG fully appreciates the opportunity to review these concerns of safety and procurement, to offer factual findings, and to provide input. To assist the BCC in its efforts to elevate the discussion to public transit policy, above and beyond the selection of a particular CNG bus manufacturer, the OIG posits eight policy questions in **Section VII**.

While the DTPW provided answers to these questions, which are incorporated in the Final Report, the OIG feels compelled to present these same questions for the BCC to consider as policy matters that warrant further deliberation. To further these inquiries the OIG has added comments and observations to the DTPW responses. It is respectfully requested that attention be directed towards the questions enumerated in **Section VII** of the report.

The OIG does not view the replacement of the aging bus fleet as an isolated matter of simply buying new buses, but rather a policy issue that requires complex analysis that weighs infrastructure needs, environmental impacts, ridership experience, economic trade-offs, and social equities. It is suggested that the BCC and Administration take a brief pause, fully consider the ramifications of maintaining a fleet composition that relies on a variety of energy sources, and develop a clear way forward to achieve an ideal fleet composition before investing additional resources.

MIAMI-DADE COUNTY

OFFICE OF THE INSPECTOR GENERAL



FINAL CONTRACT OVERSIGHT REPORT

*Review of Safety Concerns and the County's Procurement of
Compressed Natural Gas Buses for the Department of Transportation and Public Works*

IG19-0015-O

November 13, 2019

MIAMI-DADE COUNTY OFFICE OF THE INSPECTOR GENERAL
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OIG EXHIBITS

1. One Page from the Post-Delivery Inspection Form Pertaining to Inspecting the CNG Cylinders on the Roof Top
- 2a. Natural Gas Vehicle Cylinder Inspection Record – Form Used in Routine Maintenance (36,000 miles) Inspections
- 2b. DTPW Standard Operating Procedure No. PR-SB-049, Revised 7/23/2019
3. Table 5-1 of DTPW's Planned Bus Procurements and Vehicle Replacement, updated March 2018

APPENDIX A – Department of Transportation & Public Works' Response

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I. INTRODUCTION

This report is intended to provide the Mayor and Board of County Commissioners (BCC), the County Administration, and the public with clarity and context to what has become a somewhat controversial procurement of compressed natural gas (CNG) 40-foot buses for the Department of Transportation and Public Works (DTPW). Our review was first initiated in July 2019 after comments were publicly made that called into question the safety of DTPW's current CNG bus fleet. Upon hearing those remarks, the Office of Inspector General (OIG) initiated a preliminary review. Soon after, we were contacted by representatives of the bus manufacturer, who insisted that its buses were safe. We were also requested by Mayor Carlos A. Gimenez to examine these safety allegations. Further, at that time, the OIG became aware that the Administration was intent on issuing an Invitation to Bid (ITB) for the procurement of an additional 140 CNG buses. We immediately expanded our review to include monitoring the development and eventual release of this procurement solicitation.

Approximately six weeks later, at the BCC's meeting of September 4, 2019, the controversy surrounding CNG buses, and the County's procurement of them, re-surfaced in a 2-hour discussion. It was clear from the collective comments of the BCC that questions about past CNG bus acquisitions; the safety, operation and maintenance of them; and recent current BCC directives aimed at expeditiously buying more CNG buses were still at the forefront. Another expressed area of concern involved the intensified rivalry between two vendors—and their lobbyists—to secure the County's order for the greatest number of buses. Commissioners expressed concern for how this was playing out in front of the public; Commissioners also expressed wanting a report from the OIG to help clarify these issues. Based on the expressed sentiments from the BCC, we expanded our review to provide the historical context of CNG bus acquisitions by examining past planning and procurement efforts from 2016 through to the recent issuance of the aforementioned ITB, issued July 26, 2019.¹

II. RESPONSE TO THE DRAFT REPORT & OIG COMMENTS

This report, as a draft, was provided to DTPW for its discretionary written response. DTPW provided its written response to the OIG responding that it will be implementing

¹ Two bids have been received in response to Invitation to Bid (FB-01356) for the purchase of 140 CNG buses. At the request of the OIG, the bids were not been opened to allow for the OIG to conduct this review. In light of DTPW's position to proceed with the procurement, today, on November 13, 2019, the bid results previously received were downloaded from the BidSync system and opened. The OIG will continue to monitor this procurement process and, if necessary, will prepare a separate report of our procurement oversight efforts.

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each of the OIG's four safety-related recommendations detailed in Report Section V OIG REVIEW OF SAFETY CONCERNS. DTPW's specific action plans are re-stated in the body of the report following each of the OIG's recommendations.

In addition, DTPW provided explanations and context to the eight OIG-posed policy questions that are enumerated in Report Section VII GOING FORWARD. (The OIG has reproduced² and/or summarized DTPW's answers after each of our questions.) Regarding its answers to the eight procurement questions, the OIG has concerns that DTPW's answers do not address completely or accurately the questions posed. To facilitate further discussion, the OIG has provided additional comments to the DTPW responses.

As it relates to two major considerations put forth by the OIG—suspending the current procurement process for additional CNG buses and halting the planned \$20 million investment for a third CNG fueling station at the Northeast Bus Depot until such time as these policy questions can be fully aired—DTPW did not concur. DTPW stated its intention of moving forward with both the procurement for new buses and the amendment for a third facility. Notwithstanding DTPW's answers to the policy questions and its stated intent, the OIG believes that further policy discussion by the BCC would be beneficial.

DTPW's response is attached, in its entirety, as Appendix A to our final report. As the implementation of the OIG's safety-related recommendations are prospective, the OIG requests that DTPW provide us with a follow-up status report in 90 days, on or before February 11, 2020.

III. OBJECTIVES, SCOPE & METHODOLOGY

This review was neither an investigation nor audit of CNG buses.³ It was a review based on an examination of documentary evidence, in the form of email correspondence, budget and planning records, procurement records, inspection records and work orders, etc., supplemented with explanations and interview statements from a variety of individuals. OIG Contract Oversight personnel met with and spoke to numerous individuals from DTPW, ranging from inspectors and mechanics, to procurement staff, and managerial personnel, including the DTPW Director. We also met with procurement staff from the Internal Services Department (ISD). We also interviewed the President of the Transport Workers Union, Local 291, and spoke with the County's former Transit director. We spoke

² Quoted statements and passages are in italics.

³ This review was performed in accordance with the *Principles and Standards for Offices of the Inspector General, Quality Standards for Inspections, Evaluations, and Reviews*, as promulgated by the Association of Inspectors General.

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to representatives, and their lobbyists, from the two CNG bus manufacturers centered in this contest including both their sales and technical personnel.

Our review covers the period 2016 (during negotiations that would result in a Master Developer Agreement (MDA) with Trillium Transportation Fuels, LLC (Trillium) for CNG fueling facilities) to the present. This report has three main parts. First, it addresses the safety concerns that have been publicly aired and assesses the current inspection procedures to detect natural gas leaks (see Section IV). Second, the OIG examines the history of procurement activity relating to the purchase of CNG buses. This expository review is intended to shed light on the rationale behind some of the procurement decisions that have been made to-date (see Section V). Third, we provide information and identify issues that should be addressed to allow for the formulation of policy and direction to guide future bus procurement actions (see Section VI). This last section is in-line with the OIG's statutorily-driven function:⁴

. . .to report and/or recommend to the Board of County Commissioners whether a particular project, program, contract or transaction is or was necessary, and if deemed necessary, whether the method used for implementing the project or program is or was efficient both financially and operationally. Any review of a proposed project or program shall be performed in such a manner to assist the Board of County Commissioner in determining whether the project or program is the most feasible solution to a particular need or program.

The OIG hopes this report will provide the County's policy makers with such information.

IV. BACKGROUND ON THE COUNTY'S CNG PROGRAM

(See OIG Schedule A for a Comprehensive Timeline of Events)

A. The County's CNG Program and the Initial Acquisition of 300 New Flyer Buses

The County's CNG program officially got off the ground on May 6, 2014, when the BCC authorized the advertisement of two RFPs for CNG facilities.⁵ One would be for DTPW,⁶ while the second RFP would be for the County's remaining heavy fleet.⁷ The former

⁴ Section 2-1076(d)(4) of the Code of Miami-Dade County

⁵ BCC adopted Resolution No. R-420-14

⁶ At the time, Transit was its own department; it is now part of the Department of Transportation and Public Works (DTPW), and the successor departmental name of DTPW will be used throughout this report.

⁷ The results of this RFP have not yet been determined.

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would require the successful proposer to design, build, operate and maintain fueling facilities for DTPW; the successful proposer would also purchase CNG buses on behalf of the County. The RFP included a set of CNG bus specifications, but it did not identify a preference for a particular bus manufacturer. The RFP specified “an initial replacement of up to 300 transit buses, with MDT option for additional buses to replace the remainder of the bus fleet...”⁸

In response to this RFP, the County received three proposals. The successful proposer, Trillium, had offered a choice of Gillig or New Flyer CNG buses, and provided a price for each bus. During negotiations, the County requested that Trillium obtain Best and Final Offer (BAFO) prices from each of the two bus manufacturers. Trillium used the quantity of 200 buses plus an option of 100 buses as the basis for the BAFO. New Flyer had the lower price and was selected.

During negotiations, the County decided to include a second fueling facility (at the Coral Way Bus Depot), in addition to the original intended facility at the Central Bus Depot, and leave an unpriced, to be negotiated option, for a third facility at the Northeast Bus Depot. Also, the County decided to take all 300 buses (the original 200 and the option for 100). No remaining bus quantities (i.e., options) were left in the contract.

On January 27, 2017, the BCC adopted Resolution No. R-35-17, approving the award of the MDA to Trillium. The MDA requires Trillium to: 1) finance, develop, construct, operate, and maintain CNG fueling stations at the Central Bus Depot and Coral Way Bus Depot; 2) convert existing facilities to accommodate CNG; 3) purchase 300 CNG buses; 4) provide the CNG fuel; and 5) lease County property for public access CNG fueling stations. Appendix B of the MDA is the Mass Transit Bus Purchase Agreement for the purchase of 300 New Flyer CNG buses.⁹ The financing structure of the agreement, involved the County buying fuel from Trillium with added surcharges to cover the cost of construction, etc. However, the bus purchase was a straight payment by the County, through a Trillium clearing account, to New Flyer for the buses. There were no fees or mark-ups paid to Trillium.

On January 8, 2018, the County received its first CNG bus, with subsequent deliveries averaging five buses per week. The buses are driven from the assembly plant in

⁸ See Bid RFP 00096, Attachment 1, Section 4.

⁹ Appendix B Sec. 7 states “Bus Order Quantity: Trillium will submit the bus order for 300 buses as specified herein (the “Bus Order”). The Bus Order shall be submitted by Trillium at least six (6) months (or other lead time agreed upon by the Parties) prior to a delivery date determined by the Parties in contemplation of the completion and ready for service date of the Central Bus Depot CNG Fueling Station constructed by Trillium in accordance with the Master Developer Agreement.”

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Alabama to the Central Bus Depot, approximately 800 miles. Once the buses arrive, the Warranty Division of DTPW performs a Post Delivery Inspection (PDI) and testing of each bus; it is during this process that the on-board CNG fuel storage tanks and delivery system is visually inspected and alarm system checked. Buses are accepted by DTPW only after satisfactory completion of the PDI. Buses that fail any portion of the PDI must be corrected by New Flyer prior to a re-inspection. DTPW does not accept a bus if it has not successfully completed the PDI. The last of the 300 New Flyer buses arrived September 18, 2019.

B. Status of CNG Fueling Stations & New Flyer Bus Allocations per Bus Depot

The reason bus acquisition was delegated to Trillium was to ensure that the delivery of the new CNG buses would be coordinated with the operational status of the new fueling facilities. The intent was to have fully functional bus depot fueling stations by the arrival of the first deliveries of the new CNG buses.¹⁰ As it turned out, because of construction delays and site environmental issues,¹¹ this optimal plan never came to fruition. Instead, DTPW has had to rely on Trillium providing temporary fueling stations. Initially, Trillium was required to “truck-in” the CNG fuel. Since then, the permanent CNG storage tanks have been completed allowing for more efficient temporary fueling station operations.

At present, CNG fueling is provided by two temporary filling stations at the Central and Coral Way Bus Depots. Currently, CNG fuel is not available at the Northeast Bus Depot; CNG buses assigned to the Northeast are fueled and serviced at the Central Bus Depot. The current status of the deliverables under the Trillium MDA is illustrated in Table 1.

Table 1 Status of the CNG Program, as of October 9, 2019

	Central	Coral Way	Northeast
Maintenance Facilities	Completed	Completed	Negotiations are in progress.
Fueling Facilities			
CNG Storage Tanks	Installed	Installed	
Construction Initiated	April 16, 2018	Oct. 29, 2018	
Original Completion Date	Dec. 2017	May 2018	
Current Projected Completion	Mar. 13, 2020	Dec. 19, 2019	
Temporary Fueling	2 fuel stations	2 fuel stations	None
CNG buses in service	209	65	22
Certified CNG Inspectors ¹²	15	14	0

Note: As of October 9, 2019, all 300 New Flyer CNG buses have been delivered; 296 New Flyer CNG buses have been accepted for service, and four are still going through the PDI process.

¹⁰ Trillium Agreement; R-35-17. Page 18 of 707.

¹¹ Construction of the Central fuel facility experienced significant delays due to environmental issues related to contaminated soil clean-up and the related DERM permitting requirements.

¹² County employees trained and certified as CNG Inspectors by the Natural Gas Vehicle Institute (NGVi)

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With only two temporary CNG pumps available at each depot, the hours for refueling buses have been extended, and additional DTPW depot personnel (hostlers) have been added. As bus drivers complete their route assignment each shift, the buses are parked at the depot. The hostlers ready each bus for the next shift by fueling, topping off fluids, and performing any minor maintenance services that may be needed. Historically, the hostlers worked in the evenings only. Due to the limited access to temporary CNG pumps, the hostlers now work extended hours to ensure buses are fueled and ready for service. To date, and to the credit of the bus operations staff, DTPW has adapted and overcome the operational challenges associated with fueling the 300 new CNG buses using only temporary pumps. At no point in time have there been any policy directives to curtail the purchase of additional CNG buses due to the construction delays of the permanent fueling facilities.

On December 4, 2018, in order to expand the CNG program, the BCC adopted Resolution No. R-1258-18 authorizing the Mayor or designee: 1) to exercise the option for Trillium to construct a CNG fueling facility at Northeast; 2) procure additional CNG buses to operate from the Northeast Bus Depot; and 3) report every 60-days until the fuel facility at the Northeast Bus Depot is complete and CNG buses are operating from the facility.

Negotiations with Trillium for Northeast Fueling and Maintenance Facilities are near completion. It is expected that this amendment to the MDA for Northeast will be presented to the BCC in November 2019.

C. Purchase of 120 Gillig CNG Buses and Their Anticipated Delivery Schedule

On December 11, 2018, the County issued a purchase order to Gillig for 120 CNG buses.¹³ This purchase was made from the Central Florida Regional Transportation Authority (CFRTA) d/b/a LYNX Contract No. 14-C09 (the LYNX Contract).¹⁴ The purchase was made pursuant to the adoption of BCC Resolution R-1262-18, on December 4, 2018, which directed the Administration to make a purchase of CNG buses from the LYNX Contract, prior to its expiration—seven days later—on December 11, 2018.

¹³ An updated/revised purchase order was issued on December 20, 2018 and retroactively approved by the BCC on January 23, 2019 (see Resolution R-99-19).

¹⁴ LYNX is a regional transit agency serving Orange, Osceola and Seminole counties, which are located in Central Florida. The CFRTA is one of 34 members of the Florida Public Transportation Association (FPTA or the Florida Consortium), whose members are located throughout Florida, ranging from Pensacola in north Florida to Key West in south Florida. At the time, CFRTA was the designated “lead” procurement agency for the FPTA.

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On September 24, 2019, after having been driven 3,000 miles from Gillig's assembly plant in California, the first (pilot) Gillig CNG bus arrived at DTPW's Central Bus Depot. Once formally accepted by DTPW (after a thorough post-delivery inspection) and once DTPW gives Gillig the green light to proceed, the remaining buses are scheduled to begin arriving on November 1, 2019. Delivery will be at the rate of five new buses per week, increasing to 10 per week until all 120 buses are delivered by February 25, 2020.

The OIG has been advised that initially, all 120 Gillig CNG buses will be assigned to the Coral Way Bus Depot due to fuel and maintenance availability.¹⁵ Upon the availability of CNG fuel at Northeast Bus Depot, Gillig CNG buses from the LYNX purchase and/or from subsequent purchases will be re-assigned to the Northeast Bus Depot.

V. OIG REVIEW OF SAFETY CONCERNS

A. Publicly-voiced Concerns Over the Safety of CNG Buses

Public comments were made by representatives of the Transport Workers Union (TWU), Local 291, at three different Board meetings in June, July, and September of this year. These remarks were directed at the first order of New Flyer CNG buses that were arriving at DTPW throughout 2018 and 2019. The public comments alleged that these new buses had safety issues, specifically that they were leaking CNG, and had other mechanical safety concerns such as noticeable vibrations when traveling at high speeds, and bus doors that were opening while in motion. The remarks made before the Transportation and Finance Committee (in June), and before the full BCC (in July and September), were made to urge against the purchase of additional New Flyer buses. The TWU representatives all made their opinions clear that they favored purchasing new buses from Gillig, instead of from New Flyer, due to these stated concerns.

Among all the remarks made, the most provocative comments were made by the TWU President on July 10, 2019, during the "Reasonable Opportunity to be Heard" portion of the regular BCC meeting. After making introductory remarks and commenting about the doors opening while a bus was in motion, the TWU President stated:

Number two, the big one, and I don't know if you pay attention to the news, and I know that you all do, but there was an explosion in Plantation, natural gas. We have these buses being delivered to us leaking compressed natural gas. Our mechanics, I have some work

¹⁵ The Coral Way fuel and maintenance facilities are expected to be completed by mid-December 2019.

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orders here, I just brought a few as an example of how they been finding these leaks upon the buses getting here. We are talking about the buses from 2018 and the ones from 2019. If someone is standing at a bus stop, smoking a cigarette, I hate to tell you what's going to happen with compressed natural gas. We shouldn't be correcting items at the garage for something that we bought, paid for new.

Shortly after these statements were made, Miami-Dade County Mayor Gimenez issued a memorandum unequivocally stating "that no bus is ever released for service in a dangerous or unsafe condition."¹⁶ His memorandum further explained that:

Currently, one of every five new transit buses in America is fueled by CNG and about 35 percent of new transit buses on order are powered by CNG. In addition, there are more than 5,500 CNG school buses in school districts across the country. . . . Not once has a CNG bus exploded, as the TWU representative recklessly insinuated.

The remainder of the Mayor's memorandum addresses other allegations brought up by the TWU representatives, such as allegations of chronic repair and excessive maintenance resulting in higher than average missed hours of service.

The issue of CNG leaks was brought up again at the September 4, 2019 BCC meeting. At this meeting's "Reasonable Opportunity to be Heard" session, New Flyer's lobbyist refuted the allegations made by TWU representatives about the safety and reliability of New Flyer buses. Following these comments, the TWU President alleged that since he has spoken about this issue, the department [DTPW] has made it harder for the mechanics to find the leaks. Later, during the BCC's discussion item involving CNG buses, the BCC Chairwoman clarified that the TWU President never stated that the buses were blowing up, only that they have leaks. Moments later, the TWU President also clarified that his concern was with the fact that compressed natural gas was leaking out of the recently delivered New Flyer buses.

In summary, the main safety allegations voiced have concerned 1) CNG leaks, and as a subsidiary to that, changes in process that make it harder to detect leaks; 2) doors opening while in service; and 3) vibrations. As there has been acknowledgement and remediation (by New Flyer) of the vibration phenomenon, which has been attributed to a resonant frequency condition, the OIG, in the remainder of this section, will address the two issues of CNG leaks and the bus doors.

¹⁶ Memorandum to the BCC from Mayor Gimenez dated July 16, 2019, Subject: Purchase of CNG Buses.

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Within the subsections below, we will describe our review procedures, including our attendance and observation at initial, post-delivery inspections and routine maintenance inspections; review of CNG standards and inspection protocols; interview of the TWU President, and discussions with DTPW inspections and maintenance personnel. Also included is **OIG Schedule B**, which is a compilation of photographs taken by the OIG, with captions, of the CNG tanks, sensors, and the inspection process, to help illustrate our narratives in the subsections below.

B. Understanding Compressed Natural Gas (CNG)

1. *What is Compressed Natural Gas?*

CNG in its natural state is methane (CH₄), a colorless odorless gas that has been compressed to about 1% of its normal volume at room temperature. In this condition, it is usually stored in cylindrical containers at about 2,300 – 3,600 pounds per square inch (psi). Since methane is colorless and odorless, a chemical gas named Methanethiol (CH₄S) or Mercaptan is added to the methane to give it an unpleasant odor similar to rotten eggs. The amount of Mercaptan added makes the odor detectable at levels 16 times lower than the level of methane concentration that is flammable.¹⁷

Natural gas (methane) that is typically delivered to residential households via a pipeline is uncompressed natural gas. While similar but not the same, propane (C₃H₈), is a refined hydrocarbon fuel, which is typically delivered and stored in steel tanks. An everyday example of this is the portable 20 lb. cylinder, commonly used for BBQ grills.

Because natural gas is lighter than air, if it were to leak from a CNG fuel system, it will rise vertically from the leak point. Natural gas will not pool on the ground like gasoline or diesel fuel, or sink to lower levels, nor will it spread horizontally. If leaking into open air, natural gas will quickly dissipate to non-flammable concentration levels as it rises.

2. *Flammability of CNG*

Although CNG is a flammable gas, it has a very narrow flammability range and requires a high temperature (1076°F) to ignite. The flammability range refers to the concentration of methane in a standard volume of air. For methane, this has been determined to be between 5% and 15% volume of air; likewise, it has been defined as being between

¹⁷ If there were leaking methane present in the air, individuals would be able to detect the unpleasant odor of the Mercaptan (mixed with the methane) at methane concentrations that would not be flammable.

