

The image shows two electric buses from the Alexandria Transit Company. The buses are primarily blue with a yellow stripe along the bottom. They feature the text 'ZERO EMISSIONS' and 'ECO-CITY ALEXANDRIA' on the upper side. A large graphic of green leaves is applied to the side of the buses. The words 'CHARGED UP' are prominently displayed in the center of the side panel. Below this, it says '003 Alexandria Transit Company'. The buses are parked on a paved surface, and a traffic light is visible in the background.

# ALEXANDRIA TRANSIT COMPANY

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ZERO EMISSIONS  
ELECTRIC BUS PROGRAM

# DASH OVERVIEW

- Local Bus System for the City of Alexandria, VA
- Services City of Alexandria and surrounding areas
- Operates over 3 million miles annually
- Roughly 4 million annual passengers
- Fleet of 115 fixed route buses
- Service area of 15 square miles

A photograph of a DASH bus driver. The driver is wearing a dark blue cap with 'DASH' on it, a dark blue face mask, a light blue long-sleeved shirt, a dark blue vest, and dark blue cargo pants. He is leaning against the side of a bus. The bus is yellow and blue, with the word 'DASH' written in large white letters on a blue background. The background shows the interior of the bus through the windows.

**DASH**

# STUDIES AND RESEARCH

- ZEB Feasibility Study (Completed 2019) – CTE
- ZEB Implementation Study Phase 1 (Completed 2021) - WSP
- ZEB Implementation Study Phase 2 (In Progress - WSP)
- Future studies to evaluate performance of vehicles, driver habits, and other metrics from the fleet



# ZERO EMISSIONS FLEET PROGRAM OVERVIEW

- Total fleet of 115+ heavy duty buses
- Purchase only Zero Emissions Buses by 2027 for all new bus orders
- Full Zero Emissions fleet by 2037





## CURRENT DEPLOYMENT BUSES

### Proterra

- (7) 40' ZX5, 440kWh
- Requirement for interoperability with ABB Chargers

### New Flyer of America

- (3) 40' XE40, 466kWh
- (4) 60' XE60, 524 kWh
- Requirement for interoperability with Proterra Chargers



## FACILITY REQUIREMENTS

- Fleet growth to 115+ buses
- Assuming today's technology and tomorrow's service requirement – requires at minimum 40 charge points
- Higher than 1:1 Charger to Bus Ratio = Platooning is Necessary

# CURRENT FACILITY LAYOUT

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- Capacity of 96 Buses
- 6 Depot Chargers/12 Dispensers – Max Charging Available
- 3 Proterra, 3 New Flyer



