

September 27, 2019

# Going Electric! Electric Bus Technology and Vermont Pilots

Bi-State Electric Vehicle Connector

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Benjamin Lake



To act with urgency  
to enhance the  
economic,  
environmental and  
societal benefits of  
clean and efficient  
energy for all people.



# Why do we care?

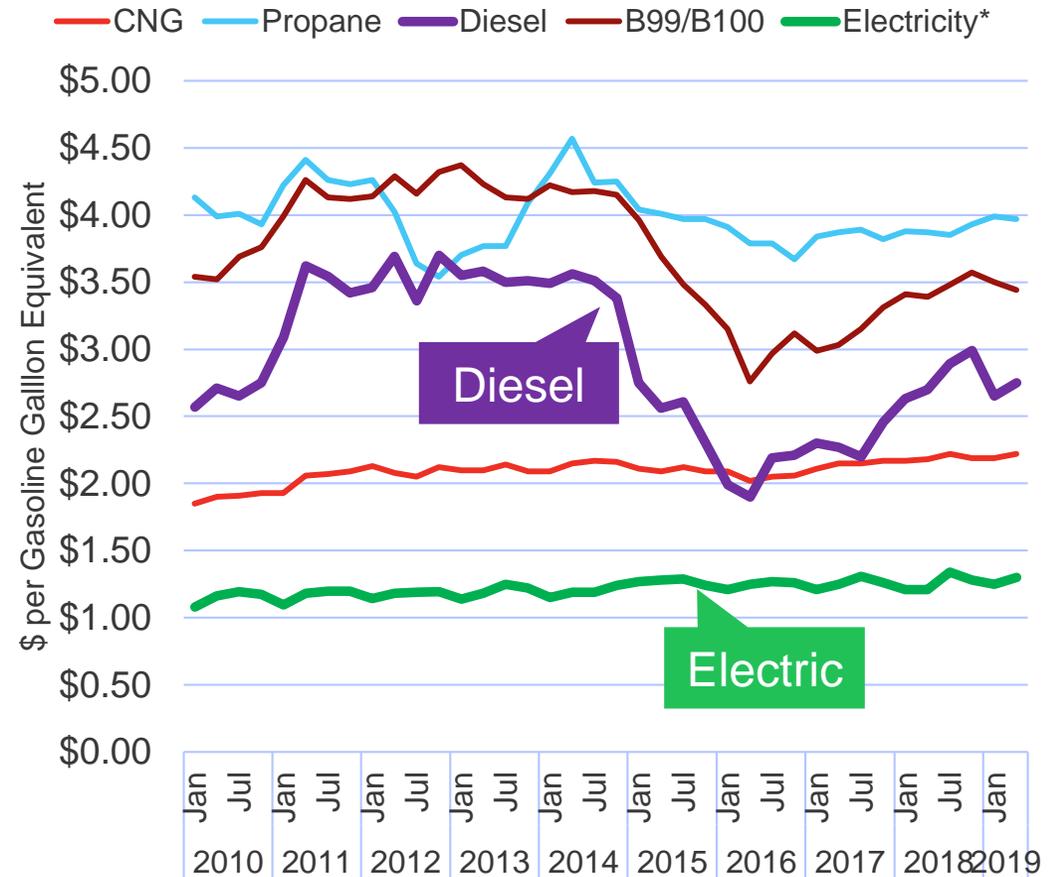
Transportation, Climate Change, and Health Impacts



# Electric Bus Benefits

- Better for the environment and public health
- Quieter
- Cheaper to run
  - Electric buses are less expensive to fuel, more efficient, and have lower maintenance costs compared to diesel
- Energy independence
- Fuel price stability
- Potential value from using battery as an energy storage