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50,000 parts per million (ppm) and 150,000 ppm. Outside of this range, the gas is considered too lean or too rich to burn. Figure 1 below depicts CNG flammability levels.

Figure 1 CNG Flammability Levels

<15%	<150,000 ppm	Flammability Range of CNG is between 50,000 - 150,000 ppm at 1200°F
>5%	>50,000 ppm	
5.0%	50,000 ppm	Lower Flammability Limit (LFL)
4.5%		
4.0%		
3.5%		
3.0%		
2.5%	25,000 ppm	At 50% of LFL (25,000 ppm) detectors will illuminate a red warning light and the bus engine shut down
2.0%		
1.5%		
1.0%	10,000 ppm	At 20% LFL (10,000 ppm) detectors will illuminate an amber warning light and audio signal
0.5%	5,000 ppm	
0.3%	3,125 ppm	CNG smell like rotten eggs

Note: Table presentation configured from data obtained from Agility Fuel Solutions, which is the manufacturer of the fuel tanks used aboard both New Flyer and Gillig CNG buses.

The flammability limits of CNG (methane) are between 50,000 ppm and 150,000 ppm in an enclosed environment. This means that the methane leak has to be in an environment that prevents it from continuing to rise; i.e. a closed engine compartment or an enclosed area with a ceiling or roof allowing the methane to accumulate. In an open environment, the methane would continue to rise and rapidly dissipate in the atmosphere; thus reducing its concentration rendering it incombustible.

3. CNG Storage Tanks

There are four (4) different types of CNG storage tanks in use today. Table 2, on the next page, describes the four tank types. As depicted in the chart, the tanks used on transit buses are Type 4 tanks.

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Table 2 CNG Tank Types

Type 1	All Metal (steel or aluminum)	Heaviest type; typically weighs approximately 350 lbs.
Type 2	Metal with Wire	Lighter than Type 1, but could be up to 200 lbs.
Type 3	Fully Wrapped Composite	Metal cylinder wrapped in composite/ fiber resin.
Type 4	Full Composite	Polymer liner wrapped in fiber; lightest and does not corrode, typically weighs approximately 160 lbs.

The recently acquired New Flyer CNG buses in DTPW's fleet are equipped with six Type 4 fuel tanks manufactured by Agility Fuel Solutions.¹⁸ The recently purchased Gillig CNG buses will be similarly equipped with Agility-manufactured Type 4 fuel tanks; however, the Gillig buses will have eight fuel tanks.

4. Out-gassing

Out-gassing occurs when some methane escapes from the inner polymer liner of Type 4 tanks. This can be a typical condition when filling the tanks based on a change in pressure of the tanks. More specifically, "out-gassing is a temporary condition on Type 4 tanks when air that is drawn into the space between a low-pressure liner and composite shell is pushed out by the re-pressurized liner."¹⁹

Out-gassing naturally occurs when a tank is partially emptied (100-500 psi). As the tank empties; the inner liner pulls away from the outer shell and so air is drawn between the liner and the outer shell. When the tank is refilled (up to 3,600 psi²⁰) the inner liner expands to fill the space and expels the trapped air. This trapped air may contain some methane, which is the main component of CNG. Over time, this trapped air slowly seeps through the outer fiber wall and rapidly dissipates once exposed to open air. This process is called "out-gassing" a depiction of which is shown in Figure 2, on the next page.

¹⁸ All cylinders meet DOT FMVSS 304, ANSI/CSA NGV2, Canadian CSA B51-Part 2, METI/KHK, and NFPA 52 requirements. They are also compliant with and can be certified to ISO 11439 or other national or international standards.

¹⁹ Description provided by New Flyer in its presentation dated July 24, 2019. This presentation titled "Agility CNG Tank Investigation" involved out-gassing and possible leaks identified by the Coast Mountain Bus Company (Vancouver BC). New Flyer provided DTPW with an abbreviated form of this same presentation on or before April 4, 2019.

²⁰ For comparative purposes, when full, according to NFPA58, the common household propane tank will have pressure of 140 psi at 70°F; while a high-pressure scuba tank would be rated at 3,300-3,600 psi.

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Figure 2 Tank Type 4 Out-gassing

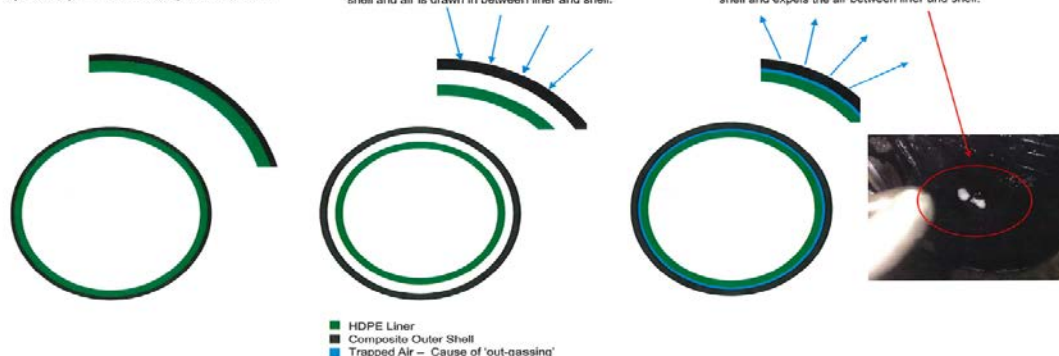
Out-Gassing

Type 4 All-Carbon Fiber Construction CNG Tanks susceptible to 'out-gassing'

A) At 3600 psi – Liner sealed against outer shell.

B) At 100-500 psi – liner pulls away from outer shell and air is drawn in between liner and shell.

C) At 3600 psi – liner re-seats against the outer shell and expels the air between liner and shell.



NEW FLYER.

Note: Depiction taken from New Flyer/Agility CNG Tank Investigation, April 4, 2019

5. Gas escaping from the Pressure Relief Device (PRD)

All CNG fuel containers must be equipped with a pressure relief device. The OIG learned that DTPW Bus Maintenance met with representatives from Agility (the tank manufacturer) on April 10, 2019, regarding the process involved with CNG inspections and repairs. One of the issues discussed in follow-up Questions and Answers correspondence involved gas escaping from the PRD. In an answer to a question about gas being detected at or near the end of the “vent tubes” and whether that is “trace gas” from a previous pressure release or an actual gas leak from the PRD, Agility stated yes, it is gas escaping from the PRD. Agility, in its response, explained that there is “difficulty in manufacturing ‘gas tight’ seals. The limit of 20 scc/hr^[21] is indicative of the capabilities of sealing a metallic component. So, yes, it is gas escaping from the PRD, but unless it exceeds 20 scc/hr, it is technically not a leak per the requirement of NGV 6.1.”²²

²¹ Standard cubic centimeters/hour (scc/hr)

²² NGV 6.1 is a bi-national standard (United States and Canada) for natural gas vehicles. It is promulgated by the American National Standards Institute (ANSI) and the CSA Group (formerly known as the Canadian Standards Association). Standard 6.1 applies to the inspection, repair and maintenance of CNG fuel storage and delivery systems for road vehicles.

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C. CNG Leak Detection – Methods & Authorities

1. *Gas Detection Monitors*

The New Flyer and Gillig CNG buses are outfitted with on-board gas detection monitors. New Flyer (and Gillig) buses are equipped with four leak detection monitors that are permanently attached within the bus; although in different locations. Each monitor is hard-wired connected to the sensor alarm panel located in the driver's compartment. New Flyers are equipped with the Kidde Dual Spectrum PM-MDS Gas Sensor. Similarly, Gillig buses are equipped with gas detection sensors from the Amerex SafetyNet4 system.

Both the Kiddie and Amerex CNG leak detection sensor warning levels are factory set at CNG concentrations of 10,000 ppm and 25,000 ppm. The first level would register a warning when methane is detected at concentrations over 10,000 ppm (or 20% of the Lower Flammability Level), are detected. The sensor would illuminate an amber warning light and activate an audible alarm. The second level of detection, at 25,000 ppm (or 50% of the Lower Flammability Level), would result in a red warning light and immediately shut-down the bus engine. OIG's research indicates that all major manufacturers of on-board CNG leak detection monitors are factory set at these levels.²³

The OIG observes that the National Fire Protection Association (NFPA), an international nonprofit organization, has promulgated guidelines for on-board gas detection systems, including that:²⁴

The detection system shall activate a visual alarm within the driver's compartment of the vehicle at a gas concentration not exceeding 20 percent to 30 percent of the LFL [lower flammable level] and sound an audible and visual alarm at a gas concentration not greater than 50 percent to 60 percent of the LFL.

Based on the above guideline, the manufacturer settings of 10,000 ppm (20% LFL) and 25,000 ppm (50% LFL) are consistent with NFPA's guideline. The OIG notes that, while this subsection containing this guideline was found in Chapter 16.4 pertaining to Liquefied Natural Gas (LNG) and not CNG, both forms of natural gas have the same LFL.

²³ This appears to be an industry standard driven by California State Regulations on the detection of methane gas.

²⁴ NFPA 52 *Vehicular Natural Gas Fuel Systems Code* (2019), see Section 16.4.7.1.5.

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2. *Portable Combustible Gas Detectors (e.g., hand-held devices)*

Portable combustible gas detectors (hand-held devices) are utilized during regular maintenance inspections at each 36,000 mile interval,²⁵ and in any maintenance work of a bus involved in an accident that may compromise the CNG storage or distribution system. The detector has a wand, with a small sensor at its end that is used to trace along gas lines, in-and-around connections, and fittings. Whenever the detector detects combustible gases, in this case methane, it displays a concentration reading on the display panel. Guidelines require that should there be a positive reading, it should be confirmed with an additional test using a recommended leak detection fluid; this is commonly referred to as the “soapy water test.” (See next section.)

Initially, DTPW inspectors were issued the Amprobe Combustible Gas Detector, Model GSD600. These detectors are designed to detect methane or propane concentration levels, with the range of 0 - 640 ppm in specified increments set at >40 ppm, >80 ppm, >160 ppm, >320 ppm, and >640 ppm. DTPW, in consultation with New Flyer and Agility, advised the OIG that the sensitivity of these meters resulted in many false positives of leaking gases. Furthermore, industry safety practices consider trace amounts as normal due to materials used in construction of tanks, pipe, or fittings and not to be treated as leaks. Thus, due to the many false positives for leaking gas, and the inability of the Amprobe detector to register greater than 640 ppm, the department replaced these detectors with the TPI 721 Combustible Gas Leak Detectors in the summer of 2019. The manufacturer's specifications for the TPI 721 state a sensitivity range for methane concentration levels of 0 – 9999 ppm, in increments of 10 ppm, with a +/- 10% accuracy.

3. *Soapy Water Test*

Leak detectors only indicate the presence of combustible gases in the environment immediately surrounding the sensor but are not able to pin-point the source of the leak. Soapy water applied to surface would result in bubbles being formed at the source of the leaking gas, thus pinpointing the source of the leak.²⁶

In August 2019, OIG staff was present at the Central Bus Depot's maintenance shop to observe a CNG-certified inspector perform a post-accident inspection of the CNG system on bus #18184. The inspector was observed taking a plastic spray bottle, approximately one liter in capacity, containing a soapy liquid and a large handful of paper towels to the roof of the bus. The inspector advised that he would be doing a visual inspection of the tank surfaces (looking for any anomalies), and because they were dirty, he would be

²⁵ The actual inspection requirement is at 36,000 miles or once every year, whichever comes first.

²⁶ This procedure is similar to that used for auto tire repairs when the mechanic is looking for a hard-to-find leak.

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using soapy water not only to clean the tanks but also to detect for leaks. The hand-held detector (ATI 720) was also utilized in this inspection.

After checking the tanks and lines, with the hand-held device, the inspector was observed spraying a tank with the soapy water spray, using paper towels to wipe away dirty soapy water, and then spraying again. The inspector then ran his fingers over the tank surface, feeling for ridges or differences in the surface while visually inspecting the surface of the tank. This was repeated for each of the six tanks. No evidence of a leak was found; however, a slight ridge on the surface of a tank was noted. The inspector explained that upon noticing surface conditions, such as a ridge, the protocol would be to take a picture of it and send it to Agility, the tank manufacturer.

4. Regulations, Authorities, and Standards

The OIG noted only one federal guideline specifying natural/methane gas leak detection criteria; however this guideline is applicable to federally-mandated random roadside inspections carried out by inspectors of the Federal Motor Carrier Safety Administration (FMCSA).²⁷ This guideline, published by the FMCSA in a July 2015 training manual entitled *Leak Detection in Natural Gas and Propane Commercial Motor Vehicles Course* is used by FMCSA-authorized agent/inspector for determining whether the inspected natural gas powered vehicle should be declared out-of-service because of a fuel leak. This guideline, differentiates between the level of concentration (ppm) deemed hazardous to human health vs. the level needed in order to confirm that there is in fact a fuel leak, and as such, take the vehicle out of service. Section 1.69 of the aforementioned training manual states the *Out-of-Service Criteria*:

When a fuel leak is verified on a CNG/LNG and LPG vehicle, by a soap bubble test, or by a reading of 5,000 parts per million (ppm) or more on a combustible gas detector, the condition is deemed hazardous, and the vehicle is declared out-of-service.

Section 1.70 *Out-of-Service Indicators* adds:

A reading of 5,000 ppm or more on a combustible gas detector that is sampling air inside the engine compartment, vehicle cab, fuel

²⁷ 49 CFR 396.9 *Inspection of motor vehicles in operation* authorizes FMCSAP [Federal Motor Carrier Safety Administration Program] special agents to conduct such inspections. FMCSAP Inspectors conduct roadside inspections on commercial motor vehicles and drivers to check that they are in compliance with the Federal Motor Carrier Safety Regulations (FMCSRs) and/or Hazardous Materials Regulations (HMRs). If an inspection results in serious violations, the driver will be issued a driver or vehicle Out-of-Service Order. These violations must be corrected before the driver or vehicle can return to service.

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compartment, cargo compartment, or any other enclosed space on the vehicle.

As mentioned earlier, this federal training guide distinguishes between the ppm level that is considered hazardous versus the ppm level that warrants taking a vehicle out of service. In Section 1.28 of the FMCSA training manual, three ranges of ppm levels are discussed:

- A measured concentration of natural gas in an enclosed space that is less than 12,500 ppm (< 25 percent of the LFL) (< 1.25 percent overall concentration) is not considered hazardous and requires no action.
- A measured concentration of natural gas in an enclosed space that is between 12,500 and 25,000 ppm (25 percent and 50 percent of the LFL)(1.25–2.50 percent overall concentration) is considered hazardous, and at a minimum occupants should be warned.
OIG Note: The CNG buses' on-board detectors will illuminate an amber color warning light and sound an audible alarm at 10,000 ppm.
- A measured concentration of natural gas in an enclosed space that is greater than 25,000 ppm (> 50 percent of the LFL (> 2.50 percent overall concentration) is considered extremely hazardous, and occupants should evacuate.
OIG Note: The CNG buses' on-board detectors will illuminate a red hazard light and shut off the engine at 25,000 ppm.

Even though readings under 12,500 are not considered hazardous, the federal training manual makes clear that a reading of 5,000 ppm or above is a conservative measurement of what should be defined as a “leak.”²⁸ As explained in its training video:

So, for conservatism we are going to adopt as our threshold definition of a “leak” a measured concentration of combustible gases of more than 5,000 parts per million. So, this threshold is high enough to protect against false positive readings, but it’s low enough to ensure that a vehicle with a fuel leak is removed from service before gas has accumulated to a hazardous level.

So, when conducting a fuel leak test on a commercial vehicle, if your combustible gas detector measures more than 5,000 ppm of combustible gases, either in an enclosed compartment on the vehicle, or at any specific leak point in the system, that measurement constitutes

²⁸ Section 1.88 *Combustible Gas Detector Ratings that Indicate a Leak*, transcript of training video used in the training.

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confirmation that there is a fuel leak, and the vehicle should be put out of service. An enclosed compartment would, for example, be the vehicle cab, the engine compartment, or the cargo compartment of the vehicle.

While technically this federal standard/guideline does not apply to local transit agencies for their CNG-powered buses, it does provide a good basis for developing one's own standard.²⁹ As quoted in a July 23, 2019, Miami Today article, the DTPW Director stated that "her department will reduce the upper leakage threshold to 5,000 parts per million to be in keeping with federal standards."

D. Delivery, Inspection, and Acceptance of New Buses

In preparation for the delivery of the CNG buses, maintenance facilities at both the Central and Coral Way bus depots were upgraded with high volume exhaust systems and methane gas detectors. Similarly, certain DTPW employees received training to become Natural Gas Vehicle Institute (NGVi) Certified CNG Inspectors.

According to DTPW personnel, New Flyer CNG buses are driven approximately 800 miles directly from the assembly plant in Anniston, Alabama, to the Central Bus Depot. (Gillig buses will travel approximately 3,000 miles from their California manufacturing location.) Upon arrival, DTPW personnel perform a visual walk-around to inspect for any obvious signs of damage that might have occurred during transit. Thereafter, DTPW personnel conduct a rigorous Post Delivery Inspection (PDI) of the bus; this process includes visual inspections, systems testing, and test driving. On-site New Flyer representatives would be informed of any issues that required corrective action – these issues would then be re-inspected by DTPW personnel. New buses are not accepted by DTPW until after successful completion of every item listed in the PDI.

1. *OIG Observations of Post-Delivery Inspection (PDI)*

On August 8 and 14, 2014, OIG representatives visited Central to observe portions³⁰ of the PDI process for bus #19214. While there, the OIG observed the assigned DTPW Inspector³¹ perform the external and internal walk-around, engine compartment inspection, inspection and testing of some internal alarms systems, CNG storage tank

²⁹ The FMCSA does not cover passenger vehicles (buses) of local transit agencies. FMCSA extends to commercial, inter-state vehicles.

³⁰ A complete PDI may occur over a period of five or more days. OIG representatives conducted two visits of approximately three hours each over separate days.

³¹ DTPW personnel assigned to perform PDIs are Certified CNG Inspectors

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inspection, and the test drive. A number of items were noted by the DTPW inspector that required attention by New Flyer personnel. These included the bike rack not being properly installed; a passenger handrail that was loose; heat sensor cables in the overhead compartment that were not properly labeled; positive (+) battery cables that were tie-wrapped together with negative (-) cables; and bolts that were missing torque markings, including bolt heads in the CNG storage compartment. These items were referred to New Flyer for immediate remedying and were subsequently re-inspected prior to completion of the PDI.³²

The OIG observed, which was later confirmed by DTPW, that the PDI does not include an independent inspection for CNG leaks either by using a hand-held wand detector or by application of a soapy water test. (See **Exhibit 1** for the section of the PDI form that pertains to CNG.) It was explained that during the PDI, the inspector visually inspects the tanks for signs of visible damage; and using one's sense of smell to detect any off-smells, such as rotten eggs, which would prompt a more exploratory inspection utilizing the hand-held device, soapy water, or both. Similarly, on September 26, 2019, the OIG was present for the CNG inspection portion on the first Gillig bus to arrive. During the PDI for that first bus, we also observed that there was no independent inspection (using a hand-held detector or soapy water test) performed to detect CNG leaks.

The OIG sought an explanation for the absence of an independent PDI requirement to test for CNG leaks. DTPW inspectional staff explained that since the buses, and tanks, are new, DTPW relies on the testing certifications from the manufacturer/vendor prior to leaving the assembly facility. The CNG tanks are required to be inspected during routine maintenance (at every 36,000 miles) and after any accident that involves damage near or around the tanks.

2. PDI Records Search

The OIG requested DTPW perform a search of PDI records for all New Flyer CNG buses that had been delivered. We asked DTPW to pull any PDI inspection record that showed any issue of a possible leak of CNG. This search did not reveal any discovery or report of a CNG leak. However, it did show that one bus (#19129) was delivered with three of the six CNG storage tanks valves in the closed position. (These valves connect the fuel storage to the engine and should be in the open position.) When the valves were opened and the tanks were being filled with CNG, the condition referred to as out-gassing (previously explained) occurred. This situation may have been mistaken for a gas leak.

³² After a bolt is tightened with a specified amount of force, using a torque wrench, the mechanic would use a marker across the bolt head and plate surface to confirm that the bolt was torqued and also show the alignment of the bolt head.

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3. Interview of TWU President

On September 23, 2019, Jeffrey Mitchell, TWU President, was invited to the OIG for a sworn statement regarding public comments that he made on July 10 and September 4, 2019, that New Flyer was delivering buses that are leaking gas. When advised that an OIG review of the PDIs for New Flyer CNG buses did not reveal any notation or indication of leaking gas, and that all PDIs are signed by inspectors and supervisors prior to acceptance by DTPW, the TWU President responded that "... well, you don't expect them to be leaking so soon after that ..." and continued by saying that "... my purpose is to tell you that you have buses that are leaking. I don't give a darn when they started leaking. They are leaking. And they are leaking within 2 years on a 20-year certified tank."

During that same meeting, the TWU President showed a video, on his cellphone, of what he alleged was a CNG tank with bubbles rising from beneath the soapy water covering the tank. He stated that the tank was patched to stop the leak. The OIG requested a copy of the video, along with location and the date of the video, and copies of any documents to support his allegation. The TWU President advised the OIG that he relies on his people (other union representatives) in the shop to provide him with information. (Mr. Mitchell referred to his union colleague "Tony" as having more information on this incident.) Subsequently, he provided the OIG with the names and telephone numbers of two individuals to contact.³³ The OIG has left numerous voicemail messages and text messages to the union representatives inviting them to meet with the OIG. In those messages, we made it clear that their President, Jeffrey Mitchell, provided us with their contact information. The OIG did not hear back from either individual; we re-contacted Mr. Mitchell and advised him of our difficulty in speaking to his colleagues. As of this writing, we have not heard back from them.

Subsequent to the meeting, the TWU President sent a copy of the video via text message to the OIG, but no information as to the date or location that the video was recorded. In addition, he sent the OIG three photographs of work orders demonstrating the detection of leaks.

- The first photograph is of Work Order No. 4419503 for Bus No. 18121, dated 4/1/19. It shows that it was for a post-accident inspection. The typed comments read: "found two failed tanks that are leaking from the dome around the valve and the inlet where the valve enters the tank." No ppm level was recorded, and this bus was returned to service on 4/10/19. (See OIG Schedule C, entry number 8.)