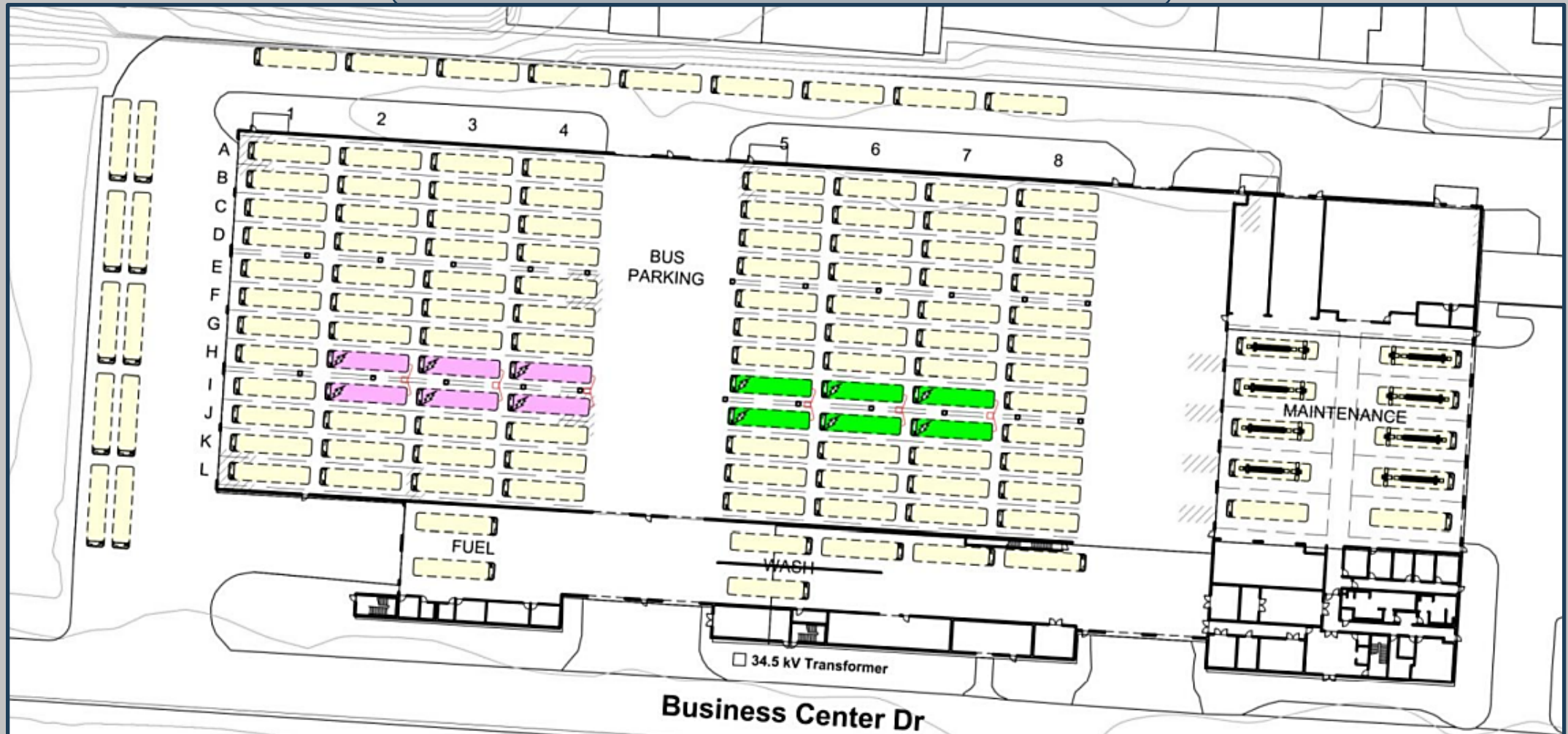


## CURRENT FACILITY AND CHARGERS

- ABB
- (3) 150 KW Chargers
- 6 Dispensers Total
- Sequential Charging
  
- Proterra (Rhombus)
- (3) 125 KW Chargers
- 6 Dispensers Total
- Sequential Charging



# CURRENT FACILITY



PROTERRA BEB WITH THREE 125 KW OEM CHARGING CABINETS W/ 2 PLUG-IN DISPENSERS



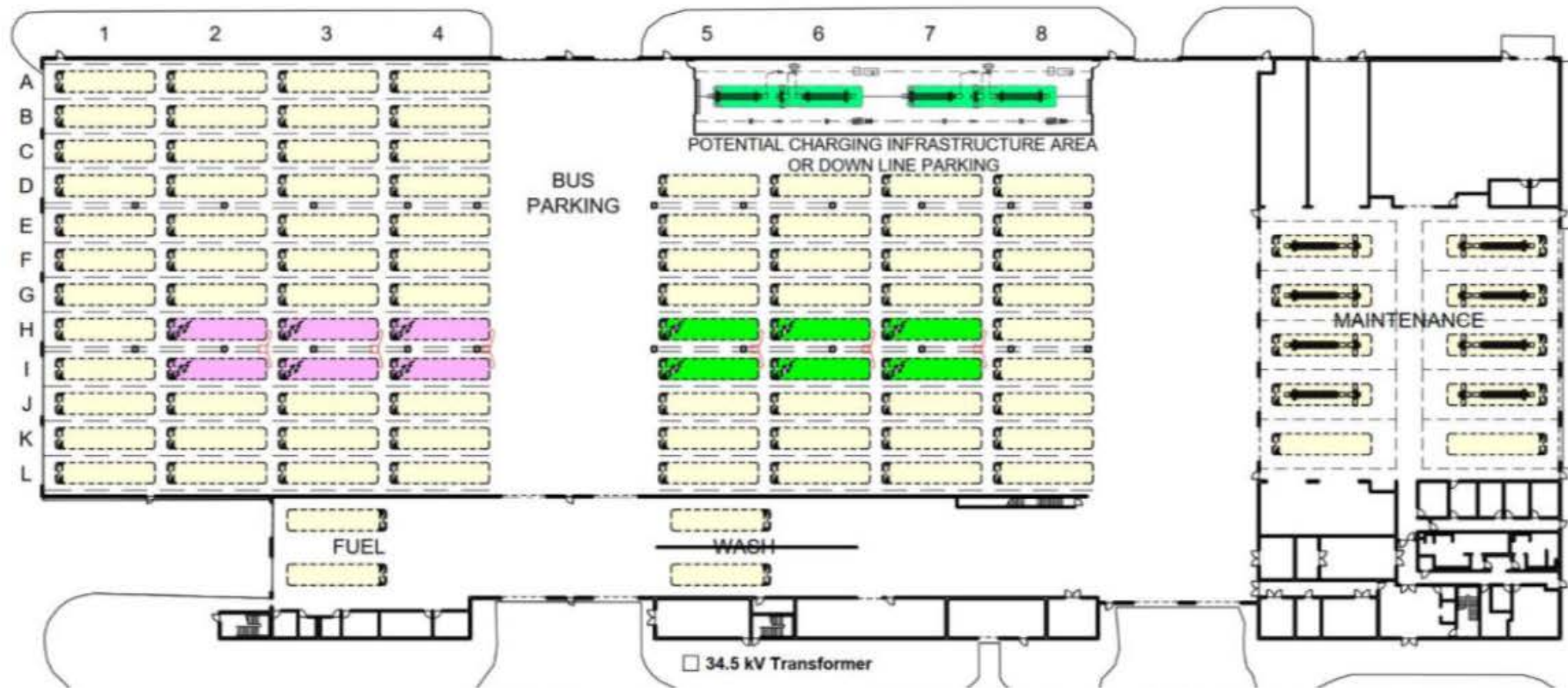
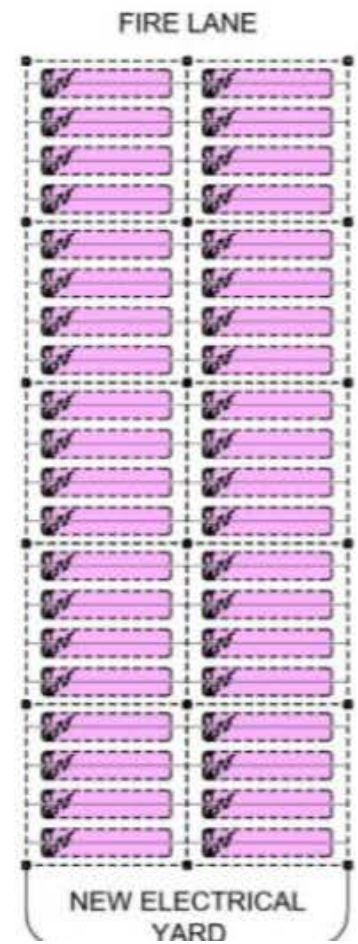
NEW FLYER BEB WITH THREE 150 KW ABB CHARGING CABINETS W/ 2 PLUG-IN DISPENSERS