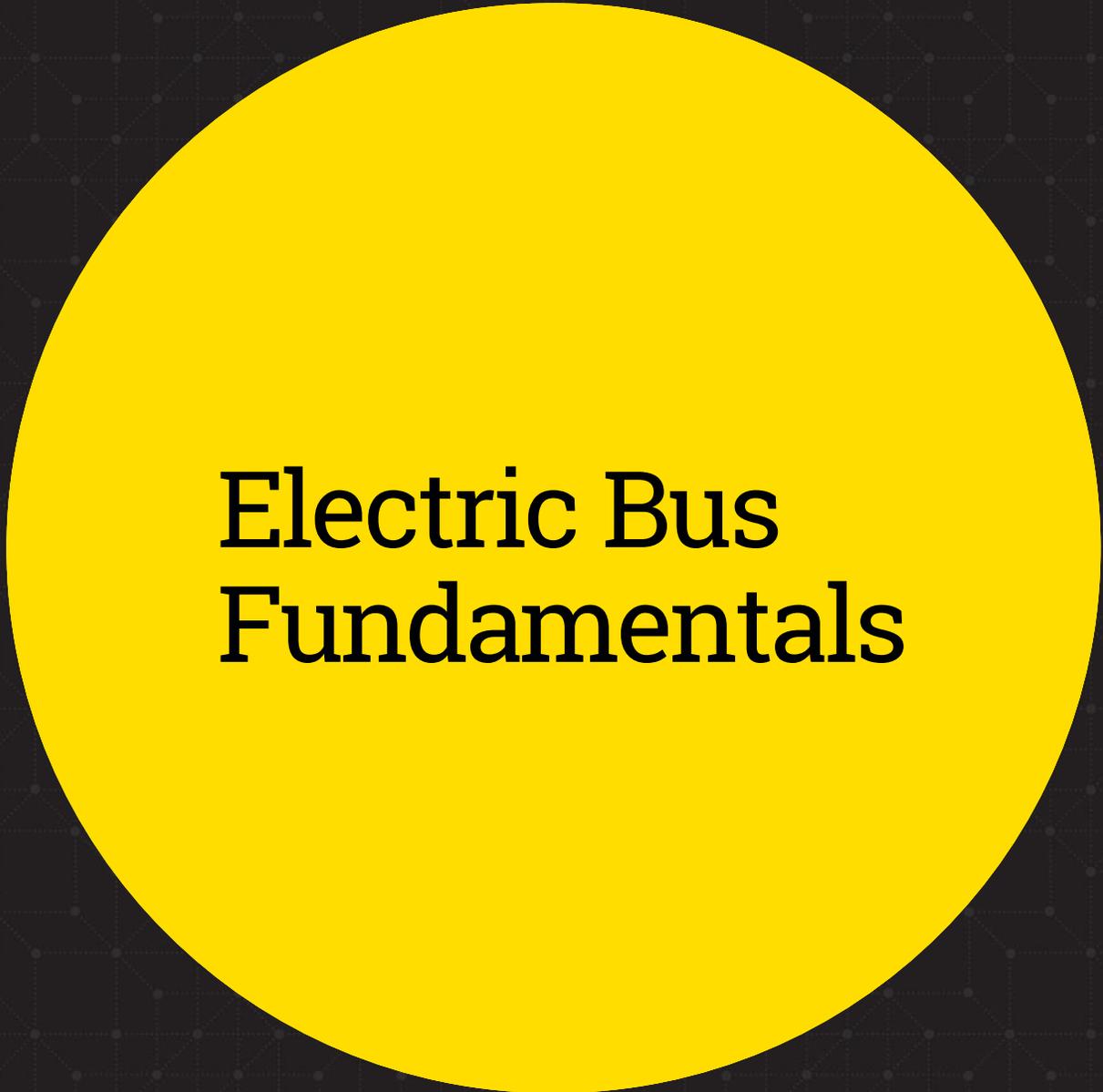
## US Average Retail Fuel Prices



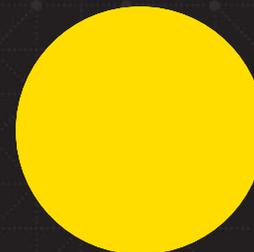
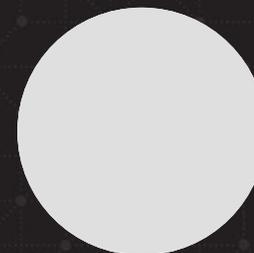
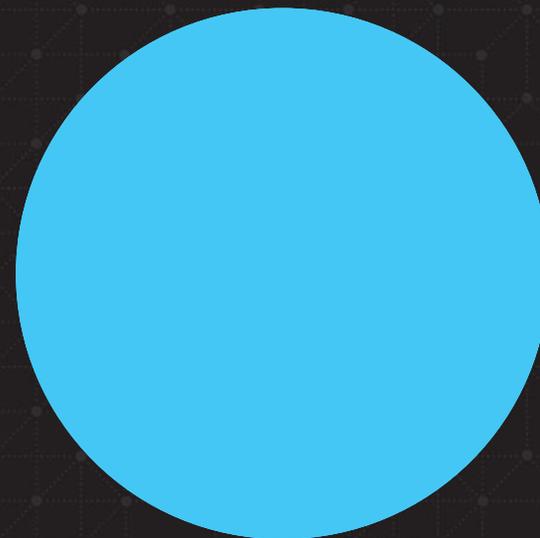
[www.afdc.energy.gov/data/](http://www.afdc.energy.gov/data/)

\*Electricity prices are reduced by a factor of 3.4 because electric motors are approximately 3.4 times as efficient as internal combustion engines





# Electric Bus Fundamentals



# Overview: Electric Transit Buses in the US

## Size of Opportunity

- 71,000 transit buses nationally
- 51% diesel, 23% CNG, 17% hybrid & electric, 8% biodiesel
- Electric transit buses are a relatively mature technology
  - Deployment across the United States