³³ Antonio Gonzalez and Andrew Alcindor

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- The next two photographs pertain to Bus No. 18136. One photo is of the inspector's handwritten note which reads: "found tank leaking at neck front streetside – isolated from fleet at wall and running all other tanks." The second photo is of the work order itself for Bus No. 18136. The full comments for Work Order No. 4409815 read: "performed a cng inspection per order of mileage, found a tank in the front streetside location leaking, bus was killed on the board and placed on the wall running, five tanks were closed and one remained open to drain." Again, no ppm level was recorded. EAMS does not show a further disposition. (See OIG Schedule C, entry number 4)

Neither of these work orders pertain to the post-delivery inspection. What was called leaks by the inspectors could have been outgassing; however without the ppm levels recorded, it is unknown whether the leak was really a leak.

The OIG showed the video that we received from the TWU President to several DTPW supervisory personnel. All of them denied knowledge of the video. In addition, they advised that neither New Flyer nor Agility personnel has ever visited Central to patch a tank.³⁴ Further, they advised the OIG that if there were to be any anomalies in the tank surface, they would take pictures and send them to Agility, not to New Flyer. Should there be a concern, the tank would be sent to Agility for further testing³⁵ or DTPW would be instructed to destroy the tank rendering it unusable (e.g., drilling holes in strategic locations of the tank).

Based on our understanding of the PDI inspectional process and the records reviewed, the OIG determined that the allegation that the New Flyer CNG buses were arriving here with leaks to be unfounded. Moreover, through our discussion with the TWU President, he clarified his statement that he did not mean to say the buses were arriving with leaks, but that leaks were being found in relatively newer buses.

OIG Recommendation No. 1 – Even though the allegation of new buses arriving with leaks is unfounded, DTPW should consider including utilizing the hand-held CNG detector, as part of its CNG post-delivery inspection protocol. The OIG notes that additional time to perform the "wanding" would be de minimis, as this would be performed simultaneously with the visual inspection. Upon a positive detection of CNG, the

³⁴ After examination of the video and documentation, the OIG speculates this video to be recorded on February 7, 2019 of Bus #18121 showing leaks around the domes. As shown in OIG Schedule C, entry #2, O-rings were replaced under warranty repairs for CNG tanks #5 and #6 of bus #18121.

³⁵ Further testing would include hydrostatic testing of the tank in a controlled environment.

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remaining inspection protocols utilized in the 36,000 mile inspection (see next section below) should be followed.

***DTPW Action Plan:** The DTPW CNG Bus Post-Delivery Inspection Plan currently requires performance of a visual inspection of the CNG Cylinders. DTPW's Field Test Engineers, Quality Assurance Engineers, and Bus Maintenance Management Team will determine the method and requirements related to the CNG leak inspections in the next revision of the CNG Bus Post-Delivery Inspection Plan. Wanding with a soap bubble test will be included in the SOP.*

E. Required Inspections at 36,000 Mile Intervals and Post-Accidents

Inspections of the CNG fuel system are required annually or every 36,000 miles, whichever comes first. Inspections of the fuel system must also be performed after any accident that may compromise the fuel storage or delivery system or any fire on the bus. DTPW developed a form entitled "Natural Gas Vehicle Cylinder Inspection Record" to aid in the inspection and record its results. **(Exhibit 2a)** We note that this is the version of the form that is actually utilized by DTPW inspectors in the garages. This form also states that "All inspections must be carried out using the guidelines found in the CNG Fuel Cylinder Inspection Manual ENP-558 published by Agility Fuel Solutions."

DTPW has also enacted a Standard Operating Procedure (SOP) for "Natural Gas Vehicle Cylinder Inspection." The original issue date of the SOP was April 17, 2019. It was revised on July 23, 2019. The last page of the SOP contains an Inspection Form **(Exhibit 2b)**, however, this form is different from the one actually being utilized in the garages. The one big difference between the forms involves a place on the form to record the ppm level of any positive methane reading. The form attached to the SOP includes it, but the form actually used in the garages does not.

Table 3, on the next page, compares the actual procedures of the two SOPs as it relates to the detection of methane gas.

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**Table 3 Comparative Revisions to DTPW Standard Operating Procedure
 PB-BS-049 Natural Gas Cylinder Inspection**

Original Issue Date 04/17/19	Revision Date 07/23/19
4.0 Procedure <ul style="list-style-type: none"> • Search for leaks using leak detecting solutions such as Swagelock Snoop³⁶ or soapy water and electronic leak detection equipment. 	4.0 Procedure <ul style="list-style-type: none"> • Search for leaks using leak detecting solutions such as Swagelock Snoop and electronic leak detection equipment (Minimum requirement for leak detection equipment: Methane Leak detection sensitivity: 10ppm. Real ppm range: 0 to 9999ppm)
<ul style="list-style-type: none"> • If gas leak or seepage is observed: (On Valves and Connections) <ul style="list-style-type: none"> a. Greater than 10,000 ppm, replace valves or connection. b. Less than 10,000 ppm, within allowable tolerance. (On Tank) <ul style="list-style-type: none"> a. Look for damage. b. No visible damage and less than 10,000 ppm – out gassing. c. Greater than 10,000 ppm – replace tank. 	<ul style="list-style-type: none"> • If gas leak or seepage is observed: (On Valves and Connections) <ul style="list-style-type: none"> a. Replace valves or connection. (On Tank) <ul style="list-style-type: none"> a. Look for damage. b. Replace tank. <p style="color: red; font-style: italic;">*OIG note: no ppm threshold is stated as to when valves, connections or tanks must be replaced, whereas the prior SOP had the threshold at above 10,000.</p>
4.1 Time Standard <ul style="list-style-type: none"> • 2.5 hours 	4.1 Time Standards <ul style="list-style-type: none"> • 2.5 hours
6.0 Special Tools and Equipment (if applicable) 3.0 Electronic Leak Detector	6.0 Special Tools and Equipment (if applicable) 3.0 Electronic Leak Detector (Minimum requirement for leak detection equipment: Methane Leak detection sensitivity: 10ppm. Real ppm range: 0 to 9999ppm)

The SOP was revised on or about July 23, 2019, which follows statements made, on or about July 14, 2019, that DTPW has a zero-tolerance policy for leaks.³⁷ The revision also follows the change in hand-held detection device to the TPI 721 model (the former device could only provide a reading up to 640 ppm). While the revised policy indicates that the range for the hand-held methane detection device will measure from 0 to 9999 ppm (with a sensitivity setting of 10 ppm), the revised SOP does not indicate at what ppm level must a valve, connection, or tank be replaced. While a zero-tolerance policy sounds forceful, it will likely be impracticable and not feasible with respect to methane detection due to out-gassing and gas escaping from the PRD, as described earlier.

In a Miami Today article of July 24, 2019, it was reported that the DTPW Director told the paper that, following research, her department will reduce the upper leakage threshold to

³⁶ Snoop® is a liquid leak detector that is applied to CNG components.

³⁷ The last signature approving the revised SOP occurred on August 26, 2019.

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5,000 ppm in keeping with a Federal Motor Carrier Safety Administration July 2015 training guide. The DTPW Director is also quoted as saying “We’re actually adopting a standard similar to what Los Angeles uses – that basically any leaks detected will be addressed.”³⁸

F. OIG Work Order Review

The OIG requested that DTPW provide copies of maintenance Work Orders and Natural Gas Vehicle Cylinder Inspection Records for all CNG buses related to “gas leak” or other CNG issues. As a result, DTPW provided the OIG with 43 Work Orders relating to noted gas leaks or other CNG issues (valves, tanks, vent lines, etc.) covering the period August 13, 2018 to September 22, 2019. The OIG has compiled these work orders into **OIG Schedule C**. Our schedule includes excerpts taken from the inspector’s handwritten comments on the Inspection Records, as well as the inspector’s typed comments into the EAMS database, and the disposition of each work order.

OIG observations from reviewing the records are summarized below:

- **Leak event described without a methane ppm level recorded** – there were 12 instances where a leak of some type was noted, however neither the inspector’s hand written notes nor the description on the work order entered by the inspector stated the methane level; in all of these instances, the disposition shows that no further action was taken (see schedule entries 4, 8 – 17, and 41)
- **CNG leak within safe limits** – there were 13 instances reporting concentrations of methane within the safe limits (less than 5,000 ppm) and did not require further remedial action (see schedule entries 6, 7, 18 – 24, 28, 32, 36, and 38)
- **CNG leak between 5,000 – 9,999 ppm** – there were three instances where a leak was reported between 5,000 – 9,999 ppm; this range is captured due to the federal training guide which uses 5,000 ppm, as its safety threshold for taking a motor carrier out of service; in all three reported instances, no remedial action was taken by DTPW noting that it was still below the 10,000 ppm threshold (see schedule entries 31, 33, and 34)

³⁸ Los Angeles County Metropolitan Transit Authority (LA Metro), Operations Department, Bus Maintenance Directive E02-07 rev-b, titled *Low Floor Bus CNG Fuel Cylinder Inspection Processes*, revised January 15, 2008 (originally released on December 12, 2002). The procedures described therein go into detail on how to perform an inspection to the fuel system, including the cylinders, valves, and PRDs, using a combination of electronic gas detectors (e.g., hand-held devices), soapy water tests, and through visual inspection. As it relates to a threshold reading from an electronic gas detection device, LA Metro’s procedure only refers to “leaks in accordance with the manufacturer’s recommendation for CNG leak detection.” In other words, LA Metro’s procedure does not contain an express threshold, for example at 5,000 ppm.

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- **CNG leak exceeding 10,000 ppm** – there were five instances of reported CNG levels in excess of 10,000 ppm; two out of the five were determined to require warranty repairs; one was found on re-inspection to be at 3,000 ppm and within allowable guidelines; two involved leaks detected at vent lines (in one instance the notation reads that gas detection at vent tube is not considered a leak, the other contained no disposition although the inspector's handwritten notes confirm the leak at the vent lines (see schedule entries 29, 35, 40, 42 and 43)
- **CNG leaks requiring warranty repairs** – there were four instances where leaks were confirmed and were repaired, under warranty by New Flyer; these entries on the schedule are highlighted in tan (see schedule entries 2, 19, 29, and 43)
- **CNG tank anomalies** – there was one instance of a reported tank anomaly (resin bubbles on tank) (see schedule entry 5); other than acknowledging the existence of the resin bubbles, no other remediation was noted
- **CNG alarm system** – there were six instances related to the CNG alarm system (see schedule entry 1, 3, 25, 26, 27, and 30); in all six cases, upon inspection, the warning light did not reappear
- **CNG smell in bus** – there was one instance of a gas smell in the bus (see schedule entry 37); the disposition shows that a sticky substance was found, which may have been the culprit of the smell; it does not appear that a leak was detected

Our overall assessment of these Work Orders and Inspection Records show that DTPW inspectors were very diligent and, perhaps, overcautious. As earlier mentioned, the portable hand-held devices, which were originally issued to maintenance personnel, had low gas concentration levels (0 – 640 ppm). This led to detections of trace amounts, which may have rendered false positive readings, i.e., an incorrect test result showing a leak when, in fact, it was nothing more than “outgassing.” As our Schedule C shows, recorded meter readings, after the new hand-held TPI 721s were in effect, captured readings at higher levels. The deployment of the new hand-held devices with concurrent additional training likely resulted in fewer trace detections being recorded as possible leaks.

During our review of Inspection Records, we note that inspectors were not uniform in recording the concentration level (ppm). There were 10 instances where a leak was noted but no ppm level was recorded. The fact that the inspection form (see Exhibit 2a) does not have a place to write down the reading may be a contributing factor. However, we only found two instances where an inspector's handwritten notation of the ppm level

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was not also entered into EAMS.³⁹ This was not a widespread condition as alleged by the TWU President.⁴⁰

As earlier mentioned, DTPW had a meeting with Agility (the tank manufacturer) on April 10, 2019.⁴¹ Responding to the question of what “rate of gas leakage” is allowable or permissible, Agility stated:⁴²

When New Flyer triggers a trace warning (at 10,000 ppm) is the appropriate time to consider that the vehicle has a suspected leak. The key for your [DTPW] personnel and operation is to get gas detectors that do not create false positives for leak – anywhere from 60 ppm to 9,999 ppm. . . I think it is probably best if Miami-Dade personnel discuss the exact level of ppm or LEL [lower explosive level] that you are comfortable with (keeping New Flyer's recommendation in mind).

Again, the OIG draws distinction between the remarks above, regarding New Flyer's on-board detection system triggering a warning at 10,000 ppm, and the FMCSA's training standard of 5,000 ppm, as the threshold for confirming that there is a leak. The OIG concurs with Agility's statement that DTPW needs to determine what level it is comfortable establishing, revise its SOP accordingly, and train its inspectors on that standard.

OIG Recommendation No. 2 – SOP PR-BS-049 should be revised again to clearly state at what ppm level additional exploratory measures (such as the soapy water test) and remediation, such as replacement of valves, PRDs, and tanks is warranted. DTPW should make this determination after consulting with other Transit agencies experienced in operating and maintaining CNG buses, the FMCSA and the FTA [Federal Transit Administration], and both New Flyer and Gillig.

³⁹ See schedule entries 7, which was determined not be an actual leak requiring remediation, and 18, which resulted in a warranty repair.

⁴⁰ The TWU President, in his public comments to the BCC and in his interview with the OIG, stated that whenever Inspectors find leaks during the inspection process, they would make written notations of the leak levels (ppm) registering on the portable detectors. He further alleged that the notations of the leak levels never make it into the electronic system (Equipment Asset Management System) because this would take the bus out of service.

⁴¹ The OIG was advised that as a result of that meeting, DTPW was recommended to acquire different hand-held detectors with a higher range. Additionally, DTPW deferred to industry standards that the presence of CNG in concentrations less than 10,000 ppm (or 20% of the LFL) is within the safe operating limits for buses. The disposition recorded in EAMS on eight work orders states: “Under direction of New Flyer and Agility, this bus returned to service on 4/10/19.” It appears that at that meeting, is was determined that

⁴² Agility prepared a Questions and Answers document for DTPW to summarize the main points discussed at its meeting.

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DTPW Action Plan: DTPW's Field Test Engineers and the Bus Maintenance Management Team will reach out to other Transit Agencies/Authorities that operate and maintain similar CNG buses, the FMCSA, FTA, and bus manufacturers for additional guidance and best practices as part of the revision of the "Natural Gas Vehicle Cylinder Inspection" SOP (PR-BS-049).

OIG Recommendation No. 3 – The inspection form used by DTPW inspectors needs to match the inspection form contained in the SOP, as will be revised. The form should 1) have a place to record the location of the leak, if applicable, and 2) the ppm record reading. The inspection form should also be revised in order to accommodate an inspection of a 6-fuel cylinder bus (New Flyer) and an 8-fuel cylinder bus (Gillig). Cylinder identifiers such as "rear middle curbside" may not work with the 8-cylinder configuration. The inspection forms may want to incorporate diagrams of the tank layouts and gas lines so inspectors can clearly mark location of any leaks found.

DTPW Action Plan: The inspection forms referenced in the "Natural Gas Vehicle Cylinder Inspection" SOP (PR-BS-049) will be revised to clearly identify the bus configurations (e.g. 6-fuel cylinder versus 8-fuel cylinder) and will include a diagram of the different types of CNG vehicles, so that any issue following inspection can be marked. Once the inspection form has been revised and approved, it will be issued to the bus inspection personnel and all outdated forms shall be removed accordingly.

OIG Comment: It is not clear from DTPW's response whether the form will be revised to include a place to record the location and ppm reading level of any methane detected. We reiterate our recommendation that the revised form include a place where these notations can be recorded.

G. Allegation – DTPW Shortened the Inspection Period Making it Harder to Find Leaks

During the OIG's September 23, 2019 interview with the TWU President, we asked him to clarify an earlier public comment where he stated that the department "changed the process to make it shorter, to make it harder to find leaks."⁴³ In response, the TWU President stated that the department shortened the amount of time allotted to perform inspections but did not elaborate further. Throughout our interview with the TWU President, he commented that he was relaying information that was told to him by

⁴³ Comment made during the Reasonable Opportunity to be Heard portion of the BCC meeting on September 4, 2019.

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members of the union. He provided the names and phone numbers of others to contact; however, despite numerous attempts to contact these other individuals, the OIG was unable to gain further clarification on the allegation that the department shortened the amount of time allotted for a CNG inspection.

Regarding the time standard for performing CNG cylinder inspections, the OIG notes that actual time of 2.5 hours has not changed from the original to the revised SOP (see Table 2).

According to DTPW maintenance personnel, when they were preparing their policies and procedures for CNG inspection, they did extensive research of similar agencies operating CNG buses. They eventually settled on using the same time standard used by LA Metro—which is 2.5 hours.⁴⁴ This standard has been in place at LA Metro since at least 2008, and it is the same time standard that is used regardless of the number of fuel cylinders on the vehicle.⁴⁵

In an attempt to seek additional information, OIG personnel spoke with a DTPW Certified Inspector who advised that while attending the NGvi Certification Program for Certified CNG Inspectors, he was told by an instructor that the recommended time for inspecting a single tank is one hour, but that DTPW has allotted 2.5 hours to inspect six tanks. The DTPW Training Supervisor who also attended a similar program, advised the OIG that the program was not tailored for CNG buses but included all types of CNG vehicles. He advised the OIG that he did not recall being instructed on any recommended time standard for tank inspection, nor does he remember reading it in the training manual for the course.

Similarly, the OIG asked the field representatives for both New Flyer and Gillig if their companies provided recommended times to perform a CNG system inspection. Both representatives stated that they are unaware of any recommended time requirement for inspecting a CNG system.

During a site visit to the Central Bus Depot's maintenance area on August 19, 2019, the OIG observed a condition that can contribute to the length of time to inspect the six fuel tanks on top of the roof of the bus. These include the fact that at present, there is only one inspection bay equipped with a safety harness line (above the bus). This means that only one CNG tank inspection can take place at a time. With the expectation of a significant increase in the annual or 36,000-mile inspections⁴⁶ each year, DTPW should

⁴⁴ LA Metro, Policy BMD E02-07 rev-b, 01/15/08

⁴⁵ LA Metro operates several models of CNG buses, which have either 6, 7, or 12 CNG fuel cylinders.

⁴⁶ CNG vehicles are required to have system inspections annually or every 36,000 miles whichever comes first.

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expedite the installation of safety harness lines in all maintenance bays where CNG tank inspections will be performed.

H. Allegation – Doors Opening While Bus in Operation

The OIG did confirm one incident of a New Flyer CNG bus having its door open, while the vehicle was in motion. Upon further review of the documents associated with this one particular bus, it appears that this incident may be attributed to human error and a break in communication between maintenance and operations personnel.

To begin our review, the OIG requested copies of all work orders referencing “doors opening while in transit” on New Flyer buses. We received six work orders, as summarized below in Table 4. Information written on the actual work orders are excerpted in the Description/Complaint column and in the Comment/Action column.

Table 4 – Work Orders (WO) Referencing Bus Doors Opening

Date	WO #	Bus #	Description/Complaint	Comment/Action
11/11/18	4305839	18165	Front door opens while in service. Chronic.	drove bus around, perform wiggle test on wires, disconnected wire plugs to check for damage or looseness to door controller, plugs are good and no damage to pins or wires found at this time. found APC sensor not secure in place. secure in place APC sensor, unable to duplicate symptoms at this time.
11/17/18	4312053	18226	Front doors open while bus in motion. Doors won't close bus won't move	Interlock switch found in wrong position. Put switch in correct position. Then Test Drive (ok), Checked it Again (OK)
01/27/19	4365890	18217	Doors keeps opening while bus	entrance door connection rod was detach, reattach rod replace washer and bolt test door add fluids to engine test drive bus ready for service
05/17/19	4458035	19138	<i>OIG note: no entry shown on work order</i>	<i>OIG note: no entry shown on work order</i>
06/12/19	4475898	19172	Front door is opening in route	NF/DTPW tech found at front door arm off motor, find and install hardware and arm.

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Date	WO #	Bus #	Description/Complaint	Comment/Action
06/22/19	4483745	19115	Rear door problem	I drive bus, check rear door, no found problem

Regarding Bus #19172, a previous work order for the same bus shows that on 06/06/19, the week before, the bus operator reported a door problem while in route. A service truck was dispatched to the bus and made repairs. On 06/10/19, it was reported that the front door would not close, and the door module was replaced. Two days later, on 06/12/19, it was reported that the front door opened while in route. During repairs, it was found that the door arm was not attached to the motor. The repair history for this bus is shown below.

Table 5 - Repair History for Bus #19172

Date	WO #	Description	Comment/Action
06/06/19	4471884	Front door right side swing open	Service truck, permanent repair
06/10/19	4530005	Door, entrance door defective	<i>OIG note: No entry shown on work order</i>
06/10/19	4473630	Front door won't close	Replaced door module as per New Flyer 173910
06/12/19	4475898	Front door is opening in route	NF/DTPW tech found at front door arm off motor, find and install hardware and arm.

Through an interview with New Flyer representative, the OIG was advised that New Flyer personnel was indeed working on that bus to replace the module. The work shift ended before the installation was complete. New Flyer's investigation of the incident revealed that its technician failed to notify his supervisor of the incomplete job status and also failed to "lock-out" the bus. On the following day, DTPW personnel had not verified whether repairs were completed before scheduling and dispatching that bus for service. Thus, it appears that this incident of door opening although mechanical in nature, was caused by a series of human errors that were easily preventable. New Flyer representative indicated that they have strengthened procedures to prevent any future recurrence.

OIG Recommendation No. 4 – DTPW should consider affixing a "Do Not Operate" or "Lock Out" tag to a critical components such as the steering wheels, door handles, gas/fuel connections, etc. at the beginning of a repair job by the technician performing the repairs, which can only be removed by the technician after the completion of the repair. The tag should be affixed in a manner that it cannot "fall off."