# FACILITY EXPANSION

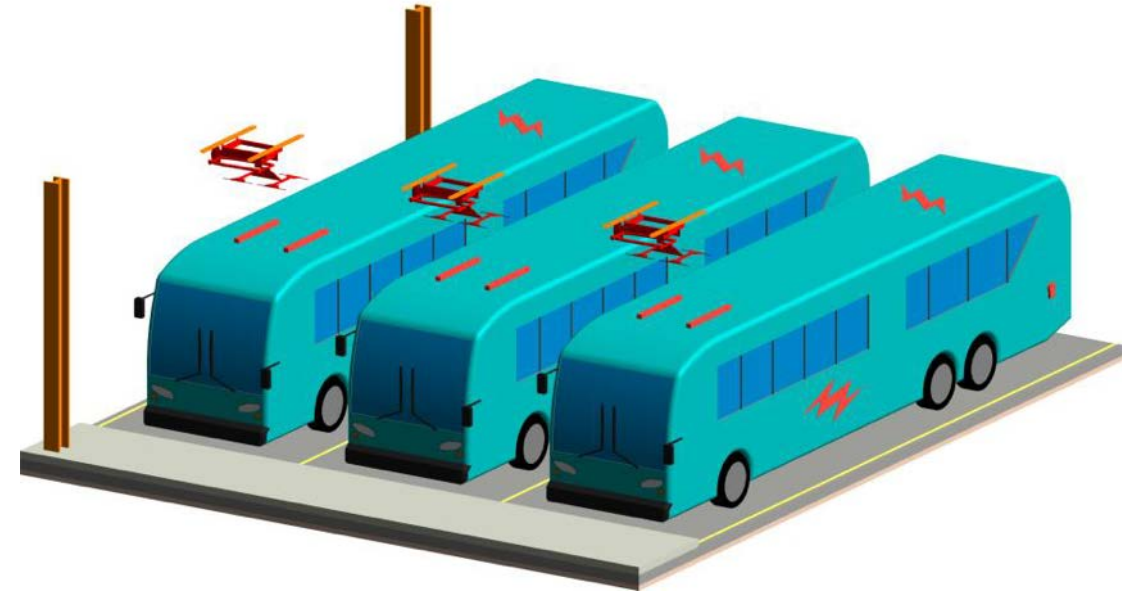
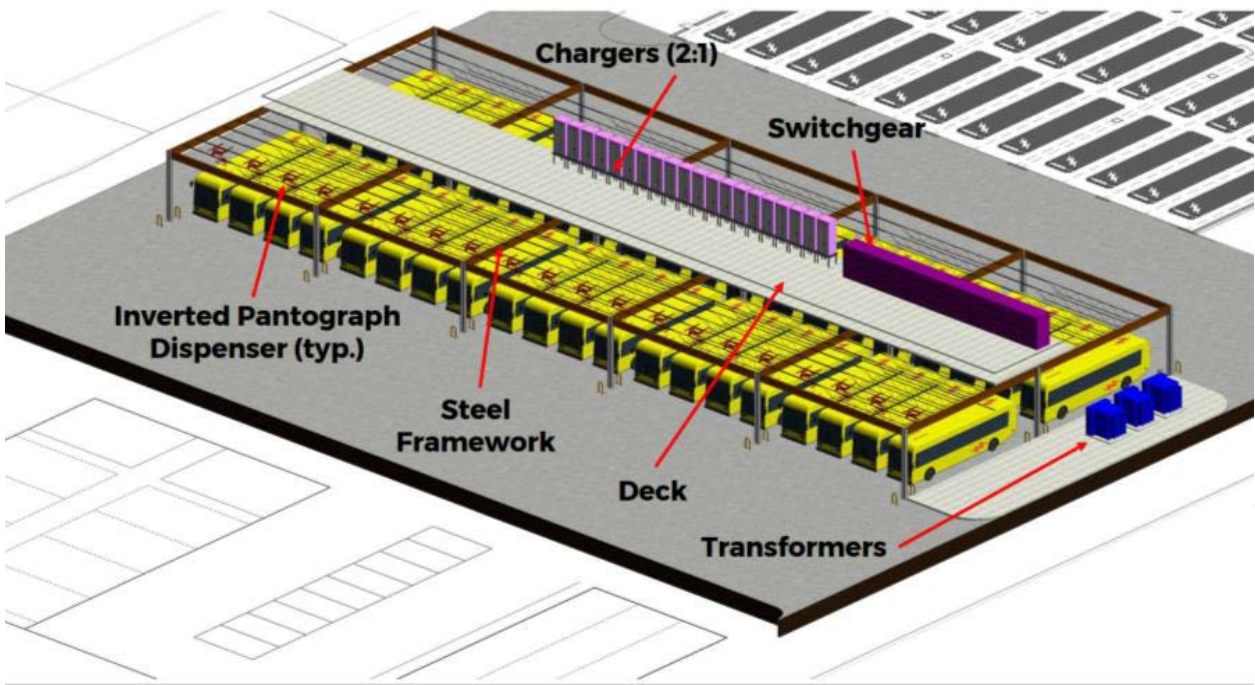
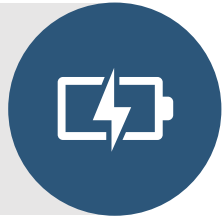
- Additional capacity for 38 buses
- Designed as an electric bus charging yard
- Up to 38 charge points total
- Designed to accommodate up to 12 Megawatts of new power to support charging infrastructure