  - Multiple models and manufacturers
  - Vehicles range up to 300 miles on one charge
  - Cost has come down over the last 10 years but still considerably more expensive than a diesel vehicle

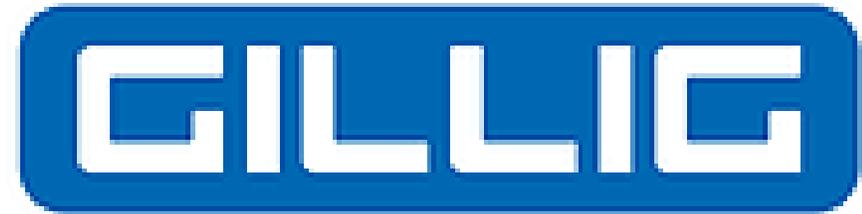
# Major Manufacturers



**PROTERRA**



**NEW FLYER**



# Electric School Bus Fundamentals

## Size of Opportunity

- 400,000 school buses nationally
  - 90% – 95% of the fleet is diesel
  - Most popular alternative fuel is propane
- Electric School buses deployed so far in CA, NY, MA, MN, ND, NJ

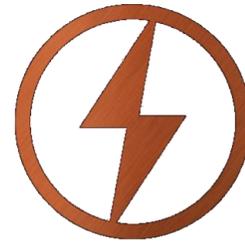
## Barriers

- Upfront Costs - 2 – 3 times the cost of a diesel
- Requires new fueling practices and infrastructure
- Requires training for mechanics and drivers