***DTPW Action Plan:** The Bus Maintenance Management Team will develop an appropriate system to address this concern.*

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VI. OIG REVIEW OF CNG BUS PROCUREMENTS

A. Overview of DTPW's Bus Fleet

DTPW currently maintains an active fleet of 754 buses. The fleet consists of 662 full size buses, 89 articulated buses and three 'mini' buses. The average age of the active fleet is 7.5 years. There is also a contingency fleet of 12 inactive buses.⁴⁷ The procurement of new buses follows a schedule detailed in the *Metrobus Fleet Management Plan* (MFMP or Plan).⁴⁸ This schedule is titled DTPW's *Planned Bus Procurements and Vehicle Replacement*, which was last updated in March 2018, and shows DTPW's 20-year forecast of future bus procurements (**OIG Exhibit 3**). We learned that there are two overarching factors that go into the 20-year forecast: 1) a FTA funding requirement is that large, heavy duty transit buses must be used for at least 12 years or until a bus accumulates 500,000 miles before federal funds can once again be used to purchase its replacement⁴⁹ and, 2) money.

Ideally, DTPW's annual capital budget would cover the acquisition of 1/12th of the fleet each year, as buses reach the end of their 12-year useful life (as defined by the FTA). This purchasing pattern would maintain the bus fleet's average age at six years and require a relatively flat expenditure amount year to year.⁵⁰ In part, due to the recession of 2008-2009, fiscal limitations over the past decade resulted in repeated deferrals of bus replacements. Fortunately, bus replacement funding, backed by the People's Transportation Plan surtax, is now readily available. Backed by these funds, the County has secured a favorable line of credit with JP Morgan to finance bus purchases over a 12-year-period.⁵¹

The current bus replacement initiatives have focused on the acquisition of hundreds of 40-foot, (i.e., full-size) heavy duty CNG buses. The U.S. Department of Energy identifies four manufacturers of CNG transit buses: New Flyer, Gillig, MCI, and Nova.⁵² Since that publication, New Flyer has acquired MCI and, as such, there are currently only three North American manufacturers. To date, Miami-Dade County has purchased CNG buses from New Flyer and Gillig.

⁴⁷ Memorandum: "Bus Facts-At-A-Glance." Carlos de La Torre, Chief, Performance Management. September 4, 2019.

⁴⁸ The Plan's most recent publication was in March 2018.

⁴⁹ FTA Circular C-5100. Section IV-8. 05/18/2015

⁵⁰ Interview. Alberto Parjus, DTPW Deputy Director 09/17/19

⁵¹ Interview. Robert Villar, DTPW. 09/24/19

⁵² <https://www.afdc.energy.gov>

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As earlier mentioned in Section IV of this report, 300 40-foot CNG buses have been delivered by New Flyer, as procured by Trillium, via the MDA. More recently, the BCC approved the purchase of 120 full-size CNG buses from Gillig by accessing the LYNX contract, as described earlier in Section III(C). The 120 CNG buses from Gillig are now arriving and are all expected to be in service by the spring of 2020.

An abbreviated survey of transit literature indicates that a diversity in the composition of bus types is common among metropolitan transit agencies.⁵³ With the addition of the 420 CNG buses to the DTPW fleet, diesel-fueled buses will no longer be the dominant bus-type. Currently, all 89 of the 60-foot articulated buses and 48 of the 40-foot full-sized buses are hybrids (diesel-electric). And recently, the Board of County Commissioners (BCC) authorized the acquisition of 33 battery electric 40-foot buses (with authorization to purchase an additional 42 electric buses).⁵⁴ These will be the first electric buses added to the DTPW fleet.

B. Key Decisions Made During the MDA/Trillium Negotiations

When the Master Developer RFP was advertised, it was contemplated that the Master Developer would retrofit the maintenance shops and provide CNG fueling stations at one of the County's three bus depots, and finance and acquire up to 300 CNG buses. The RFP solicitation mentioned a desire to have options to buy additional buses, albeit it was an unspecified quantity. During an internal strategy meeting of the county's negotiating committee,⁵⁵ three significant decisions were made:

1. The Master Developer would construct two fueling stations, one at the Central Bus Depot (original plan) and one at the Coral Way Bus Depot (an RFP option that was incorporated into the final agreement).
2. The County would purchase 300 40-foot full-size CNG buses, and would leave no options to purchase additional buses through this agreement.
3. The Master Developer would no longer be required to provide financing for bus purchases, instead, the County would purchase buses off the MDA, as a "pass-through" cost.

⁵³ Sample: <https://www.metro-magazine.com/sustainability/news/293950/41-of-u-s-public-transit-buses-use-alt-fuels-hybrid-technology>

⁵⁴ R-1041-19; File #191770; October 3, 2019. Note: DTPW's 2018 *Metrobus Fleet Management Plan* includes the 33 electric buses.

⁵⁵ Internal Strategic Negotiation Committee meeting—individuals present, included: Rita Silva (ISD), Andrew Zaworski (ISD), Jesus Valderrama (DTPW), Eric Muntan (DTPW), Derrick Gordon (DTPW), Robert Villar (DTPW), and Peter Liu (OIG). June 15, 2016.

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The OIG was present at the negotiating committee's internal strategy session when the decision to remove the option for additional buses was made. The reasons cited included a reluctance to commit to one vendor for all CNG buses, the prospect of adding electric heavy-duty transit buses to the fleet, and the availability of an alternative competitive contract for additional CNG bus acquisitions. Ultimately, there was no option for the acquisition of additional buses included in the MDA beyond the 300.

Early in the negotiations, Trillium was directed to obtain best and final offers from two CNG bus vendors (New Flyer and Gillig) that it had originally identified in its RFP proposal. Based on price, New Flyer was selected to provide 300 CNG buses. While, the option to purchase additional CNG buses was no longer included in the MDA, the County's intention to purchase more CNG buses was very clear. The first page of the Mayor's recommendation to award explicitly stated that the "purchase of an additional 200 buses is contemplated through a separate competitive contract."

Moreover, the desire to purchase an additional 200 buses was contemplated in the Office of the Commission Auditor's (OCA) research notes accompanying the MDA/Trillium agenda item, wherein OCA reported that it had queried the ISD about the "separate competitive contract."⁵⁶

According to ISD staff, Miami-Dade County is a party to the LYNX (FLORIDA CONSORTIUM) Contract #14-C-09 for the purchase of 40-foot buses. A year ago, the County accessed this contract through Resolution No. R-204-16.^[57] The County would anticipate using this competitive contract to procure the balance on new bus purchases.

During the BCC's discussion of the MDA/Trillium award, Commissioner Barbara Jordan questioned the DTPW Director when the additional 200 buses would be ordered. Director Bravo initially provided the delivery schedule for the 300 bus purchase. She then stated "there are options for 200 more [buses] afterwards."⁵⁸ This was a misstatement as the

⁵⁶ See OCA *Research Notes* of January 24, 2017 for Agenda Item 8F9.

⁵⁷ Resolution No. R-204-16, as cited in the OCA research notes, had authorized the County access to the referenced LYNX contract, for purchasing "heavy duty transit coaches. Specifically, the agenda item authorized the purchase of five 40-foot diesel buses. This contract had been competitively awarded to Gillig in December 2013 and had a five-year term. The contract satisfied the FTA's procurement criteria, and thus purchases from this contract would be eligible for federal grant funding. The Mayor's memorandum accompanying this agenda item noted that, "accessing LYNX's contract allows the County to benefit from economies of scale (i.e., lower pricing) as a single contract leverages the purchasing power of FPTA [Florida Public Transportation Association, a/k/a the "Florida Consortium] members."

⁵⁸ BCC meeting of January 24, 2017 at 3:20 pm.

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MDA did not have an option to buy additional buses, as was clear from the Mayor's memorandum accompanying the award.

C. Additional Buses to Be Purchased Through the LYNX Contract (2017)

In the spring of 2017, shortly after the Notice to Proceed was issued to Trillium, DTPW began a procurement action to obtain the remaining CNG buses through the LYNX contract. In June of 2017, ISD prepared *Market Research* for the procurement of 181 CNG buses, and on June 13, 2017, an ADPICS⁵⁹ purchase requisition was created for the purchase of the 181 CNG buses. We note that the emails before/after this date were typically between/among ISD and DTPW staff and did not appear to be elevated to the department director level or to the Mayor's Office.

The OIG observed emails between/among County and Gillig staff pertaining to the aforementioned purchase. This culminated in a proposed Letter of Agreement transmitted by ISD procurement staff, on October 16, 2017, to Butch Sibley, Sales Manager for Gillig. Gillig was notified that Miami-Dade County had "elected to access" the LYNX contract to buy 181 40-foot CNG buses. The Letter of Agreement was executed and returned to ISD by Joseph Policarpio, Vice President of Gillig, on October 18, 2017. Gillig committed to manufacture 181 CNG buses for Miami-Dade County, subject to the approval of the contract by the BCC.

It appears that this 2017 initiative by DTPW and ISD procurement staff to purchase 181 CNG buses through the LYNX contract is consistent with the earlier statement in the Mayor's memorandum and comments to OCA that the additional buses would be purchased off the LYNX contract, which was competitively awarded. In addition, we note that this purchase had been given a green light by DTPW financial staff through the approval of the purchase requisition. Nonetheless, despite this purchase being apparently consistent with DTPW's plan, this procurement was never completed.

D. Explanation for Cancelling the 181 Bus Order

After receiving the executed Letter of Agreement back from Gillig, on October 18, 2017, there appears to be no action by ISD and DTPW staff to advance the purchase to the BCC for approval. The email correspondence reviewed by the OIG was devoid of any further mention of the prospective 181 CNG bus purchase. That is until the OIG came

⁵⁹ Advanced Purchasing and Inventory Control System

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across an email dated January 24, 2018 originated by ISD.⁶⁰ The email was sent to two other DTPW representatives, two ISD representatives, as well as two CAO representatives. It reads:

Good morning: Bruce just informed me that DTPW no longer wants to access the LYNX contract to purchase 181 CNG buses. Instead, DTPW wants to amend Contract RFP-00096, COMPRESSED NATURAL GAS PROGRAM FOR MDT [the Trillium agreement]. Bruce also asked me to inform Rita Silva and Robert Villar, both copied herein, he needs to meet with both regarding the amendment. Therefore, at this point I will no longer proceed with accessing the LYNX contract. Please let Elizabeth Ruiz know your availability.

The OIG found no record, or confirmation by way of one of our interviews, that anyone from ISD (or DTPW) contacted Gillig to inform them of the County's decision. Moreover, the OIG still did not know why the decision was made not to access the LYNX contract.

The information void lasted up until the OIG's interview with the Director of DTPW. We asked the Director about this matter and she forthrightly explained that rejecting the proposal was her decision. Director Bravo recounted being presented with a file containing a complete package for the purchase of the 181 buses. She told the OIG that she was taken aback by this, as she was completely unaware that staff had been pursuing a large purchase of CNG buses off the LYNX contract. She recalled questioning why staff would use the LYNX contract for the purchase when the Trillium agreement—a County approved contract—had available options to purchase additional buses.

Director Bravo then explained to the OIG that—at that time—she was under the impression that the Trillium MDA contained bus purchase options. When she realized that the MDA did not include an option for more buses, she told the OIG that she became suspicious. She commented to the OIG that she felt she was being steered towards buying off the LYNX contract, which she was uncomfortable with. During our interview, Director Bravo directly linked her decision to reject the proposed LYNX purchase with the “removal” of the option to buy more buses from the Trillium MDA.

When the OIG pointed out that the Mayor's memorandum on the Trillium award expressly stated that an additional 200 additional buses would be procured separately, she

⁶⁰ Email. Subj: Access LYNX contract for CNG buses. From: Jesus Lee (ISD). To: Rita Silva (ISD), Robert Villar (DTPW), Elizabeth Ruiz (CAO), Bruce Libhaber (CAO), Namita Uppal (ISD), and Vanessa Lauchaire (ISD). January 24, 2018

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acknowledged that she had reviewed the agenda item at the time but had overlooked this specific statement.

The OIG found no evidence throughout the planning, negotiation, and finalization of the procurement package for the 181 CNG buses that the Director was part of the process or had even been informed of the procurement. We note that there appears to have been poor communication among DTPW management and staff, and little to no coordination with the Director's Office, as this purchase worth over \$108,000,000 advanced through the system. Given these circumstances, the OIG was not surprised to hear the Director questioning staff's intent and decision-making.

When the Director stopped this procurement action, all communications pertaining to this item seemed to stop. Gillig, the vendor who had signed the agreement, was never formally advised that its Letter of Agreement would not be executed by the County. Gillig's Sales Manager informed the OIG that he made repeated attempts to get an audience with the Director to learn if there was a problem with the proposed bus purchase, but was unsuccessful in his attempts. He advised that he eventually managed to get a meeting with DTPW Deputy Director Frank Guyamier. The Gillig Sales Manager expressed his concerns but learned nothing from Mr. Guyamier. The Director remained unavailable. Out of frustration, Gillig decided to hire a lobbyist to deal with Miami-Dade County.

As relayed in the January 24, 2018 email, the possibility of amending the Trillium agreement to allow for the purchase of additional buses was seriously considered. Only after learning the FTA would not view such an amendment favorably, likely jeopardizing the eligibility of federal funding for bus acquisition, was the matter dropped.⁶¹

E. 2018 Procurement Activity

After learning that amending the Trillium agreement was not a viable solution, DTPW staff, in the fall of 2018, reconsidered purchasing buses from the LYNX contract again. The OIG was advised that around that time, budgetary capacity and approval was established for the purchase of an additional 245 CNG buses. Notwithstanding, the internal effort was stopped in or around October 2018 when Deputy Director Alberto Parjus conveyed a preference to develop an ITB to buy more CNG buses.

The Deputy Director, in an interview with the OIG, explained the benefits of "robust engineering." By conducting an extensive engineering review of the CNG buses now

⁶¹ The OIG in discussing the matter with the Assistant County Attorney [for DTPW] learned that he personally reached out to his counterpart at the FTA and inquired about the possibility of amending the MDA to allow for the purchase of additional buses.

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operating in the fleet, heightened technical specifications could be incorporated into a procurement solicitation to ensure the best equipment is acquired to meet the unique service needs of our community. The Deputy Director did not believe accessing a contract awarded five years ago would afford DTPW the opportunity to incorporate new technical standards.

DTPW staff prepared a preliminary schedule for the proposed ITB that would have an award item ready for consideration by the BCC during the summer of 2019. The delivery of 245 buses was planned to begin in July 2020. In November 2018, the DTPW Budget Division had cleared the finances for this ITB, approving an amount not to exceed \$185,850,000 for MDT Project No. CIP202, titled "Purchase Additional 245 CNG 40 FT Buses."

Apparently, no one told the BCC about the pending Invitation to Bid being prepared by DTPW. On December 4, 2018, by a vote of 9 – 2, the BCC directed the Administration use all available funds to purchase CNG buses by accessing the LYNX contract and other existing competitively bid bus procurements around the country. The OIG observes that during the BCC's discussion of the agenda item that would become Resolution R-1262-18, there was no mention of the impending ITB that staff was working on. Moreover, we note that that the BCC apparently was never advised about the cancelled 2017 procurement initiative to buy 181 CNG buses through the LYNX contract. Outside of the department, there was an information void pertaining to bus procurements to keep pace with the department's fleet replacement plan. This lack of communication about the intentions of the DTPW created an opportunity for others to provide input.

F. Procurement in the Political Arena

Without a clear plan articulated by DTPW for future CNG bus procurements, the lack of progress in acquiring new buses created an exigency for the procurement of additional buses on an accelerated level. DTPW's multi-million capital procurement program was slipping from the department's control to the political arena. Vice-Chair Edmonson's resolution (adopted on December 4, 2018 as R-1262-18) was the first and only legislative item to be considered by the BCC relating to DTPW's bus fleet since the Trillium agreement was approved almost two years earlier in January 2017.

The OIG was advised by Gillig's lobbyist that he was retained in 2018, after the Letter of Agreement to purchase 181 CNG buses via the LYNX contract went nowhere.⁶² Not

⁶² The lobbyist, Al Maloof, also noted that the former Transit Director, Roosevelt Bradley, serves as a technical consultant to his firm, but was not engaged to lobby the County. In a later interview with the OIG,

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receiving any adequate explanation from DTPW staff as to why the procurement was terminated, Gillig's lobbyist told the OIG that he met with elected officials to advocate for the purchase of more CNG buses. Specifically, the lobbyist proposed accessing the LYNX agreement before it was due to expire.

Vice-Chair Edmonson, who also was the Chair of the Transportation and Public Works Committee, had made public inquiries about the utilization of the LYNX agreement during a BCC discussion on November 8, 2018.⁶³ She later introduced the Resolution directing the utilization of the agreement to acquire more CNG buses. An amendment requested by the Administration was included that opened the door for DTPW to access other available competitively-bid contracts. The authorization of this flexible procurement initiative, unrestrained by a normal bidding process, allowed vendors to engage in free-style negotiations.

Because there was no competitive procurement process in effect—only directives to access other contracts—the County's Cone of Silence was not in effect. Following the adoption of Resolution R-1262-18 on December 4, 2018, there was a flurry of communications between County staff and the various representatives of bus manufacturers seeking to fulfill the County's request for new CNG buses.

G. Procurement Free-for-All

In the wake of the policy setting action of the BCC, DTPW grappled with numerous procurement options and a steady stream of offers from vendors. On December 5, 2019, the day after the BCC adopted R-1262-18, representatives of New Flyer contacted DTPW's Procurement Chief to advise that the "New Flyer team is diligently working on proposals for up to 245 compressed natural gas buses off of both the State of Virginia contract and the State of Iowa contract, for Miami Dade's consideration."⁶⁴ Pertaining to

Mr. Bradley independently confirmed his affiliation with Maloof and that he was not a lobbyist for either Gillig or New Flyer. In addition, Mr. Bradley told the OIG that he, from-time to-time, serves as subject matter expert for the Transit Workers Union (TWU), including participating in TWU-related collective bargaining activities. Mr. Bradley also stated that, since he knows bus operations and individuals—both in and outside of the County— whose work involves bus operations, these individuals may call him. He gives them advice and may occasionally speak at a public forum, such as the BCC. Mr. Bradley is active in various professional organizations, such as the Conference of Minority Transportation Officials (COMTO) and the American Public Transportation Association (APTA). In addition, Mr. Bradley noted that he owns a DBE-certified parts supplier, United Brake and Clutch Service, LLC.

⁶³ Agenda Item 5I: Resolution authorizing Miami-Dade County Bus Service adjustments to be implemented on or after November 2018.

⁶⁴ Email. Subj: Update on New Flyer Price Proposals for XN40 Buses. From: Stephanie Laubenstein. To: Ana Rioseco. Cc: Carlos Delgado; Carlos De La Torre; Jennifer Mitchell; John Andrews.

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the LYNX contract, likely in anticipation that Vice-Chair Edmonson's procurement directive would pass, DTPW and Gillig began discussing a possible Letter of Agreement for 240 and 295 CNG buses on December 3, 2018.⁶⁵ The next day, on December 4th, DTPW inquired of Gillig what other FTA-approved contracts it had available for the purchase of 40-foot CNG buses.

Gillig responded on December 5th noting that the LYNX agreement is "the best available contract for Miami-Dade County" and that Gillig will commit to accelerating bus deliveries to more than 20 per month if desired.⁶⁶ In a follow-up email sent on December 6th, which was addressed to various DTPW personnel, including Director Bravo, Gillig mentioned that even though it had the lowest base price for a 40-foot bus on the Commonwealth of Virginia contract, Gillig's price on the LYNX contract was even lower and the delivery schedule pursuant to the LNYX contract would be earlier. DTPW then requested that Gillig provide its final price for a 40-foot CNG bus meeting DTPW's specifications based off of the Commonwealth of Virginia contract (the Virginia contract).

Notwithstanding this email exchange, an erroneous belief apparently emerged among key staff. The belief was that the only two vendors on the Commonwealth of Virginia Contract No. E194-75548 that could provide CNG buses were New Flyer and Nova; and that Gillig was only available to provide CNG buses through the LYNX contract. This was apparently the thinking even though Gillig clarified on December 6th that "Although GILLIG's 40-foot CNG base price is the lowest out of all the bus manufacturers that submitted bids for the VA contract, the per vehicle contract price would be an increase over your current price off the Florida LYNX Consortium contract."⁶⁷

In a December 11, 2018 memorandum to Mayor Gimenez, the DTPW Director reports: "The quotes for new CNG buses through the State of Virginia contract, from at least two vendors, closely match Gillig, LLC pricing through the LYNX contract." (The two vendors mentioned are New Flyer and Nova.) Based on this understanding, the DTPW Director "recommended that the planned purchase of 250 new 40-foot CNG buses be divided among several vendors to insure competitive pricing and expedited production schedules." Further, the Director proposed that 120 buses be purchased from Gillig through the LYNX contract before it expires, and the remaining balance of 130 buses

⁶⁵ Email. Subj: LOA's for 240 and 295 buses off the LYNX Contract. From: Butch Sibley. To: Carlos Delgado. In later emails, Mr. Delgado asked Mr. Sibley to revise the number from 240 to 245 buses.

⁶⁶ Email. Subj: RE: Additional 40 Foot CNG Low Floor Buses. From: Bill Fay. To: Carlos Delgado. Cc: Ana Rioseco; Carlos De La Torre; Kaushik Parekh; Bill Fay; Joe Policarpio; Butch Sibley.

⁶⁷ Email. Subj: RE: Additional 40 Foot CNG Low Floor Buses. From: Bill Fay. To: Carlos Delgado. Cc: Ana Rioseco; Carlos De La Torre; Kaushik Parekh; Butch Sibley; Joe Policarpio; Alice Bravo; Bill Fay. Note that this email was a subsequent conversation to the same email thread that began on December 4, 2018; however the December 6th correspondence included Director Bravo being added to the Cc: list.

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from the Virginia contract, or possibly a pending contract by Jacksonville, Florida. This recommendation was approved by Mayor Gimenez.

In our discussions with Gillig representatives, they advised there was no explanation why the order was reduced from 245 to 120 buses. Initially, their discussions with DTPW were for a purchase of 245; it was not until the final day that they were advised that the order would only be for 120 buses. As further discussed in the next subsection of this report, it was not until April 2019, four months later that DTPW urgently requested that Gillig provide a price summary for an additional 40 buses from the Virginia contract.