# FACILITY EXPANSION



# CONCEPT DESIGN FOR NEW FACILITY

Framework for Equipment Real Estate



Pantograph Dispensers

# FACILITY PROGRAM

## APPROACHES AND OPTIONS



- Initial Scale-Up of up to 6 MW of power
- Expandable to up to 12 MW of power
- Coordination with Utility
- Different Charging Configurations Considered
  - 20+ 150 KW Standard Chargers (2:1 Ratio)
  - Up to 20 450 KW Fast Chargers (2:1 Ratio)
  - Lesser amounts of 1.5 MW Megachargers (up to 10:1 Ratio)

- Need to support ultimately 130+ Buses using no more than 12 MW of power
- Need to support 24/7 Service Profile
- Planning for Clean Energy and Resiliency
- Less chargers at faster output?
- More chargers at slower output?
- How much on-route charge opportunity?



## GOALS AND REQUIREMENTS

## ECONOMIES OF BATTERY ELECTRIC BUSES

- **One depot charger costs roughly \$150,000 per unit. (Assumes drop-in conditions)**
- **A Typical Battery Electric Bus costs \$1.2 million compared to \$600,000 for a diesel equivalent**
- **On average, the energy cost per mile is \$0.42/mile on a Battery Electric Bus vs. \$0.92/mile on a comparable Diesel bus**
- **DASH pays on average \$0.14 per kWh of electricity**
- **Total Cost of Ownership needs to consider battery degradation, midlife overhauls, infrastructure.**

# SOME CAVEATS...

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- It is difficult to quantify and measure quality of life improvements of battery electric buses
- We are working on improving our visibility into the energy consumption of the chargers
- Bus side data and telemetry needs to be vastly improved
- We have yet to implement and practice Smart Charging



# NEXT STEPS

- ZEB Implementation Study Phase II
- Pre-design of DASH Facility Expansion / Electric Bus Charging Yard
- Charge Management/Smart Charging
- Assisted Dispatch
- On-Route Opportunity Charging
- Inductive Charging?







# QUESTIONS?

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[DASHBUS.COM](https://www.dashbus.com)