# Major Manufacturers



**PROTERRA**



**LION**



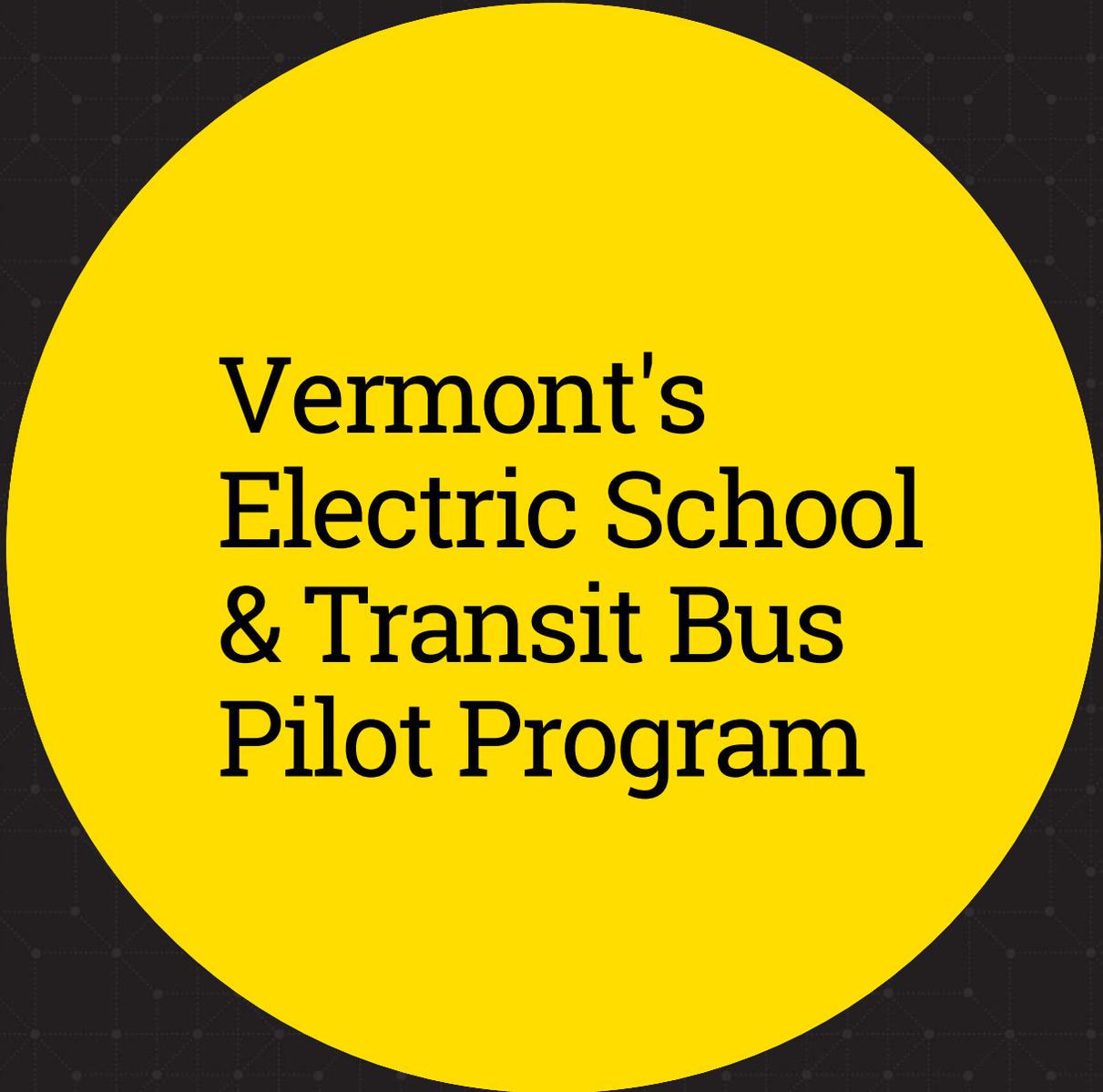
**BLUE BIRD®**

**STARCRAFT BUS**   
*a division of Forest River, Inc.*

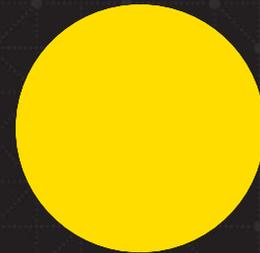
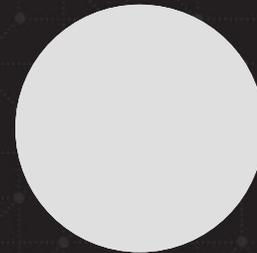
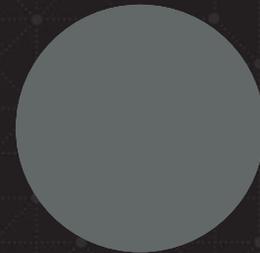
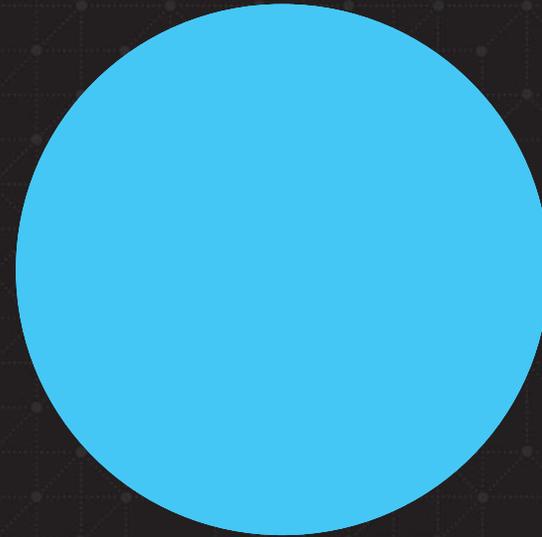


# Electric Bus Operational Considerations

- Range impacted by weather, terrain, HVAC use
- Increased fueling time
- Potential for increased electricity “demand costs” if charging isn’t actively managed
- Some routes may not be good candidates for electric bus service
- Takeaway: All of these issues can be managed, and become less significant as technology improves



**Vermont's  
Electric School  
& Transit Bus  
Pilot Program**



# Project Overview

## Goals

- Evaluate viability of electric buses in Vermont, across a range of route conditions, geographic areas, and types of weather
- Maximize air quality benefits – engine age and disproportionately impacted areas
- Expose Vermonters from different communities, regions and demographics to electric bus technology

## Key Players

- VT Agency of Natural Resources – Dept of Environmental Conservation
- VEIC
- Vermont Energy Education Program (VEEP)
- Participating Schools and Transit Fleets

# Pilot Details

## Participating Schools and Transit Fleets

- 2 schools
- 1 transit agency

## Timeframe

- 2 year project, including 1 year data collection and reporting
- Currently selecting Project Partners, invite-only (as determined through RFQ process) - RFP responses due October 2, 2019

## Funding

- VT allocated ~\$2M of total \$18.7M in VW funds to support these pilots
- Generally, incremental cost of BEBs and charging funded by VW Settlement