After a purchase order is issued to Gillig for 120 40-foot CNG buses on December 11, 2018—the last day of the LYNX contract before it expired—DTPW spends the next four months making arrangements to purchase another 130 buses from the Virginia contract only communicating with New Flyer and Nova. On April 3, 2019, Nova advises DTPW's Deputy Director Alberto Parjus that "Nova Bus can no longer commit to the delivery date at this point."⁶⁸ The decision by Nova to withdraw leaves—in the minds of key DTPW staff—only one remaining vendor under the Virginia contract—New Flyer. Even as late as April 9, 2019, Deputy Director Parjus advised staff in an email that "Gillig is not a vendor in the Virginia contract."⁶⁹

At some point, DTPW realizes that Gillig is a viable vendor for 40-foot CNG buses under the Virginia contract. By April 12, 2019, DTPW staff was sending emails to Gillig stating "We are in need of a Price Change Summary, Price Change detail schedule, and Delivery schedule in order to move forward with the procurement of 40 40' CNG Gillig buses from the Commonwealth of Virginia Contract."⁷⁰ At no other point during these back and forth discussions, do we find that Gillig was requested to provide pricing or delivery scheduling for any quantity below or above 40 buses pursuant to the Virginia Contract.

⁶⁸ Email. Subj: RE: Proposed delivery schedule for Miami Dade. From: Larose Martin. To: Alberto Parjus. Cc: Alice Bravo; Ana Rioseco; Carlos Delgado.

⁶⁹ Email. Subject: Re: RQMT1900021 Accessing the Commonwealth of Virginia Master Contract E194-75548-MA2275. From: Alberto Parjus. To: Carlos Delgado. Cc: Ana Rioseco; Colin Amorer

⁷⁰ Email. Subject: Acquisition of Buses Via the Virginia Contract. From: Carlos Delgado. To: Butch Sibley; Joe Policarpio; Bill Fay. Cc: Alberto Parjus; Ana Rioseco; Colin Amorer.

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H. Recommended Contract Award to Acquire CNG Buses from the Virginia Contract

On June 12, 2019, The Transportation and Finance Committee (TFC) considered a resolution⁷¹ seeking a bid waiver and the authorization to expend \$80,398,454 to obtain 140 CNG buses from the Virginia contract.⁷² DTPW proposed splitting the order: 100 buses from New Flyer and 40 buses from Gillig.⁷³ As noted in the Mayor's recommendation, "the fastest delivery schedule would be achieved by the proposed combination of vendors and bus quantities that is being recommended."

At the referenced TFC meeting, DTPW Director Alice Bravo noted that the New Flyer's price per bus (\$578,589) was "slightly higher" than Gillig's (\$576,987), "but it also includes a \$5,000 credit for bus parts, so when you take that into account, the New Flyer bus price is actually lower." The introduction by the Director of this new pricing variable caught Commissioners off guard. Justifiably so. The \$5,000 credit for bus parts was not referenced anywhere in the 111 pages of the agenda item. This item included New Flyer's *Price Change Summary*, dated April 18, 2019 and *Price Change Detail*—neither of which reflected the mentioned \$5,000 credit.

Notwithstanding the June 12th credit announcement, the existence of this credit was first disclosed to DTPW on December 7, 2018. In an email to DTPW representatives, including its Deputy Director for Finance/Administration and its Chief Procurement Officer, New Flyer states:

... attached is an updated proposal for both the State of Virginia contract as well as the State of Iowa contract ... As discussed, the proposed prices are for up to 245 buses and the price is reflective of 2019 line entries ... In addition, the \$5000 per bus spare parts/

⁷¹ Agenda Item 3A, File #191268 *Recommendation for Approval to Award a Bid Waiver Contract: E194-75548, Purchase of CNG Buses, and Authorizing County Use of Charter County Transportation Surtax Funds for Such Purpose.*

⁷² While Miami-Dade County could access the FTA-approved Virginia contract, it was not a competitively awarded contract, and thus pursuant to County procurement guidelines, the County could only access it through a bid waiver. The Virginia RFP required each bus manufacturer to provide its base price and option equipment prices, so customers would be able to customize their bus purchases. There was no price competition among the vendors, thus it was a non-competitive award.

⁷³ The Nova Bus Company (Nova), a 3rd participant in the subject contract, was effectively eliminated from consideration because to do so required Nova to produce a "pilot" bus for DTPW evaluation, prior to its production. As a result, Nova was unable to meet DTPW's delivery needs. In contrast, both the New Flyer and Gillig 40-foot CNG buses had already been evaluated and accepted by DTPW; thus, they were available for production and delivery.

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publications/training credit for a minimum order of 100 buses is included as well. (OIG emphasis)

This offer, we believe, was the genesis of DTPW's choosing to award a 100-bus purchase to New Flyer. From mid-December 2018 up until late April 2019, negotiations were based on the additional total quantity of 130 buses.

- In January 2019, DTPW requests New Flyer provide pricing and scheduling for 130 buses. New Flyer responds to the request and commits to a delivery of 8 – 10 buses per week.
- On or about April 2, 2019, the quantity directed to New Flyer drops to 65 buses; this presumes that Nova will be allowed to provide 65 buses, thus totaling a combined purchase of 130 buses. New Flyer is prepared to begin delivering buses at a line rate of 5 buses per week, for the first four weeks of production, and then the rate would increase to 8 – 10 per week.
- Upon learning that Nova could not meet the requested delivery schedule, and realizing that Gillig was indeed a viable vendor on the Virginia contract, DTPW, on April 12, 2018, requests New Flyer to submit a revised proposal for 90 buses.
 - On this same date, DTPW requests that Gillig provide pricing and delivery scheduling for 40 buses.
 - Also on this same date, DTPW Procurement advises ISD Procurement that management has directed staff to move forward with purchasing 90 Buses from New Flyer and 40 from Gillig.⁷⁴
- On April 18, 2019, New Flyer submits revised pricing to DTPW for 100 buses. While not reflected in the *Price Change Summary* sheet, the \$5,000 credit is disclosed on the cover letter. The credit will only apply to an order that is a minimum of 100 buses.
 - An inter-departmental memorandum (dated April 29, 2019) is sent from the DTPW Director to the ISD Director. The memorandum advises that DTPW's evaluation of the Virginia contract has determined that "Gillig and New Flyer will be able to manufacture all one hundred and forty buses and

⁷⁴ Email. Subject: Re: State of Virginia Contract for CNG Buses. From: Ana Rioseco (DTPW). To: Jesus Lee (ISD); Namita Uppal (ISD/CPO); Vanessa Stroman (ISD). April 12, 2019.

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deliver by the end of March 2020.” This inter-departmental memorandum does not disclose the quantity split between Gillig and New Flyer, but it does disclose each vendor's price per bus.

- ❖ Gillig's pricing proposal per bus is \$576,987.00
 - ❖ New Flyer's pricing proposal per bus is \$578,589.74
- There is no mention of New Flyer's proposed \$5,000 per bus credit in this inter-departmental memorandum.
- On May 6, 2019, ISD sends New Flyer a proposed Letter of Agreement for 100 buses; on the same day, ISD sends Gillig a proposed Letter of Agreement for 40 buses.

Up until April 18th, when New Flyer submits revised pricing for 100 buses and reiterates its \$5,000 per bus credit towards spare parts, training etc., the total quantity of buses being proposed was only 130 (in addition to the 120 already purchased off the LYNX contract). We found no correspondence or explanation that increased the total amount from 130 to 140 buses.

Back at the TFC meeting of June 12, 2019, within minutes of the Director's mention of the credit, a representative of Gillig was recognized and made a commitment to match New Flyer's offer that was just announced by the Director. Following this meeting, DTPW requested that New Flyer formally amend its contract pricing proposal to include the credit offer, which it did. A similar request was later made of Gillig; however Gillig only offered the credit on similar terms, i.e., on a minimum order of 100 buses.⁷⁵

I. Initiative to Access the Virginia Contract Fails

The agenda item for the purchase of 140 CNG buses from the Virginia contract was forwarded by the TFC to the full BCC without recommendation. At the BCC meeting, held on July 10, 2019, Agenda Item 8F21 (for the purchase of the 140 CNG buses off the Virginia contract), was removed from the agenda on a technicality—the item failed to receive a motion. In the absence of a renewal petition signed by seven Commissioners, the Administration would have to wait six months to introduce the recommended contract award again.⁷⁶

⁷⁵ Letter of June 21, 2019. REF: Transportation and Finance Committee Dated 6-12-2019. To: Ana Rioseco, DTPW Procurement Chief. From Joseph Policarpio, VP of Gillig

⁷⁶ BCC Rules of Debate. Rule 7.01(j)

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Less than one week later, on July 16, 2019, the Mayor's Office forwarded to the BCC a notice of its intent to issue an Invitation to Bid (ITB) to purchase 140, 40-foot CNG buses. The ITB was issued on July 26, 2019. Proposers' bids were due Friday, September 11, 2019 by 6:00 p.m.

At the BCC's meeting of September 4, 2019, during a discussion item on CNG buses,⁷⁷ Commissioners requested that the OIG's report on CNG buses be provided to them prior to any further consideration of bus purchases.

On September 11, 2019, prior to the 6:00 p.m. bid due date/time, the OIG formally requested of ISD that it temporarily postpone its opening of the bids, for up to 30 days, to allow the OIG to conduct its review and offer our observations without the distraction of a highly-charged procurement award. ISD agreed to "temporarily suspend review of the bids received in response to Solicitation FB-01356 – 40' CNG Buses."

On October 9, 2019, the OIG made a second request, this time to DTPW, that the OIG's "hold" on the bid opening again be extended for another 30 days. The basis for our second request was to allow enough time to provide DTPW with a draft report for its review and comment, and for the OIG to prepare a final report. Later that day, DTPW agreed to the OIG's request.

VII. GOING FORWARD

The OIG, after careful consideration, presented two suggestions. First, that the pending ITB for 140 CNG buses should be suspended; and second, that the option to modify the Trillium contract, committing the County to a multi-million dollar investment for CNG at the Northeast Depot, should be temporarily held in abeyance. The OIG made both of these suggestions so that there could be enough time to have a broader policy discussion about the future make-up of the County's bus fleet and the County's future dependence on fossil fuels, particularly natural gas. The OIG believes the County is at a critical juncture where significant transit policy decisions by the BCC must be made. To that end, the OIG posited eight policy questions.

In its response to the draft report, DTPW stated its intention of moving forward with both the procurement for new buses and an amendment to the Trillium Master Developer Agreement for a third facility. In its response, DTPW has also provided answers and explanations to these eight questions. The OIG has excerpted and/or summarized

⁷⁷ Agenda Item 6B4 (Legislative File #192223)

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DTPW's comments and provided them (and any charts or tables) following each OIG question.⁷⁸ While the OIG is appreciative of DTPW's time and effort in addressing these policy questions in its response to the draft report, the OIG observes that some of DTPW's answers do not address completely or accurately the questions. As appropriate, the OIG has added additional comments following DTPW's answers.

OIG Question 1: When the upstream environmental impacts of natural gas and diesel fuel production are included, what is the comparative differential in greenhouse gas emissions between a CNG bus fleet and a clean diesel bus fleet? If the goal is to reduce greenhouse emissions, does a cost-benefit environmental analysis warrant additional investment in CNG? To address the near-term bus replacement needs of DTPW, could new clean diesel buses remain an option?

*DTPW Response: Upstream fuel emissions "Well-to-Wheels" (WTW) are based on the extraction, refining, transport and distribution of fuels. Upstream Fuel Emissions Indirect emissions are not generally included in the calculation, as they are fraught with difficulty. However, based on a 2013 study by MJBradley "the total wells-to-wheels Green House Gas (GHG) emissions (g CO₂-e/mi) are generally slightly higher for CNG buses than for diesel buses, due primarily to the "upstream" impact of methane emissions from natural gas production and processing. The annual GHG emissions from operating new CNG buses instead of new diesel buses could be as high as 1000 lbs. of CO₂-e per bus."*ⁱ

*A 2015 study from the Environmental Defense Fund found that "burning natural gas as compared to diesel results in an approximate 30% climate benefit at combustion due to a reduction in carbon dioxide emissions, the advantage is closer to 20% once the fact that natural gas engines are less efficient is taken into account."*ⁱⁱ

Overall Diesel and CNG Buses emit very similar levels of CO₂ from the tailpipe, however natural gas buses have lower carbon content and lower Nitrogen Oxide (NO_x) emissions from the tailpipe than diesel buses. As such, CNG bus operations are preferable to clean diesel buses. It is important to note that per the contract, the vendor is required to provide twenty percent of the CNG from renewable gas sources.

ⁱ <https://mjbradley.com/sites/default/files/CNG%20Diesel%20Hybrid%20Comparison%20FINAL%2005nov13.pdf>

ⁱⁱ <https://www.edf.org/energy/report-climate-impacts-natural-gas-trucks>

⁷⁸ Direct quotes from DTPW's response is in italics.

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OIG Comments: The need for further research to provide policy guidance is underscored by the ambivalent response. DTPW notes that studies have found the greenhouse gas emissions are higher for CNG than diesel buses when upstream production impacts are considered, but then declares CNG bus operations are preferable to clean diesel buses.⁷⁹ The OIG encourages the BCC to explore this issue further, before eliminating the possibility of clean diesel buses from the bus replacement plan.

OIG Question 2: The County now has years of experience with hybrid diesel-electric buses. All the 89 articulated 60-foot buses and 48 of the 40-foot buses are hybrids. Does the professional staff of DTPW see an advantage to investing in more hybrid buses? What does the cost-benefit environmental analysis of hybrid buses tell us?

DTPW Response: As noted above, natural gas buses have lower carbon content and lower Nitrogen Oxide (NOX) emissions from the tailpipe than diesel buses. Total wells-to-wheels GHG emissions are generally lower for hybrid buses than from diesel or CNG buses due to their higher miles per gallon. However, there is a significant cost savings associated with CNG buses. The per-bus cost benefit over 12 years is detailed in figure 1 below.

Tech-nology	Purchase Cost	Infra-structure Cost	Battery or Engine Replacement	12-Year Fuel Cost	12-year Maintenance Cost	Total
Diesel	\$550,000	\$ 28,840	\$ 50,000	\$ 432,899	\$ 868,800	\$ 1,930,539
CNG	\$561,000	\$ 103,000	\$ 50,000	\$ 199,968	\$ 768,000	\$ 1,681,968
Hybrid	\$685,000	\$ 28,840	\$ 100,000	\$ 409,041	\$ 1,118,400	\$ 2,341,281

Figure 1

OIG Comments: Hybrid buses apparently have the lowest emissions of greenhouse gas but are more expensive than CNG or diesel over a 12-year period. Additionally, prices from the aforementioned Virginia contract seem to indicate that the price difference between diesel and CNG buses is significantly more than the \$11,000 depicted in the table above. The replacement frequency for CNG engines appears understated. The OIG

⁷⁹ Upstream environmental impacts of natural gas extraction may include the methane that is typically leaked during extraction and transportation of natural gas. Another highly criticized extraction method is hydraulic fracturing (aka fracking), whereby extraction wells are stimulated by the injection of pressurized liquid to create cracks in the deep-rock formations through which natural gas will flow more freely. When hydraulic pressure is removed, the hydraulic fracturing proppants hold the fractures open, thereby weakening the earth's core and increasing the risk for ground water and surface water contamination and seismic activity, i.e., triggering earthquakes.

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encourages the BCC to seek additional supporting information regarding the figures presented in the cost-comparison table.

OIG Question 3: Does DTPW plan to have the ability *at each depot* to provide diesel fuel, CNG, and electrical charging? Is the footprint at each location large enough to accommodate the fueling/charging and maintenance for each bus-type? Are there plans to acquire or develop new depot locations, consistent with pending changes to the route configurations?

***DTPW Response:** Yes [as to each depot having all three fueling abilities]. Yes [as to the footprint]. Additional equipment will be installed to improve the efficiency of maintenance work. Yes [as to acquiring or developing new depots]. [A]s the need arises the Department will look to acquire locations. Also, if there is an increase in the fleet there may be a need for an increased footprint. DTPW has been considering potential sites for expansion in the southern part of the County.*

OIG Comments: The OIG encourages the BCC to examine the proposed fueling configurations at each depot to better assess the capacity to accommodate diesel, CNG, and battery-electric fueling stations.

OIG Question 4: Should the County make another multi-million dollar investment for another CNG fueling facility at the Northeast depot? How many years of paying fuel surcharges will it take for DTPW to break even on this investment? Is the estimated annual fuel surcharge per bus to pay off the CNG fueling station more than \$10,000 a year?

***DTPW Response:** Yes, the additional facility will allow for the fueling and maintenance of CNG buses assigned to the Northeast Depot. Currently, the bus routes from the Northeast depot are served primarily by non-CNG buses, which are older and less reliable. Construction of the a [sic] CNG fueling facility will allow for these routes to benefit from a more modern fleet of buses.*

As to the estimated annual fuel surcharge, DTPW stated it would take 12 years, at a cost of \$9,644.81 per bus. DTPW provided a chart depicting the cost breakdown. DTPW's chart is reproduced on the next page.

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<i>GGE (Gasoline Gallon Equivalent) (CNG) in Therms</i>	1.25000
<i>Annual Bus Mileage</i>	40,000
<i>Average Miles per Gallon</i>	3.66
<i>Annual Average Number of Gallons per bus</i>	10,929
<i>Annual Average Number of Therms used</i>	13,661
<i>Tax Exempt Adder per Therm</i>	\$0.706
<i>Annual Average Capital Per Bus</i>	\$9,644.81

Figure 2

OIG Comments: DTPW's response did not reveal the anticipated capital cost of the CNG fueling facility or provide the expected number of CNG buses that would be assigned to the Northeast Depot. This factor is important as DTPW earlier answered that each depot would be outfitted with all three fueling options. The BCC should be apprised of the approximate number of CNG buses that would be stationed and fueled at the Northeast Depot. The BCC should seek clarification of this from DTPW.

OIG Question 5: Does the construction of CNG facilities at Northeast preclude a future electrical charging station?

DTPW Response: No, the stationary electric charging station will be positioned within the facility away from the CNG fueling area. In addition, this will allow for future CNG power generation as a back up to the FPL electrical supply.

OIG Comments: What distance away from the CNG fueling facilities is it considered safe to position an electrical charging station?

OIG Question 6: For a major transit agency like Miami-Dade, is there an optimal mix of bus-types by energy source to minimize the impact to the County from market spikes in the price of diesel, CNG, and electricity? Has DTPW determined the ideal bus fleet composition for Miami-Dade County?

DTPW Response: DTPW monitors the availability of resources and it maintains a reserve of fuel at each facility for the short term. Figure 3 reflects fuel prices over the past 18 years with CNG and Electric remaining relatively stable.

Determining the ideal bus fleet is an ongoing process as we implement and evaluate new technologies. Additionally, changing factors, such as new technology, improvements to

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current technology, traffic patterns, funding, ridership projections, reliability data and performance make establishing a finite fleet composition a process that will fluctuate now and into the future.

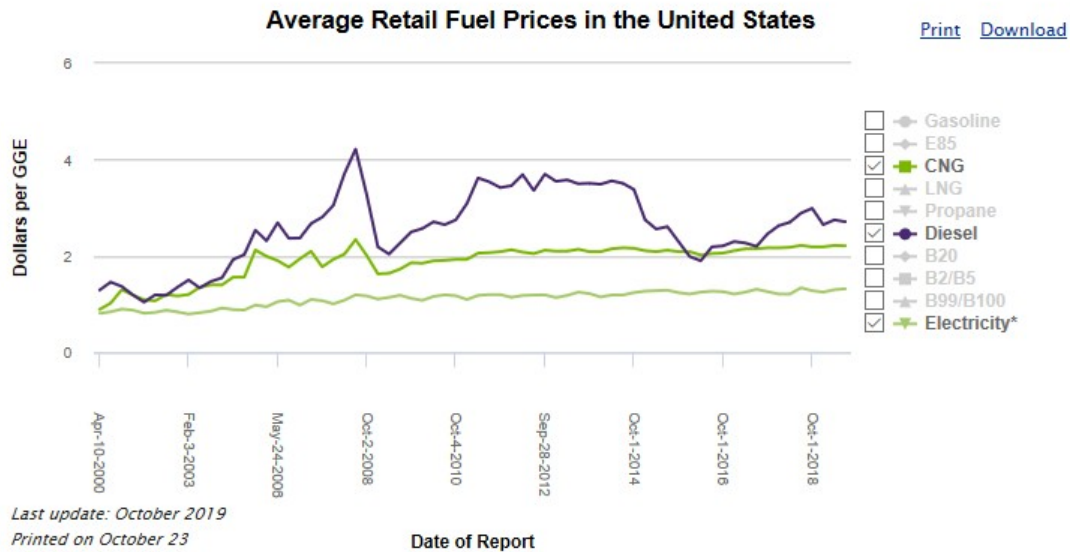


Figure 3²

OIG Comment: DTPW explained the process but did not answer the question pertaining to the ideal fleet composition. Based on past fuel pricing trends, what would be the ideal fleet mix today?

OIG Question 7: To accommodate electric buses, will new FPL infrastructure be needed at, or near, each depot? What are the physical space requirements for parking and recharging electric buses? Do buses park parallel or wishbone along an electric corridor? Do the current depots have space to accommodate the charging facilities for electric buses?

DTPW Response: *Most likely additional electrical feeders will be needed to increase capacity. The Department is working with FP&L and the Electric Bus Vendor to find the best possible solution for our needs.*

[As for the physical space requirements,] that is yet to be determined and will depend on the time required to charge each bus, it may be a 2- or 4-hour charge which will determine the number of buses that can occupy the same space during the charging period.

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[As for parking,] each bus yard is configured differently and parking of the vehicles depends on the bus yard and bus charging port configurations.

As for having space to accommodate charging facilities, DTPW responded – Yes.

OIG Comments: If the spacing requirements for electrical charging stations have not been determined, how has DTPW concluded sufficient land area is available to accommodate an electrical fleet and CNG buses?

