



Indianapolis Public Transportation Corporation  
dba IndyGo  
1501 W. Washington Street  
Indianapolis, IN 46222  
[www.IndyGo.net](http://www.IndyGo.net)

## Information Update – Hydrogen Bus (Fuel Cell Electric Bus) Pilot

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**To:** Chair and Board of Directors  
**Through:** President/CEO Inez P. Evans  
**From:** Manager of Special Projects and Regional Mobility Integration Ryan Wilhite  
**Date:** April 5, 2022

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### DEMONSTRATION PROJECT – HYDROGEN BUS

#### BACKGROUND:

As part of the Marion County Transit Plan (MCTP), IPTC included a strategy to transition its fleet to zero emission vehicles. At the time of the strategy development, IPTC's fleet included a series of diesel buses converted to battery electric power. The fleet conversion decision promised two main benefits: lower operational and maintenance costs than diesels and zero emissions for improved air quality. The vehicles provided IndyGo staff with experience in battery electric buses and zero emission vehicles in the fleet. Affectionally called ZEPS (zero emission propulsion system), the vehicles did not meet the anticipated range.

The delivery of the 31 BYD battery electric buses for service on the Red and Purple Lines in 2019 provided IPTC staff with additional experience with battery electric buses in revenue service. Orders for battery electric buses for the local fleet, 40' low-floor buses, was postponed as IPTC staff evaluated the operational profile of the battery electric buses on the market at the time. The assumed advances in battery technology at the time of the development of the transition had not occurred – specifically, battery electric buses operated at a range of less than half of an equivalent diesel bus.

IPTC staff, in examining available zero emission vehicle technology, evaluated the fuel cell electric bus (FCEB), powered by batteries that are recharged using gaseous hydrogen. Several transit properties in the country are piloting FCEBs. FCEBs produce no emissions but also offer two advantages over battery electric buses: range and refueling time. FCEBs on the market, the 40' model, can produce a range of between 250 and 350 miles on a single fill, with about a 15 minute recharge. Similarly sized BEBs only travel between 125 miles and 175 miles on a single charge, which can be about three to four hours.

#### DISCUSSION:

IPTC staff believed the first step to explore FCEBs was to borrow a vehicle from another agency. In Sunline, IPTC found a partner. In coordination with Sunline, Ballard, AirProducts, and New Flyer, a New Flyer Excelsior 2 vehicle from Sunline was arranged for a pilot demonstration for a single week in February. AirProducts provided a fueller with 80 kgs of gaseous hydrogen and a refill, to provide a total of 160 kgs of hydrogen for the project. New Flyer coordinated with Sunline to transport the FCEB from California to Indiana and provided IPTC with a driver and a technician to troubleshoot any problems with the vehicle.

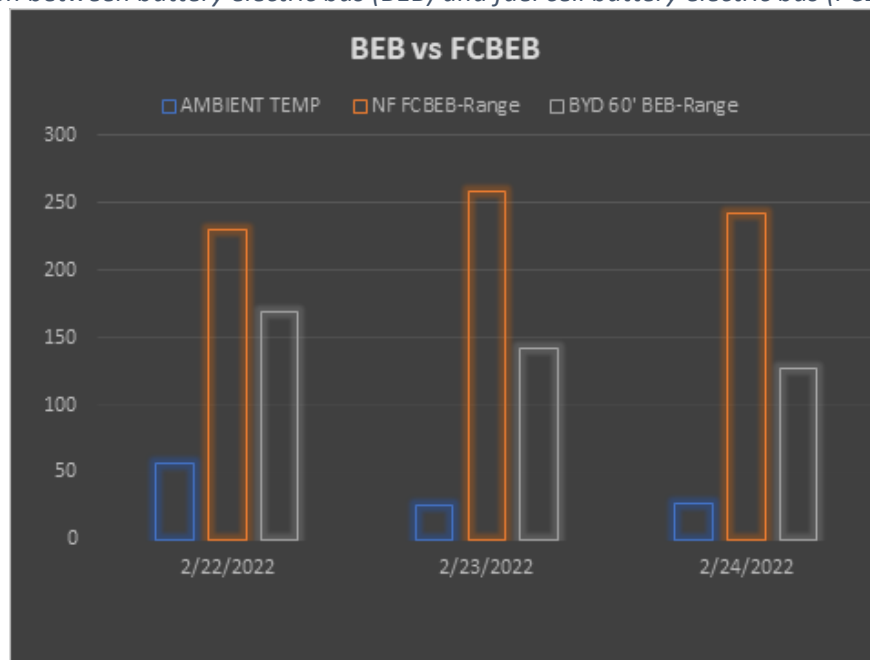
The purpose of the pilot was several folds: IPTC staff could learn more about safety with FCEB, collect data on performance in the winter, and compare data to its exciting BEB fleet. The demonstration occurred on Route 8. The assigned vehicle, likely a diesel-hybrid, would be trailed by a 60' BYD BEB and the 40' NF FCEB. IPTC drivers were

selected and worked the special assignment, driving the BYD and NF vehicle for as long as the power source in each vehicle lasted. Data were collected by New Flyer's Connect 360 reporting system and through IPTC reporting. To hopefully experience the coldest weather in the day, the pilot was scheduled to start around 4:15 am and end around 8:00 pm or whenever a vehicle's state of charge (SOC) fell below an acceptable level.

The pilot took place on February 20<sup>th</sup> through February 25<sup>th</sup>. The New Flyer vehicle was delivered on February 19<sup>th</sup> and the AirProducts fueler delivered on February 18<sup>th</sup>. IPTC staff was available to accept both deliveries and ensure the fueler was properly placed and grounded. IPTC coordinated a safety presentation for emergency responders on February 21<sup>st</sup>, also providing an opportunity for maintenance staff and operators to learn about refueling and familiarize themselves with the vehicle. When vehicles were finished with the day, the vehicle was refueled and prepared for the next day.

Following the end of the pilot, IPTC staff met with New Flyer and internally to discuss the collected data and general impressions of the pilot. Generally, IPTC staff was impressed with the performance of the FCEB, especially as compared to the BEB. As shown in Figures 1 and 2, the FCEB demonstrated superior range to the BEB.

*Figure 1. Comparison between battery electric bus (BEB) and fuel cell battery electric bus (FCBEB) for 2/22 to 2/24.*



*Figure 2. Table comparison of FCBE and BEB for 2/22 to 2/24.*

| DATE      | AMBIENT TEMP | NF FCBE Range | BYD 60' BEB Range |
|-----------|--------------|---------------|-------------------|
| 2/22/2022 | 57           | 231           | 169               |
| 2/23/2022 | 25           | 258           | 142               |
| 2/24/2022 | 27           | 242           | 127               |

Despite unseasonably warm weather for a couple days, the data gathered was useful in demonstrating FCEB range and in comparison, to BEBs as well.

The FCEB was unable to be filled up to 100% SOC, due to the refueling equipment. IPTC staff were able to learn a significant amount about FCEB safety and performance, especially safety as the vehicle would be onsite. The vehicle operated similarly to an electric bus, with little noise and no emissions. The amount of time to refill the vehicle was not tracked.

As for next steps, IPTC staff has prepared to begin a formal zero emission vehicle transition plan. With the aid of the knowledge of IPTC staff, the chosen consultant will help IPTC staff to understand available technologies, cost to adopt different technologies, and chart a path forward to adoption.

**RECOMMENDATION:**

Receive the report.

Ryan Wilhite

Manager of Special Projects and Regional Mobility Integration

Department of Strategic Planning