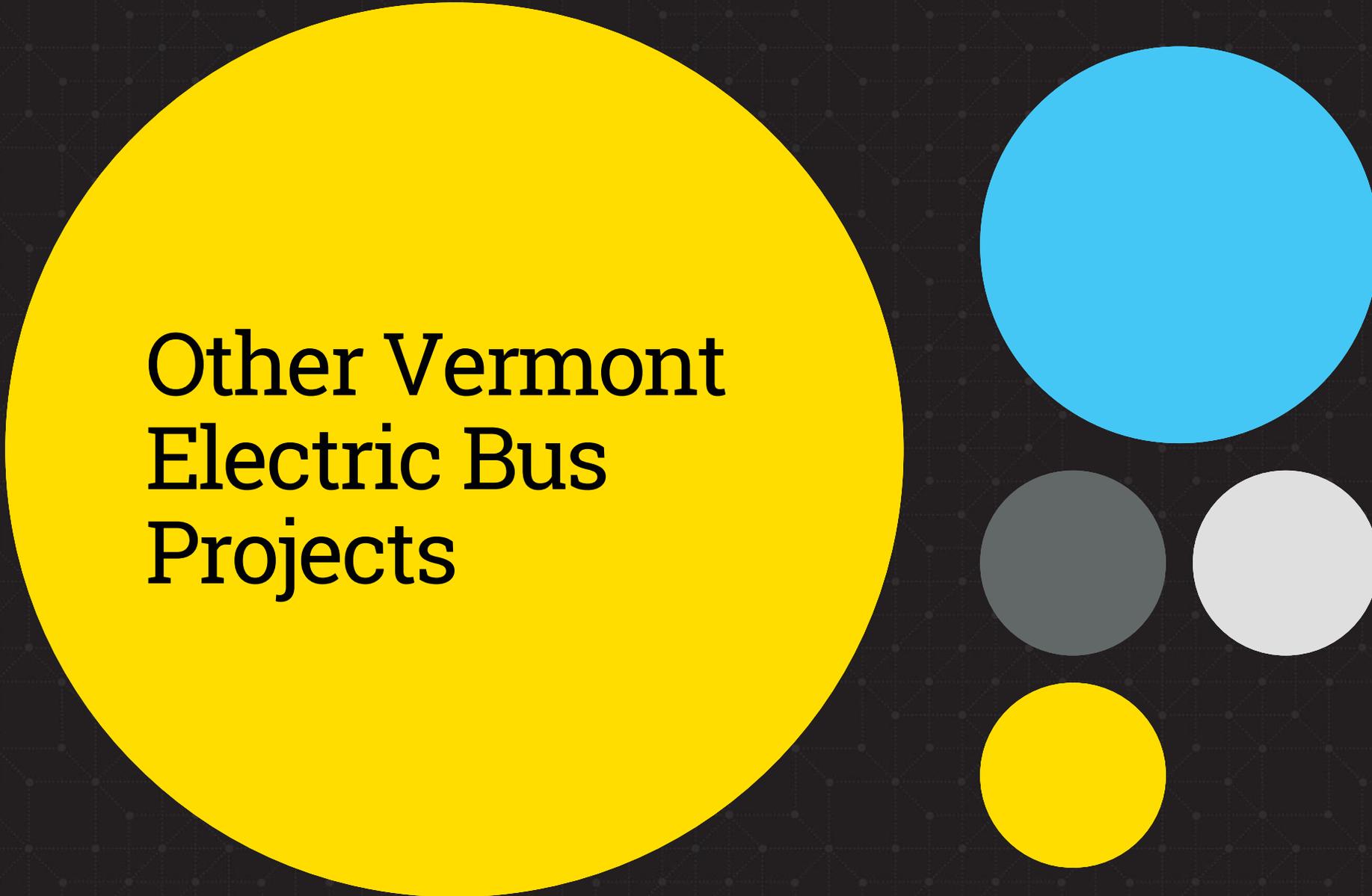
# Major Tasks

## Year 1: Program Development

- Select Partners
- Select & Purchase Vehicles
- Select, Purchase & Install EVSE
- Managed Charging Plans
- Data Collection Plan

## Year 2: Program Implementation

- Deploy Vehicles, Train Staff
- Technical Assistance and Data Collection
- Reporting



**Other Vermont  
Electric Bus  
Projects**

# Prior VT Experience

## Electric bus testing Feb - Apr 2017

- Advance Transit
- Green Mountain Transit
- University of Vermont

## Results –

- the all-electric bus was more efficient, less expensive to operate, and produced significantly lower emissions than a new diesel bus
- Performance and savings varied by operating environment.
- Drivers generally liked the electric bus experience

# Upcoming Electric Transit Bus Projects

## Green Mountain Transit

- Deploying 2 full-sized electric transit buses in Burlington this Fall
- Deploying 2 smaller “cutaway” electric buses in Montpelier in near future

## Advance Transit

- Deploying 4 full-sized electric transit buses in Upper Valley region in 2021

Funded in part by FTA Low-No Emission Vehicle Program and supported by VTrans

# Summary

- Programs are underway to advance electric buses
- Funding can help bring down the upfront costs
- Seek utility input in procurement decisions & charging plans to maximize cost savings
- Technical assistance is available from several sources
- More options coming!

# Questions?

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Thank  
you!