OIG Question 8: Has the County considered satellite electric charging stations and centralized maintenance facilities? Is there any possibility of charging buses from the existing power supply along the Metrorail corridor? Could an electric charging operation be co-located with a new waste-to-energy plant?

DTPW Response: DTPW responded affirmatively that it has considered satellite charging stations. As to the possibility of charging buses from the existing power supply, DTPW explained: *The power required to charge the buses may exceed that which is currently available from the Metrorail traction power substations. The Department will need to determine excess capacity and assess available space.* Last as to co-location with a new waste to energy plant, DTPW responded that it is “*not aware of any of waste-to-energy plants being within reasonable proximity to any of our routes.*”

OIG Comment: While there may not currently exist any waste-to-energy plants in the vicinity, would the County be amenable to exploring future options for constructing a waste-to-energy plant that could supply power for other County uses?

Notwithstanding DTPW's answers to the policy questions and its stated intention to continue on the same path, the OIG believes that further policy discussion by the BCC would be beneficial. Before the County invests tens of millions of dollars in additional CNG infrastructure, and spends another \$80 million for additional CNG buses, effectively locking in the County's dependence on natural gas, the OIG believes that a brief pause in bus replacement procurement (for up to 90 days) will afford the Mayor and BCC an opportunity to conduct a clear-eyed assessment of the County's options.

Fortunately, the County has the luxury of existing financial capacity to invest in new buses, with no pressing time constraints attached to the line of credit. Ensuring those dollars are invested strategically is paramount. Given the quantity of new buses

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introduced to the fleet, the DTPW has effectively reduced the average age of the bus fleet from **11.3 years**⁸⁰ in 2017 to an average age of **7.5 years** now.⁸¹

A limited pause in bus procurement for a policy review does not put at risk operational performance. Rather, the OIG believes this is a rare opportunity for the BCC to revisit some of its past directives⁸² and provide guidance that will maximize optimal system performance for years to come. The policy decisions embedded with the pending procurement of additional CNG buses are much more significant than prior bus acquisitions. Miami-Dade County is at a critical juncture where decisions are being made that will set the course of public transit for a generation. The OIG respectfully urges the BCC to favorably consider the recommendation to pause the procurement process for up to 90-days to allow for appropriate deliberations, with additional information and citizen input.

* * * * *

The OIG appreciates and thanks the staffs of the Department of Transportation and Public Works and the Internal Services Department for the courtesies and cooperation extended to the OIG during the course of this review. Additionally, the OIG appreciates and thanks representatives of the bus manufacturers, New Flyer and Gillig, and officials of the Transport Workers Union Local 291 for meeting and speaking with OIG staff during this review.

⁸⁰ Federal Transit Administration, Miami-Dade Transit, 2017 Annual Agency Profile.

⁸¹ Memorandum to File. Subj: Bus Facts-At-A-Glance. From: Carlos De La Torre, Chief, Performance Management. September 4, 2019

⁸² R-614-15 Title Excerpt: "Cut Greenhouse Gas Emissions by up to 28 Percent over the Next Decade." Prime Sponsor, Rebeca Sosa. Adopted 06/30/15.; R-1034-18. Title Excerpt: "Establishing Goal that the Transit Fleet have at least 50 Percent Battery Electric Powered Buses by 2035." Prime Sponsor Daniella Levine Cava. Adopted 10/02/18

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OIG SCHEDULE A

Comprehensive Timeline of Events

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OIG Schedule A Comprehensive Timeline of Events

Date	Participant	BCC Resolution or Other Identifier	Description/Comment
May 6, 2014	BCC	R-420-14 File #140811 Item 8F	Authorize Request to Advertise Solicitations, a/k/a Request for Proposals (RFP), for CNG Development Programs for (1) Transit Department and (2) ISD, PWWM, and WASD
Mar. 8, 2016	BCC	R-204-16 File #160198 Item 8F7	Authorization to access LYNX Contract No. 14-C09 for the purchase of heavy-duty transit coaches from Gillig., specifically for five (5) 40-foot diesel buses totaling \$2,670,000
Jan. 24, 2017	BCC	R-35-17 File #162416 Item 8F9	Award of the Master Development Agreement (MDA), Contract No. 00096 to Trillium
Mar. 27, 2017	DTPW	Department records	<i>Notice to Proceed</i> for CNG program issued Trillium
Spring/Summer/ Fall 2017	DTPW/ISD/Gillig	Email communications	Discussions to purchase 181 CNG buses via LYNX contract from Gillig
June 13, 2017	DTPW/ISD	Interdepartmental communications	ADPICS requisition for 181 CNG buses created
Oct. 18, 2017	ISD	Email	Gillig submits executed Letter of Agreement (LOA) to provide 181 CNG buses via LYNX contract
Jan. 8, 2018	DTPW	Department records	First New Flyer 40-foot CNG bus received
Jan. 24, 2018	ISD	Email	DTPW was no longer interested in purchasing 181 Gillig CNG buses via LYNX contract
Summer/Fall 2018	DTPW/ISD/Gillig	Email communications	Discussions to purchase 240 Gillig CNG buses via LYNX contract
October 2018	DTPW	Departmental meeting	Preliminary work initiated for an ITB to acquire CNG buses
Nov. 8, 2018	BCC	R-1124-18 File #181763 Item 5l	Authorizing bus service adjustments to be implemented on or after November 2018; comments provided by TWU representatives during the public hearing
Dec. 4, 2018	BCC	R-1258-18 File #182862 Item 11A6 Sub.	Direction to Mayor to execute MDA option to construct CNG fueling facility at Northeast Bus Depot and to procure additional CNG buses that would operate out of said facility

Date	Participant	BCC Resolution or Other Identifier	Description/Comment
Dec. 4, 2018	BCC	R-1262-18 File #182875 Item 11A11 Sub.	Authorize purchase of CNG buses pursuant to LYNX Contract No. 14-C09 in a quantity costing up to the maximum amount of available funds budgeted for FY 2018-2019 and FY 2019-2020, as proposed in FY 2018-2019 multi-year CIP
Dec. 11, 2018	DTPW	County Memorandum	Director's <i>Recommendation Regarding Purchase of Compressed Natural Gas (CNG) Buses</i> for purchasing 250 CNG buses as follows—120 CNG buses using LYNX contract and another 130 CNG buses via Commonwealth of Virginia contract
Dec. 11, 2018	ISD/DTPW	Departmental communications	Purchase Order issued for 120 Gillig CNG buses via LYNX contract
Jan. 23, 2019	BCC	R-99-19 File #190042 Item 14A3	Approve Purchase Order for 120 Gillig CNG buses, totaling \$69,210,520 via LYNX contract
Feb. 4, 2019	DTPW	Departmental records	<i>Notice to Proceed</i> purchase of 120 Gillig CNG buses via LYNX contract
Feb. 14, 2019	BCC/HCCO Committee	Resolution File #190032 Item 8F (withdrawn)	Reject all proposals received for RFP-00085 for CNG Development Program at various departments (ISD, PWWM, and WASD)
Apr. 17, 2019	DTPW	Departmental records	Updated Post Delivery Inspection (PDI) Standard Operating Procedures (SOPs) issued. By this date, 230 New Flyer 40 ft. CNG buses have been received; over 220 of which were inspected and released for service.
May 16, 2019	BCC/HCCO Committee	Resolution File #191148 Item 3G	Reject all proposals received for RFP-00085 for CNG Development Program at various departments Action: Deferred
June 12, 2019	BCC/TAF Committee	Resolution File #191268 Item 3A	Waive formal bids and award bid waiver to procure 140 CNG buses (100 New Flyer and 40 Gillig) via Commonwealth of Virginia Contract No. E194-75548 totaling \$80,938,454. Action: Forwarded to the BCC without a recommendation.
June 18, 2019	BCC	Resolution File #191268 Item 14A1	Waive formal bids and purchase 140 CNG buses (100 New Flyer and 40 Gillig) via Commonwealth of Virginia Contract No. E194-75548 totaling \$80,938,454. Action: 4-Day Rule invoked.

Date	Participant	BCC Resolution or Other Identifier	Description/Comment
June 21, 2019	BCC	Discussion Item 6B1	Existing policy on CNG Fleet
July 10, 2019	BCC	Item 1G. Reasonable Opportunity to be Heard	Presentations on CNG buses by individuals representing TWU
July 10, 2019	BCC	Resolution File #191268 Item 8F21 (no motion to move; item removed from agenda)	Waive formal bid procedures and award Bid Wavier to purchase 140 CNG buses (100 New Flyer and 40 Gillig) via Commonwealth of Virginia Contract E194-75548 totaling \$80,938,454
July 16, 2019	Mayor's Office	County Memorandum	Notice of intent to issue <i>Invitation to Bid</i> (ITB) to purchase 140 CNG Buses; response to TWU comments presented at July 10, 2019 BCC meeting
Sept. 4, 2019	BCC	Item 1G. Reasonable Opportunity to be Heard	Presentations on CNG buses by individuals representing TWU, New Flyer, and Gillig
Sept. 4, 2019	BCC	Discussion Item 6B4	BCC members request for OIG to monitor ITB for CNG buses
Sept. 11, 2019	OIG	Interdepartmental communications	Request that ISD temporarily postpone, for up to 30 days, FB-01356 bid opening and evaluation otherwise scheduled to begin at 6:00 p.m., Sept. 11, 2019
Sept. 12, 2019	ISD	Interdepartmental communications	Agrees to OIG request to temporarily postpone any action on the subject ITB
Sept. 18, 2019	DTPW/New Flyer	R-35-17 File #162416 Item 8F9	Last of the 300 New Flyer 40-foot CNG buses received
Sept. 24, 2019	DTPW/Gillig	R-99-19	First of the 120 Gillig 40-foot CNG bus received
Oct. 3, 2019	BCC	R-1041-19 File #191770 Item 8F24	RFP-00456, Proterra, Inc, Purchase of a minimum 33 up to 75 40-foot Battery-Electric Buses, NTE \$72,176,322
Oct. 9, 2019	OIG/DTPW	Interdepartmental communications	Request of DTPW for a second 30-day extension; DTPW agrees
December 2019	DTPW/Trillium	R-35-17 File #162416 Item 8F9	Estimated completion month for the Coral Way Bus Depot CNG fueling station. Original estimate was May 2018.
March 2020	DTPW/Trillium	R-35-17 File #162416 Item 8F9	Estimated completion month for the Central Bus Depot CNG fueling station; original estimated completion was December 2017

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OIG SCHEDULE B

Photographs of a CNG Tank Inspection, Taken on August 19, 2019

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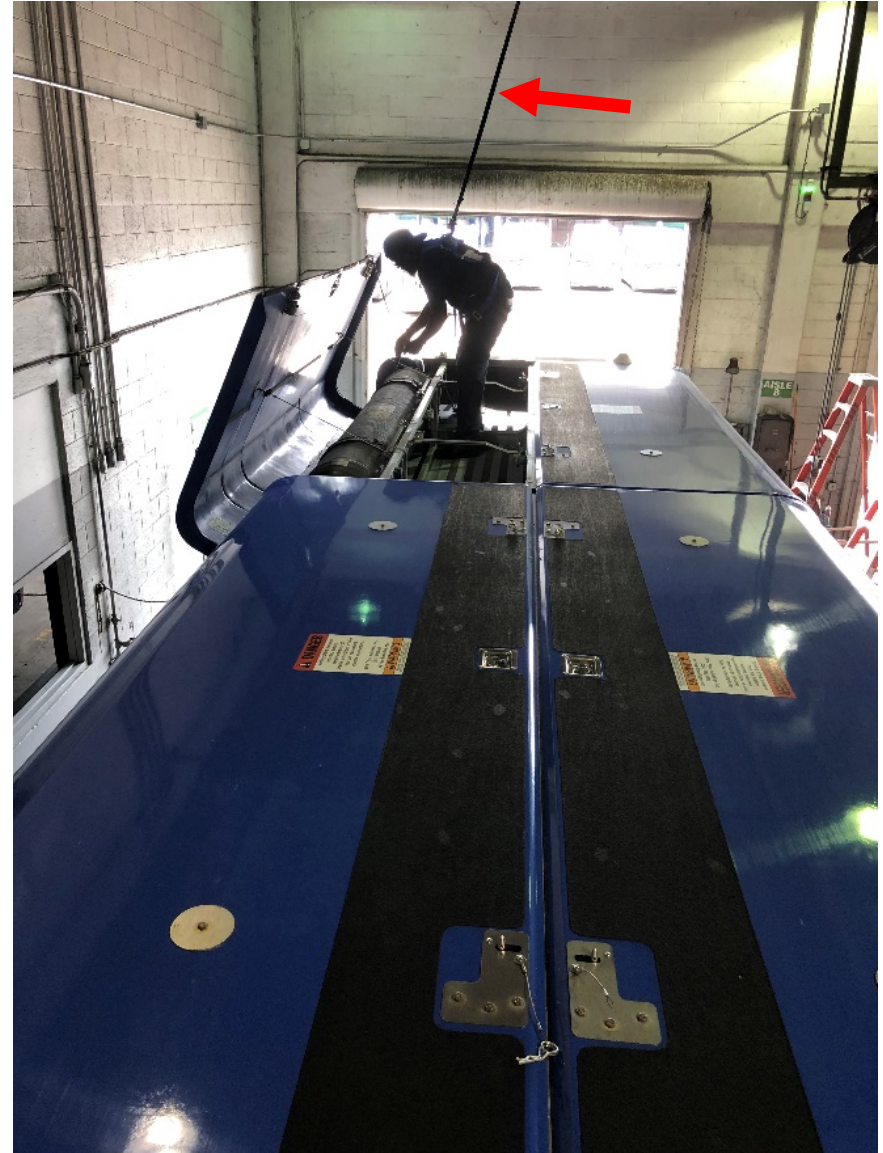
November 13, 2019

OIG Schedule B

Photographs of a CNG Tank Inspection
Taken August 19, 2019



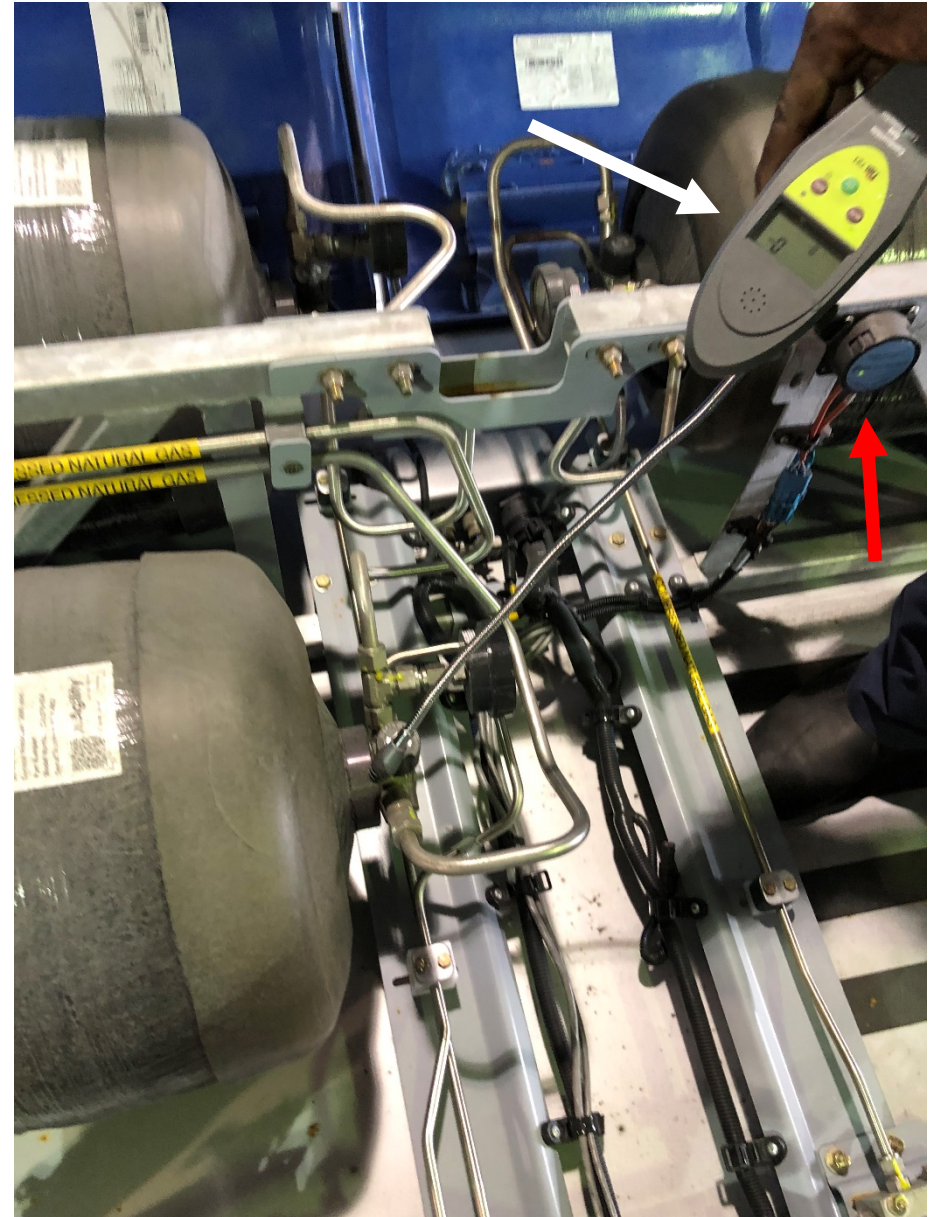
1. Access to CNG storage tank through rear roof hatch.



2. Inspector on top of the bus opening a hatch cover to CNG storage tanks. Red arrow show the inspector wearing safety harness and line.



3. Inspector using a portable leak detector to wand in and around valves, gauges, and PRD with a portable leak detector. Red arrow shows inspector in safety harness attached to tether line.



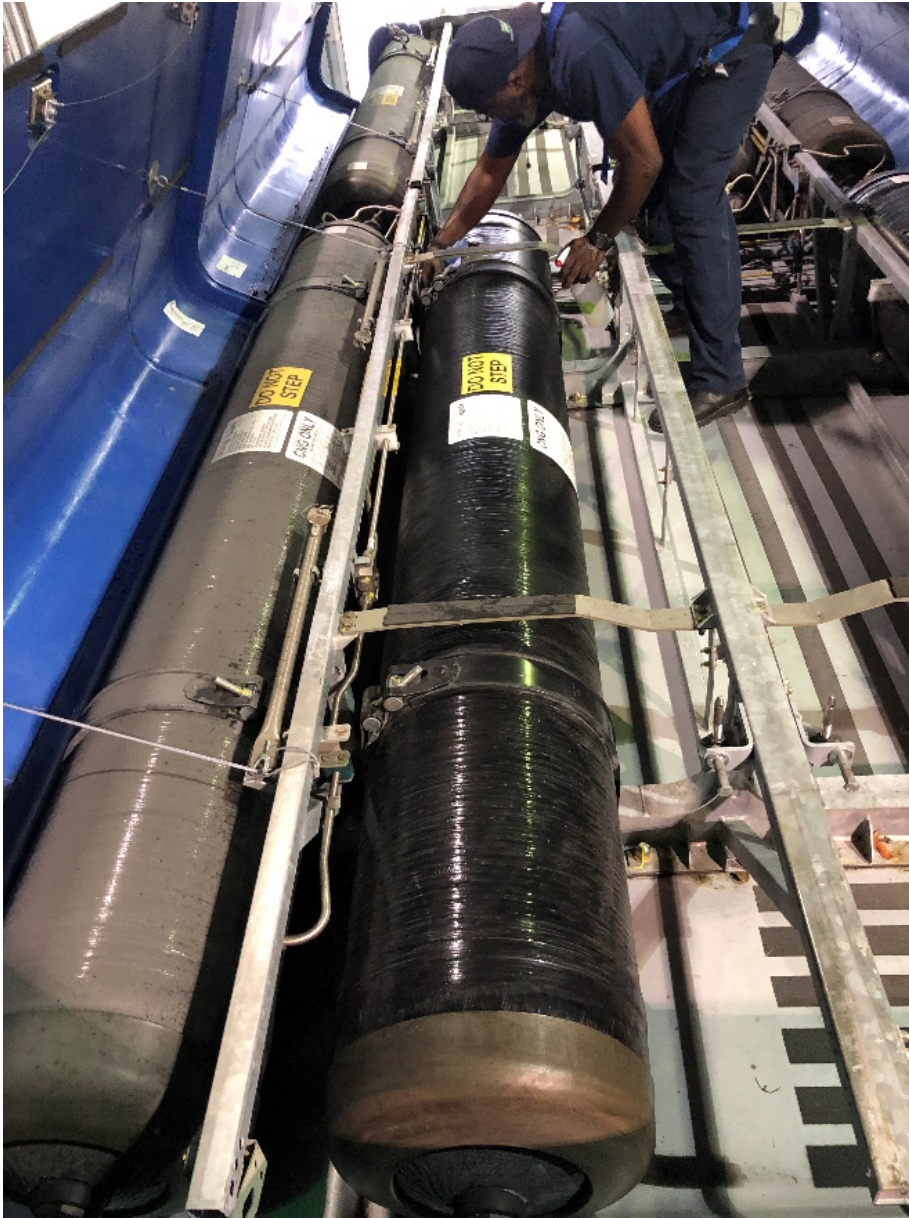
4. Inspector using portable leak detector to wand around valves and gauge. White arrow shows portable leak detector, with meter reading at "0". Red arrow shows location of fixed leaked detector in storage compartment.



5. Inspector getting paper towels and spray bottle containing soapy water to clean tanks.



6. Inspector spraying surface of CNG storage tank with soapy water to clean surface of tank. A clean tank surface is required to perform a visual inspection of the tank.



7. Inspector examining surface of tank for anomalies. Tank on the right after it has been cleaned using soapy water spray and wiped dry with paper towels. Tank on left is covered with dust and grime and must be cleaned before inspection.



8. Inspector points to an anomaly on the surface of the tank; i.e. two (2) resin bubbles. Resin bubbles can occur during the manufacture of the tank and are not considered a structural defect.



9. FOGMAKER Fire Detection and Methane Detection alarm panel in New Flyer bus located in left over-head panel. Both system lights are “green” indicating “SYSTEM OK”



10. Top: Kidde Dual Spectrum gas sensor attached to New Flyer CNG fuel tank compartment. Bottom: Amerex gas sensor attached to Gillig CNG fuel tank compartment.



11. PRD vent line outlet (with black cap) on New Flyer CNG bus.



12. PRD vent line outlets (with red cap) on Gillig CNG bus.

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OIG SCHEDULE C

Listing of New Flyer Buses with Reported CNG Leaks or Other Related Issues for the Time Period of August 13, 2018 to September 22, 2019

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OIG Schedule C

Schedule of New Flyer CNG Buses with Reports of CNG Leaks or Related Problems - August 13, 2018 to September 22, 2019
 Information Extracted from Work Orders and Natural Gas Vehicle Inspection Records Provided by DTPW
 Prepared by The Miami-Dade County Office of the Inspector General

	Date	WO #	Bus #	Description/Issue ¹	Inspector's Notes ²	Comment/Action ³
1	08/13/18	4228602	18155	Trouble with gas lite and beeping	<i>*no Inspection Report Provided</i>	Assist CNG Techs in diagnosing and performing road test. Could not duplicate problem at this time. No Problem found at this time after long road test
2	02/07/19	4343201	18121	Defective CNG tank. Needs vendor replacement.	<i>*no handwritten notes</i>	Tanks #5 & #6 repaired with new O-rings by NF ⁴
3	03/03/19	4396748	18162	Dash reads "Gas Leak/Trouble" Flashes On/Off	<i>*no Inspection Report Provided</i>	Check for possible gas leakage alarm. Not detecting any leakage or alarm activated at this time.
4	03/18/19	4409815	18136	Found a tank in front street side location leaking	Dome is leaking around inlet valve	<i>*no disposition noted in EAMS</i>
5	03/20/19	4409772	18156	Found anomalies on two tank tanks.	Manufacturer's anomaly. Resin Bubble	Resin bubbles on tank
6	03/29/19	4417437	18130	A small leak, between 60-180 ppm on front right cylinder	Small leak (80-160 ppm) on dome next to valve.	No leaks present with leak fluid detector
7	04/01/19	4418203	18161	Found PRD vent and cylinder dome or valve leaking	Leak of cylinder, leak at vent line, leak, valve or dome leaking, vent line leaking, valve or dome leaking, street/side rear PRD vent leaking over 640 ppm	Under direction of New Flyer and Agility, this bus returned to service on 04/10/19 ⁵

1. Description/Issue – excerpt from the Work Order contained in EAMS [Enterprise Asset Management System] describing complaint/condition
2. Inspector's Notes – handwritten notes taken the Inspection Report
3. Comment/Action – excerpt from EAMS screen showing disposition/resolution of the complaint
4. A warranty repair; these entries are highlighted tan
5. According to DTPW, based on discussions and/or meetings with New Flyer and Agility, all parties determined this condition was within safe limits and the bus should be returned to service.

	Date	WO #	Bus #	Description/Issue ¹	Inspector's Notes ²	Comment/Action ³
8	04/01/19	4419503	18121	Post accident tank inspection. Found two failed tanks leaking from dome around valve and inlet where the valve enters the tank.	Cylinder tank leaking at dome around valve. Dome of tank leaking and also at valve	Under direction of New Flyer and Agility, this bus returned to service on 04/10/19 ⁵
9	04/02/19	4420857	18224	Gas leaks at vent line front and rear side street.	Found leak at vent line. Found leak at shared vent line.	Under direction of New Flyer and Agility, this bus returned to service on 04/10/19 ⁵
10	04/04/19	4409815	18136	Dome is leaking around valve inlet.	Dome is leaking around valve inlet.	Per DTPW/Agility does not meet threshold for leak
11	04/05/19	4423518	18144	Found leak at front curbside and rear streetside vents – multiple. Also silicon in tubes	All four PRD vent lines were clogged with silicone and after taking silicone out all were leaking on detector. Possible one of the PRDs leaking from c/s f/o tank #4 or c/s f/l – tank #3 leaking. Using shop leak detector AmprobeGSD6000.	Under direction of New Flyer and Agility, this bus returned to service on 04/10/19 ⁵
12	04/06/19	4424846	18175	Post-accident. Possible leak at shared vent line.	Possible PRD leaking (leak on shared vent line)	<i>*no disposition noted in EAMS</i>
13	04/08/19	4424843	18190	Found vent lines on curbside front and streetside rear have gas leaks.	Check PRD-curbside vent leak detected. s/s rear vent – leak detected, need to check PRD	Under direction of New Flyer and Agility, this bus returned to service on 04/10/19 ⁵
14	04/09/19	4420877	18269	Performed after accident. Multiple leaks detected.	One or more PRD still leaking thru shared vent line. Possible PRD leaking on shared vent line. Vent line rubbing against body panel.	Under direction of New Flyer and Agility, this bus returned to service on 04/10/19 ⁵

1. Description/Issue – excerpt from the Work Order contained in EAMS [Enterprise Asset Management System] describing complaint/condition
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5. According to DTPW, based on discussions and/or meetings with New Flyer and Agility, all parties determined this condition was within safe limits and the bus should be returned to service.

	Date	WO #	Bus #	Description/Issue ¹	Inspector's Notes ²	Comment/Action ³
15	04/09/19	4425664	18216	Post accident inspection. Multiple PRD leaks.	One or more PRDs leaking through shared vent line.	Under direction of New Flyer and Agility, this bus returned to service on 04/10/19 ⁵
16	04/09/19	4424844	18132	Found all 4 PRD vent tubes clogged with silicone and leaking.	All four PRD vent tubes are leaking, also took silicone out vent tubes per order of New Flyer. FAILED	Under direction of New Flyer and Agility, this bus returned to service on 04/10/19 ⁵
17	04/09/19	4425663	18122	Found all 4 vent lines leaking, PRD valves fail.	Found all four vent lines leaking.	Under direction of New Flyer and Agility, this bus returned to service on 04/10/19 ⁵
18	4/17/19	4432559	18155	Found gas leak at vent line. 640 ppm or more.	Found gas leak at vent line. The gas detector read 640 ppm or more. The New Flyer technician says normal leak is OK to release the bus	The New Flyer technician says normal leak is OK to release the bus
19	04/19/19	4435000	18135	Tank #4 leaking. Located/ verified leak with soap solution and snoop solution	2xMeter reading 640 ppm or above at vent tube. Paul Hatton said its okay to return bus back to revenue service (New Flyer). Leaking between boss and valve. meter reading at or above 600ppm, verify leak with soap solution and snoop (tank #4)	NF remove and replace with new O-ring. ⁴
20	04/23/19	4418203	18186	Use Amprobe. Found leaks over 640 ppm around vent lines.	Leak of cylinder. Leak at vent line. Found leak. Possible valve leaking. Valve or dome leaking. Street/side rear PRD leaking over 640 ppm	<i>*no disposition noted in EAMS</i>

1. Description/Issue – excerpt from the Work Order contained in EAMS [Enterprise Asset Management System] describing complaint/condition

2. Inspector's Notes – handwritten notes taken the Inspection Report

3. Comment/Action – excerpt from EAMS screen showing disposition/resolution of the complaint

4. A warranty repair; these entries are highlighted tan

5. According to DTPW, based on discussions and/or meetings with New Flyer and Agility, all parties determined this condition was within safe limits and the bus should be returned to service.

	Date	WO #	Bus #	Description/Issue ¹	Inspector's Notes ²	Comment/Action ³
21	04/23/19		18189	Meter reading 120 at vent. Meter reading 640 or above at PRD vent	Meter read 120 at vent. Agility sad no problem with this reading. Meter reading 640 ppm or above, at PRD vent.	Agility sad no problem with this reading.
22	04/25/19	4440046	18194	Post accident. Found impact damage and 640 or higher reading	A leak of 640 PPM or more was detected on shared vent line. Impact damage on dome foam pad. Consulted with manufacturer for damage assessment.	Email: Detecting CNG leakage at vent lines does not constitute a leak.
23	04/28/19	4440811	18183	A leak up to or over 640 ppm was found on front left cylinder PRD	A leak of up to or over 640 PPM was detected on PRDs shared vent line	Email: Detecting CNG leakage at vent lines does not constitute a leak.
24	05/02/19	4444513	18190	PRD vent leaking >640ppm on tanks 2, 3, 4, 5, and 6	Check PRD – curbside vent leak detected. s/s rear vent – leak detected need to check PRD	<i>*no disposition noted in EAMS</i>
25	05/07/19	4448608	18156	Alarm, Gas Presence Alarm	<i>*no handwritten notes</i>	Check of the bus gas leak system, not detecting any activated alarm on the panel. I proceeded to be a test drive recommended by the technicians on the CNG to check if the alarm returned, (no return) If the problem occurred again it is necessary for certified technicians to check if any tank or line is leaking.
26	05/09/19	4451485	18230	System gas trouble light ON	<i>*no Inspection Report Provided</i>	inspected bus no trouble no lights on fuel level at 92%

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2. Inspector's Notes – handwritten notes taken the Inspection Report
3. Comment/Action – excerpt from EAMS screen showing disposition/resolution of the complaint
4. A warranty repair; these entries are highlighted tan
5. According to DTPW, based on discussions and/or meetings with New Flyer and Agility, all parties determined this condition was within safe limits and the bus should be returned to service.

	Date	WO #	Bus #	Description/Issue ¹	Inspector's Notes ²	Comment/Action ³
27	06/13/19	4475425	18156	Gas trouble light ON with buzzer.	<i>*no Inspection Report Provided</i>	no code found reset batteries & no duplicated problem at this time
28	06/15/19	4477675	18205	Found two PRD vent tubes reading at or above 640 ppm	PRD removed silicone from vent tube, meter reading 640 ppm or above	<i>*no disposition noted in EAMS</i>
29	06/23/19	4483258	18209	Fail inspection due to an over 10,000 PPM fuel leak on rear right cylinder rear PRD pressure fitting side	Over 10,000 PPM fuel leak on cylinder rear PRD pressure side fitting right/rear	Locate CNG leak at C/S rear PRD for vendor, New Flyer employee repaired leak ⁴ .
30	06/24/19	4484857	18162	Fire and Gas Leak protection panel gas trouble	<i>*no Inspection Report Provided</i>	New flyer inspection. Inspect fire suppression for fault. No light on warning panel. Check gauge, gas sensors for fault lights - green light on. Drove bus and verify no fault is activating on the road. Ok no problem found at this time
DTPW issued TPI 721 Combustible Gas Leak Detectors (Range 0 – 9,999 PPM)						
31	07/03/19	4490802	18165	Leak reading at 5,000	Missing vent cap, meter read 5000 ppm. Installed new vent cap Tank #2, #3, #4. Removed silicone from vent tubes. Resin bubbles, as per Agility no problem. Reading at vent tube 3000 ppm	Installed new vent cap Tank #2, #3, #4. Removed silicone from vent tubes. Resin bubbles, as per Agility no problem
32	07/10/19	4495569	18203	Tank#1 meter reading 3,000ppm at PRD vent tube	Meter read 3000 ppm at PRD vent tube (#2)	<i>*no disposition noted in EAMS</i>
33	07/17/19	4501814	18208	Leak reading at 6,000 ppm	Meter reading 6000ppm (okay by Agility) (#2), (#6)	As per Agility, no problem at this time

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3. Comment/Action – excerpt from EAMS screen showing disposition/resolution of the complaint
4. A warranty repair; these entries are highlighted tan
5. According to DTPW, based on discussions and/or meetings with New Flyer and Agility, all parties determined this condition was within safe limits and the bus should be returned to service.

	Date	WO #	Bus #	Description/Issue ¹	Inspector's Notes ²	Comment/Action ³
34	07/17/19	4503092	18227	Tank 1 PRD vent meter reading at 5000ppm (as per Agility no problem)	Meter reading 5000 ppm @ vent tube	<i>*no disposition noted in EAMS</i>
35	07/23/19	4505478	18198	A leak of over 10,000 PPM was found on the rear right cylinder rearward PRD fitting, refer to vendor for repair	A leak of up to or lower than 3,000 ppm was found on rearward PRD pressure line fitting which is permissible under new county SOP guidelines (minimum of 10,000) right rear	Performed inspection of the rear right fuel cylinder, a leak of up to 3,000 PPM was found which is permissible under new county SOP guidelines (a minimum allowable leak of under 10,000 PPM)
36	07/27/19	4510533	18222	Meter reading 3,000 ppm.	Remove silicon from vent tube. Resin bubbles as per Agility normal manufacture anomalies. Meter reading 5000 ppm at vent tube- as per Agility normal condition (#1), (#5)	Meter reading 5000 ppm at vent tube- as per Agility normal condition
37	08/01/19	4514212	18227	Gas smell in bus	<i>*no Inspection Report Provided</i>	Found some kind of sticky smelly substance underneath rear seat, took it to good will right away, they clean bus inside and outside. n fumes at moment ... let bus idle for a while, no problem found at this time
38	08/01/19	4435897	18179	tank #1 PRD leak at vent tube, meter reading at or above 640ppm	Leak at vent tube, meter reading at or above 640 ppm. As per Paul Hatton of New Flyer bus okay for revenue service.	As per Paul Hatton of New Flyer bus okay for revenue service.
39	08/02/19	4514802	18204	Found gas leak at rear center tank, gage fitting, need to repair	<i>*no handwritten notes</i>	No more leak found at this time

-
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 2. Inspector's Notes – handwritten notes taken the Inspection Report
 3. Comment/Action – excerpt from EAMS screen showing disposition/resolution of the complaint
 4. A warranty repair; these entries are highlighted tan
 5. According to DTPW, based on discussions and/or meetings with New Flyer and Agility, all parties determined this condition was within safe limits and the bus should be returned to service.

	Date	WO #	Bus #	Description/Issue ¹	Inspector's Notes ²	Comment/Action ³
40	08/26/19	4531900	18226	Found both vent lines >10,000 ppm	Both front vent lines leaking CNG above 10000 #1, #2, #3, #4, #5, #6	CNG venting from vent tube is not considered a leak. They're doing what they are designed to do.
41	08/27/19	4532893	18147	Gas Leak	<i>*no Inspection Report Provided</i>	No fuel leak found, active code #4747 After treatment Intake Oxygen sensor - Drifter High, Made Failure Notification
42	09/12/19	4544849	18250	All vent line >10,000 ppm	Found all four vent lines leaking above 10000 PPM	<i>*no disposition noted in EAMS</i>
43	09/22/19	4551814	18230	Found leak >10,000 ppm	Found gas leak more 10,000 at gauge – rear center	Julio from New Flyer completed repair. Replaced fuel gauge and fitting. 10-4-2019. ⁴

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1. Description/Issue – excerpt from the Work Order contained in EAMS [Enterprise Asset Management System] describing complaint/condition
 2. Inspector's Notes – handwritten notes taken the Inspection Report
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MIAMI-DADE COUNTY

OFFICE OF THE INSPECTOR GENERAL



EXHIBITS

1. One Page from the Post-Delivery Inspection Form Pertaining to Inspecting the CNG Cylinders on the Roof Top
- 2a. Natural Gas Vehicle Cylinder Inspection Record – Form Used in Routine Maintenance (36,000 miles) Inspections
- 2b. DTPW Standard Operating Procedure No. PR-SB-049, Revised 7/23/2019
3. Table 5-1 of DTPW's Planned Bus Procurements and Vehicle Replacement, updated March 2018

Final Contract Oversight Report

IG18-0005-A

November 13, 2019

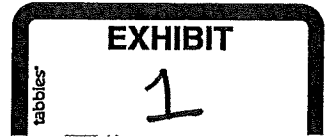
Bus No. _____

Date _____

Inspector _____

CNG CYLINDERS (ROOF TOP)	PASS	FAIL	RE-INSPECT
RECORD THE CYLINDER SERIAL NUMBER & EXPIRATION DATES (MONTH/YEAR) SHOWN ON THE CYLINDER LABEL(S). SERIAL NUMBER EXPIRATION DATES (MONTH/YEAR) _____ _____ _____ _____ _____			
CYLINDER LABELS ARE PRESENT AND LEGIBLE			
CYLINDER ARE FREE FROM ANY CUTS OR ABRASION DAMAGE.			
CYLINDER IS FREE OF SURFACE DISCOLORATION, CRACKED RESIN, CHIPPING, LOSE FIBERS, BUBBLES OR BULGES.			
EACH CYLINDER HAS A PRESSURE RELIEF DEVICE (PRD) IN GOOD CONDITION WITH NO VISIBLE EXTRUSION OF FUSIBLE METAL.			
CYLINDER IS SECURELY MOUNTED TO VEHICLE AND PROTECTED FROM SUN EXPOSURE, ROAD HAZARDS, EXCESSIVE HEAT.			
CYLINDER MOUNTING BRACKETS ARE RUBBERPADDED AND FREE OF DIRT AND DAMAGE AND ARE NOT CAUSING CYLINDER DAMAGE.			
MOUNTING BRACKETS ARE IN GOOD CONDITION AND NOT CORRODED, BENT OR DEFORMED.			
CYLINDERS ARE FIRMLY RESTRAINED BY THE BRACKETS AND DOES NOT MOVE INDEPENDENT OF BRACKETS OR VEHICLE.			
VERIFY CLEARANCE AROUND CYLINDERS. MINIMUM 1/2" CLEARANCE AROUND CYLINDER AND 3/8" FROM SHIELDS.			

NOTES _____



Natural Gas Vehicle Cylinder Inspection Record

2020
 2021
 2022
 2023
 2024
 2025
 2026
 2027
 2028
 2029
 2030
 2031
 2032
 2033
 2034
 2035
 2036
 2037
 2038
 2039
 2040

Inspector Name:		Reason for Inspection (Check One):	<input type="checkbox"/> Scheduled Mileage	<input type="checkbox"/> Accident
Inspector Certification Number:		Serial Number:		
Inspection Date:		Model Number:		
Bus Number:		Expiration Date:		
Vehicle Mileage:		Mounting Location:		

Description: This inspection sheet had been developed in accordance with ANSI/CSA NGV2 which requires that all Compressed Natural Gas vehicles have periodic visual inspections of the Fuel System every 3 years or 36,000 miles whichever comes first. If the vehicle has been involved in an accident or has been involved in a fire, the cylinders must be inspected before returning to service. All information in this inspection is based on specific information found in the Agility Fuel Solutions publication or in most cases, is reproduced word-for-word from this document.

Instructions: All inspections to CNG fuel systems must be carried out by well-qualified inspectors that are trained and certified by the National Gas Vehicle Institute (NGVi). All inspections must be carried out using the guidelines found in the CNG Fuel Cylinder Inspection Manual ENP-558 published by Agility Fuel Solutions. Inspectors must be familiarized with the manual before conducting the inspection. This sheet must be used to record all findings and all defects must be recorded accurately and in detail. It is recommended that pictures are taken of any defects that are found during the inspection. If any defect renders the vehicle unsafe, it must be reported to the Supervisor. **Under no circumstances shall a vehicle be released for service if there is an unsafe condition found during the inspection!**

Required Tools & Equipment: Inspection Sheet and Pen, Depth Gauge/Micrometer, Leak Detection Fluid, Tape Measure, Inspection Mirror, Flashlight, Borescope, Coin for tap test, Camera, Personal Protective Equipment (PPE) including eye protection, hard hat, Fall Arrest Harness as needed.

Task #	Examination Features	Accept	Reject	Comments (Include damage level if applicable)
1	Cylinder and brackets cleaned prior to inspection	<input type="checkbox"/>	<input type="checkbox"/>	
2	Cylinder installation	<input type="checkbox"/>	<input type="checkbox"/>	
3	1/2-inch clearance around cylinder when mounted	<input type="checkbox"/>	<input type="checkbox"/>	
4	Bracket condition	<input type="checkbox"/>	<input type="checkbox"/>	
5	Mounting pads/isolators in good condition	<input type="checkbox"/>	<input type="checkbox"/>	
6	Labels in place	<input type="checkbox"/>	<input type="checkbox"/>	
7	Cylinders not expired	<input type="checkbox"/>	<input type="checkbox"/>	
8	Cylinder service pressure meets or exceeds vehicle service pressure	<input type="checkbox"/>	<input type="checkbox"/>	
9	Valve condition	<input type="checkbox"/>	<input type="checkbox"/>	
10	PRD condition	<input type="checkbox"/>	<input type="checkbox"/>	
11	Plug condition	<input type="checkbox"/>	<input type="checkbox"/>	
12	Fuel lines secure	<input type="checkbox"/>	<input type="checkbox"/>	
13	Vent lines secure	<input type="checkbox"/>	<input type="checkbox"/>	
14	Vent lines free of debris or moisture	<input type="checkbox"/>	<input type="checkbox"/>	
15	Interfaces free of leaks	<input type="checkbox"/>	<input type="checkbox"/>	
16	Cylinder condition	<input type="checkbox"/>	<input type="checkbox"/>	
17	Cylinder dome with valve condition	<input type="checkbox"/>	<input type="checkbox"/>	
18	Cylinder dome with no valve condition	<input type="checkbox"/>	<input type="checkbox"/>	

Employee's Signature: _____	Employee ID: _____	Date: _____
Supervisor's Signature: _____	Supervisor ID: _____	Date: _____

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 EXHIBIT
 202

DTPW

Standard Operating Procedure (SOP)

Title of Procedure:	Natural Gas Vehicle Cylinder Inspection	Procedure Number	Revision Date
		PR-BS-049	7/23/2019
Division	Bus Maintenance	Revision Level	Original Issue Date
		1	4/17/2019

Inspector Name:	Reason for Inspection	<input type="checkbox"/> Scheduled Mileage <input type="checkbox"/> Accident					
		Cylinder 1	Cylinder 2	Cylinder 3	Cylinder 4	Cylinder 5	Cylinder 6

Description: This inspection sheet had been developed in accordance with ANSI/CSA NGV2 which requires that all Compressed Natural Gas vehicles have periodic visual inspections of the Fuel System every 3 years or 36,000 miles whichever comes first. If the vehicle has been involved in an accident or has been involved in a fire, the cylinders must be inspected before returning to service. All information in this inspection is based on specific information found in the Agility Fuel Solutions publication or in most cases, is reproduced word-for-word from this document.

Instructions: All inspections to CNG fuel systems must be carried out by well-qualified inspectors that are trained and certified by the National Gas Vehicle Institute (NGVI). All inspections must be carried out using the guidelines found in the CNG Fuel Cylinder Inspection Manual ENP-558 published by Agility Fuel Solutions. Inspectors must be familiarized with the manual before conducting the inspection. This sheet must be used to record all findings and all defects must be recorded accurately and in detail. It is recommended that pictures are taken of any defects that are found during the inspection. If any defect renders the vehicle unsafe, it must be reported to the Supervisor. **Under no circumstances shall a vehicle be released for service if there is an unsafe condition found during the inspection!**

Required Tools & Equipment: Inspection Sheet and Pen, Depth Gauge/Micrometer, Leak Detection Fluid, Tape Measure, Inspection Mirror, Flashlight, Borescope, Coin for tap test, Camera, Personal Protective Equipment (PPE) including eye protection, hard hat, Fall Arrest Harness as needed.

Task #	Examination Features	Accept	Reject	Comments (Include damage level if applicable)	
1	Cylinder and brackets cleaned prior to inspection	<input type="checkbox"/>	<input type="checkbox"/>		
2	Cylinder installation	<input type="checkbox"/>	<input type="checkbox"/>		
3	1/2-inch clearance around cylinder when mounted	<input type="checkbox"/>	<input type="checkbox"/>		
4	Bracket condition	<input type="checkbox"/>	<input type="checkbox"/>		
5	Mounting pads/isolators in good condition	<input type="checkbox"/>	<input type="checkbox"/>		
6	Labels in place	<input type="checkbox"/>	<input type="checkbox"/>		
7	Cylinders not expired	<input type="checkbox"/>	<input type="checkbox"/>		
8	Cylinder service pressure meets or exceeds vehicle service pressure	<input type="checkbox"/>	<input type="checkbox"/>		
9	Valve condition	<input type="checkbox"/>	<input type="checkbox"/>		
10	PRD condition	<input type="checkbox"/>	<input type="checkbox"/>		
11	Plug condition	<input type="checkbox"/>	<input type="checkbox"/>		
12	Fuel lines secure	<input type="checkbox"/>	<input type="checkbox"/>		
13	Vent lines secure	<input type="checkbox"/>	<input type="checkbox"/>		
14	Vent lines free of debris or moisture	<input type="checkbox"/>	<input type="checkbox"/>		
15	Interfaces free of leaks	<input type="checkbox"/>	<input type="checkbox"/>		
16	Cylinder condition	<input type="checkbox"/>	<input type="checkbox"/>		
17	Cylinder dome with valve condition	<input type="checkbox"/>	<input type="checkbox"/>		
18	Cylinder dome with no valve condition	<input type="checkbox"/>	<input type="checkbox"/>		
19	Inspect entire fuel system for leaks	<input type="checkbox"/>	<input type="checkbox"/>	Location of Leak (If applicable)	Record Reading (=>10,000 PPM Fails)

Employee's Signature: _____ Employee ID: _____ Date: _____
 Supervisor's Signature: _____ Supervisor ID: _____



Table 5-1

BUS PROCUREMENT / REPLACEMENT	2018	2019	2020	2021	2022	2023	2024
Total number of small buses required 30 LFW diesel hybrid	0	2	0	0	0	0	3
Subtotal Cost of small buses	\$ -	\$ 800,000	\$ -	\$ -	\$ -	\$ -	\$ 1,200,000
Total number required 40ft Electric		33					
Total number of 40 Ft buses required 40 LFW CNG	100	150	231	93	5	0	0
Subtotal Cost of 40 Ft Buses	\$ 68,000,000	\$ 124,440,000	\$ 157,080,000	\$ 63,240,000	\$ 3,400,000	\$ -	\$ -
Total number of Articulated buses required 60-ft Articulated Diesel/Electric Hybrid	0	0	0	25	0	0	0
Subtotal Cost of 60 Ft buses	\$ -	\$ -	\$ -	\$ 23,750,000	\$ 2,891	\$ -	\$ -
Total Buses	100	185	231	118	5	0	3
Cost for Bus Replacement	\$ 68,000,000	\$ 125,240,000	\$ 157,080,000	\$ 86,990,000	\$ 3,402,891	\$ -	\$ 1,200,000

BUS PROCUREMENT / REPLACEMENT	2025	2026	2027	2028	2029	2030	2031
Total number of small buses required 30 LFW diesel hybrid	0	0	0	0	0	0	2
Subtotal Cost of small buses	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 800,000
Total number required 40ft Electric							33
Total number of 40 Ft buses required 40 LFW CNG	0	35	15	0	5	100	150
Subtotal Cost of 40 Ft Buses	\$ -	\$ 23,800,000	\$ 10,200,000	\$ -	\$ 3,400,000	\$ 68,000,000	\$ 124,440,000
Total number of Articulated buses required 60-ft Articulated Diesel/Electric Hybrid		0	43	11	10	0	
Subtotal Cost of 60 Ft buses	\$ -	\$ -	\$ 40,850,000	\$ 10,450,000	\$ 9,500,000	\$ -	\$ -
Total Buses	0	35	58	11	15	100	152
Cost for Bus Replacement	\$ -	\$ -	\$ 51,050,000	\$ 10,450,000	\$ 12,900,000	\$ 68,000,000	\$ 125,240,000

BUS PROCUREMENT / REPLACEMENT	2032	2033	2034	2035	2036	2037	2038
Total number of small buses required 30 LFW diesel hybrid	0	0	0	0	3	0	0
Subtotal Cost of small buses	\$ -	\$ -	\$ -	\$ -	\$ 1,200,000	\$ -	\$ -
Total number required 40ft Electric							
Total number of 40 Ft buses required 40 LFW CNG	231	93	5	0	0	0	35
Subtotal Cost of 40 Ft Buses	\$ 157,080,000	\$ 63,240,000	\$ 3,400,000	\$ -	\$ -	\$ -	\$ 23,800,000
Total number of Articulated buses required 60-ft Articulated Diesel/Electric Hybrid		25	0	0	0		0
Subtotal Cost of 60 Ft buses	\$ -	\$ 23,750,000	\$ -	\$ -	\$ -	\$ -	\$ -
Total Buses	231	118	5	0	3	0	35
Cost for Bus Replacement	\$ 157,080,000	\$ 86,990,000	\$ 3,400,000	\$ 86,990,000	\$ 1,200,000	\$ -	\$ 23,800,000

MIAMI-DADE COUNTY

OFFICE OF THE INSPECTOR GENERAL



APPENDIX A

Department of Transportation and Public Works' Response

*Review of Safety Concerns and the County's Procurement of
Compressed Natural Gas Buses for the Department of Transportation and Public Works*

Final Contract Oversight Report

IG18-0005-A

November 13, 2019

Memorandum



Date: November 5, 2019

To: Mary T. Cagle, Inspector General
Office of the Inspector General

From: *fa* Alice N. Bravo, P.E., Director *F. Bravo*
Department of Transportation and Public Works

Subject: Response to OIG Draft Report- Review of Safety Concerns and the County's Procurement of Compressed Natural Gas Buses for the Department of Transportation and Public Works – IG19-0015-0

Thank you for the opportunity to respond to the subject draft report related to the review of safety concerns and the County's procurement of compressed natural gas buses (CNG) for the Department of Transportation and Public Works (DTPW).

The draft report includes recommendations and inquiries regarding the procurement of CNG buses. The ongoing CNG modernization of the bus fleet is already yielding tangible benefits. The reliability that our patrons experience has improved significantly, as well as customer satisfaction as a result of putting 300 new CNG vehicles into service.

Information in the draft report supports the Administration's position that CNG buses are safe to operate when properly inspected and maintained and that the allegation that CNG buses were being delivered with leaks was unfounded. I am proud that the draft report recognizes that our inspectors are "very diligent." We have reviewed the report and agree with the recommendations to enhance the DTPW Standard Operating Procedures, including updating forms and installation of additional equipment.

We appreciate the opportunity to revisit our next steps to provide vehicles to support our bus service patrons. Because we have already acquired a number of CNG buses and deploy them on routes throughout the community, we are incurring additional cost – up to \$60,000 per month – to fuel these buses because we do not have a fueling facility at the Northeast Garage. Therefore, we will be forwarding the option to modify the Trillium contract to the Board of County Commissioners for consideration this month.

Furthermore, the ability to acquire buses is impacted not just by a transit agency's ability to pay, but also by the availability of vehicles. Buses are not produced in advance but rather once a purchasing contract is executed. Because we issued an Invitation to Bid for additional CNG buses, to take advantage of the infrastructure we have already installed, responding firms have made an effort to adjust schedules to provide buses as quickly as possible. As such it is important that we continue with the procurement of an additional 140 buses. The enclosed response addresses the reasoning for acquiring CNG buses for this additional purchase, as well as for provision of CNG fueling in the Northeast Depot.

Finally, DTPW has relied upon an informal communications strategy related to procurements and other legislation. The Department will benefit from revisiting our procedures to ensure information is communicated effectively amongst all levels and with the Office of the Mayor and other stakeholders.

Thank you again for the opportunity to address the report. We appreciate the collaborative and the collegial approach exhibited by your staff throughout the review. If you have any questions, please contact me at 786-469-5406.

Attachment

c: Jennifer Moon, Deputy Mayor/Budget Director
Edward Marquez, Deputy Mayor
Tara Smith, Director of Internal Services Department

**Miami-Dade County Office of The Inspector General
OIG Draft Contract Oversight Report**

Safety Inspection Concerns Recommendations and DTPW Responses:

- I. OIG Recommendation No. 1-** *Even though the allegation of new buses arrive with leaks is unfounded, DTPW should consider including utilizing the hand-held CNG detector, as part of its CNG post-delivery inspection protocol. The OIG Notes that additional time to perform the “wandering” would be de minimis, as this would be perform simultaneously with the visual inspection. Upon a positive detection of CNG the remaining inspections protocols utilized in the 36,000 mile inspection should be followed.*

DTPW Action Plan to OIG Recommendation No. 1: The DTPW CNG Bus Post-Delivery Inspection Plan currently requires performance of a visual inspection of the CNG Cylinders. DTPW’s Field Test Engineers, Quality Assurance Engineers, and Bus Maintenance Management Team will determine the method and requirements related to the CNG leak inspections in the next revision of the CNG Bus Post-Delivery Inspection Plan. Wandering with a soap bubble test will be included in the SOP.

- II. OIG Recommendation No. 2-** *SOP PR-BS-049 should be revised again to clearly state at what PPM level additional exploratory measures (such as the soapy water test) and remediation, such as replacement of valves, PRD’s, and tanks is warranted. DTPW should make this determination after consulting with other Transit agencies experienced in operation and maintaining CNG buses, the Federal Motor Carrier Safety Association (FMCSA) and the Federal Transit Administration (FTA), and both New Flyer and Gillig.*

DTPW Action Plan to OIG Recommendation No. 2: DTPW’s Field Test Engineers and the Bus Maintenance Management Team will reach out to other Transit Agencies/Authorities that operate and maintain similar CNG buses, the FMCSA, FTA, and bus manufacturers for additional guidance and best practices as part of the revision of the “Natural Gas Vehicle Cylinder Inspection” SOP (PR-BS-049).

- III. OIG Recommendation No. 3-** *The inspection form used by DTPW inspectors needs to match the inspection form contained in the SOP, as will be revised. The form should have a place to record the location of the leak, if applicable, and 2) the ppm record reading. The inspection form should also be revised in order to accommodate and inspection of a 6-fuel cylinder bus (New Flyer) and an 8-fuel cylinder bus (Gillig). Cylinder identifiers such as “rear middle curbside” may not work with the 8-cylinder configuration. The inspection forms may want to incorporate diagrams of the tank layouts and gas lines so inspectors can clearly mark location of any leaks found.*

DTPW Action Plan to OIG Recommendation No. 3: The inspection forms referenced in the “Natural Gas Vehicle Cylinder Inspection” SOP (PR-BS-049) will be revised to clearly identify the bus configurations (e.g. 6-fuel cylinder versus 8-fuel cylinder) and will include a diagram of the different types of CNG vehicles, so that any issue following inspection can be marked. Once the inspection form has been revised and approved, it

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will be issued to the bus inspection personnel and all outdated forms shall be removed accordingly.

IV. OIG Recommendation No. 4- *DTPW should consider affixing a “do not Operate” or “Lock Out” tag to a critical components such as the steering wheels, door handles, gas/fuel connections, etc. at the beginning or a repair job by the technician performing the repairs, which can only be removed by the technician after the completion of the repair. The tag should be affixed in a manner that it cannot “fall off”.*

DTPW Action Plan to OIG Recommendation No. 4- The Bus Maintenance Management Team will develop an appropriate system to address this concern.

Procurement Questions and DTPW Responses:

- 1) *When the upstream environment impacts of natural gas and diesel fuel production are included, what is the comparative differential in greenhouse gas emissions between a CNG bus fleet and a clean diesel bus fleet?*

DTPW Response to OIG Question 1A- Upstream fuel emissions “Well-to-Wheels” (WTW) are based on the extraction, refining, transport and distribution of fuels. Upstream Fuel Emissions Indirect emissions are not generally included in the calculation, as they are fraught with difficulty. However, based on a 2013 study by MJBradley “the total wells-to-wheels Green House Gas (GHG) emissions (g CO₂-e/mi) are generally slightly higher for CNG buses than for diesel buses, due primarily to the “upstream” impact of methane emissions from natural gas production and processing. The annual GHG emissions from operating new CNG buses instead of new diesel buses could be as high as 1000 lbs. of CO₂-e per bus.”ⁱ

A 2015 study from the Environmental Defense Fund found that “burning natural gas as compared to diesel results in an approximate 30% climate benefit at combustion due to a reduction in carbon dioxide emissions, the advantage is closer to 20% once the fact that natural gas engines are less efficient is taken into account.”ⁱⁱ

Overall Diesel and CNG Buses emit very similar levels of CO₂ from the tailpipe, however natural gas buses have lower carbon content and lower Nitrogen Oxide (NO_x) emissions from the tailpipe than diesel buses. As such, CNG bus operations are preferable to clean diesel buses. It is important to note that per the contract, the vendor is required to provide twenty percent of the CNG from renewable gas sources.

Q1B- *If the goal is to reduce greenhouse emissions, does a cost-benefit environmental analysis warrant additional investment in CNG?*

Q1C- *To address the near-term bus replacement needs of DTPW, could new clean diesel buses remain an option?*

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- 2) *The County now has years of experience with hybrid diesel-electric buses. All the 89 articulated 60-foot buses and 48 of the 40-foot buses are hybrids. Does the professional staff of DTPW see an advantage to investing in more hybrid buses? What does the cost-benefit environment analysis of hybrid buses tell us?*

Response: As noted above, natural gas buses have lower carbon content and lower Nitrogen Oxide (NOX) emissions from the tailpipe than diesel buses. Total wells-to-wheels GHG emissions are generally lower for hybrid buses than from diesel or CNG buses due to their higher miles per gallon. However, there is a significant cost savings associated with CNG buses. The per-bus cost benefit over 12 years is detailed in figure 1 below.

Technology	Purchase Cost	Infra-structure Cost	Battery or Engine Replacement	12-Year Fuel Cost	12-year Maintenance Cost	Total
Diesel	\$550,000	\$ 28,840	\$ 50,000	\$ 432,899	\$ 868,800	\$ 1,930,539
CNG	\$561,000	\$ 103,000	\$ 50,000	\$ 199,968	\$ 768,000	\$ 1,681,968
Hybrid	\$685,000	\$ 28,840	\$ 100,000	\$ 409,041	\$ 1,118,400	\$ 2,341,281

Figure 1

- 3) *Does DTPW plan to have the ability at each depot to provide diesel fuel, CNG, and electrical charging?*

Response: Yes

Q3B-*Is the footprint at each location large enough to accommodate the fueling/charging and maintenance for each bus-type?*

Response: Yes. Additional equipment will be installed to improve the efficiency of maintenance work.

- 4) *Are there plans to acquire or develop new depot locations, consistent with pending changes to the route configurations?*

Response: Yes, as the need arises the Department will look to acquire locations. Also, if there is an increase in the fleet there may be a need for an increased footprint. DTPW has been considering potential sites for expansion in the southern part of the County.

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Q4B- *Should the County make another multi-million-dollar investment for another CNG fueling facility at the Northeast depot?*

Response: Yes, the additional facility will allow for the fueling and maintenance of CNG buses assigned to the Northeast Depot. Currently, the bus routes from the Northeast depot are served primarily by non-CNG buses, which are older and less reliable. Construction of the a CNG fueling facility will allow for these routes to benefit from a more modern fleet of buses.

Q4C- *How many years of paying fuel surcharges will it take for DTPW to break even on this investment?*

Response: According to DTPW calculations, 12 Years.

Q4D- *Is the estimated annual fuel surcharge per bus to pay off the CNG fueling station more than \$10,000 a year?*

Response: No. See chart below:

GGE (Gasoline Gallon Equivalent) (CNG) in Therms	1.25000
Annual Bus Mileage	40,000
Average Miles per Gallon	3.66
Annual Average Number of Gallons per bus	10,929
Annual Average Number of Therms used	13,661
Tax Exempt Adder per Therm	\$ 0.706
Annual Average Capital Per Bus	\$ 9,644.81

Figure 2

5) *Does the construction of CNG facilities at Northeast preclude a future electrical charging station?*

Response 5: No, the stationary electric charging station will be positioned within the facility away from the CNG fueling area. In addition, this will allow for future CNG power generation as a back up to the FPL electrical supply.

6) *For a major transit agency like Miami-Dade, is there an optimal mix of bus-types by energy source to minimize the impact to the County from market spikes in the price of*

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diesel, CNG, and electricity? Has DTPW determined the ideal bus fleet composition for Miami-Dade County?

Response: DTPW monitors the availability of resources and it maintains a reserve of fuel at each facility for the short term. Figure 3 reflects fuel prices over the past 18 years with CNG and Electric remaining relatively stable.

Determining the ideal bus fleet is an ongoing process as we implement and evaluate new technologies. Additionally, changing factors, such as new technology, improvements to current technology, traffic patterns, funding, ridership projections, reliability data and performance make establishing a finite fleet composition a process that will fluctuate now and into the future.

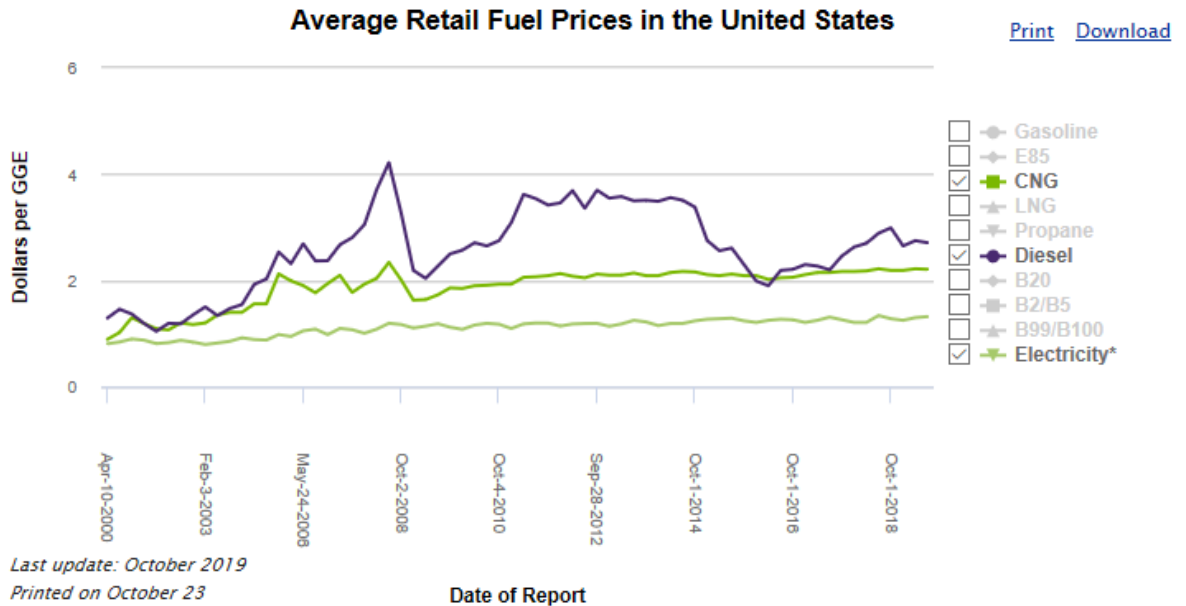


Figure 3²

7) *To accommodate electric buses, will new FPL infrastructure be needed at, or near, each depot?*

Response 7: Most likely additional electrical feeders will be needed to increase capacity. The Department is working with FP&L and the Electric Bus Vendor to find the best possible solution for our needs.

Q7B-*What are the physical space requirements for parking and recharging electric buses?*

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Response: That is yet to be determined and will depend on the time required to charge each bus, it may be a 2- or 4-hour charge which will determine the number of buses that can occupy the same space during the charging period.

Q7C-Do buses park parallel or wishbone along an electric corridor?

Response: Each bus yard is configured differently and parking of the vehicles depends on the bus yard and bus charging port configurations.

Q7D-Do the current depots have space to accommodate the charging facilities for electric buses?

Response: Yes

8) *Has the County considered satellite electric charging stations and central maintenance facilities?*

Response: Yes

Q8B-Is there any possibility of charging buses from the existing power supply along the Metrorail corridor?

Response: The power required to charge the buses may exceed that which is currently available from the Metrorail traction power substations. The Department will need to determine excess capacity and assess available space.

Q8C-Could an electric charging operation be co-located with a new waste-to-energy plant?

Response: We are not aware of any of waste-to-energy plants being within reasonable proximity to any of our routes.

ⁱ <https://mjbradley.com/sites/default/files/CNG%20Diesel%20Hybrid%20Comparison%20FINAL%2005nov13.pdf>

ⁱⁱ <https://www.edf.org/energy/report-climate-impacts-natural-gas-trucks>