

Transit Electrification Webinar

August 20, 2020

Agenda

- ▶ Welcome - Julie White, Deputy Secretary for Multimodal Transportation, NCDOT
- ▶ Welcome - Jeremy Tarr, Senior Advisor for Climate Change Policy, Office of the Governor
- ▶ CMAQ for Transit, Q&A - Heather Hildebrandt, Interim Director, Integrated Mobility Division, NCDOT
- ▶ VW Settlement Transit Bus Program - Brian Phillips, Mobile Source Branch Supervisor, NCDEQ
- ▶ Transit Electrification Value Proposition and Financing Options - Dionne Delli-Gatti, Director of Regulatory and Legislative Affairs for Southeast climate and Energy, Environmental Defense Fund; and Dr. Holmes Hummel, Founder, Clean Energy Works
- ▶ Discussion



NORTH CAROLINA

Department of Transportation



Overview of the NC CMAQ Program

Heather Hildebrandt

Transportation Planning Division

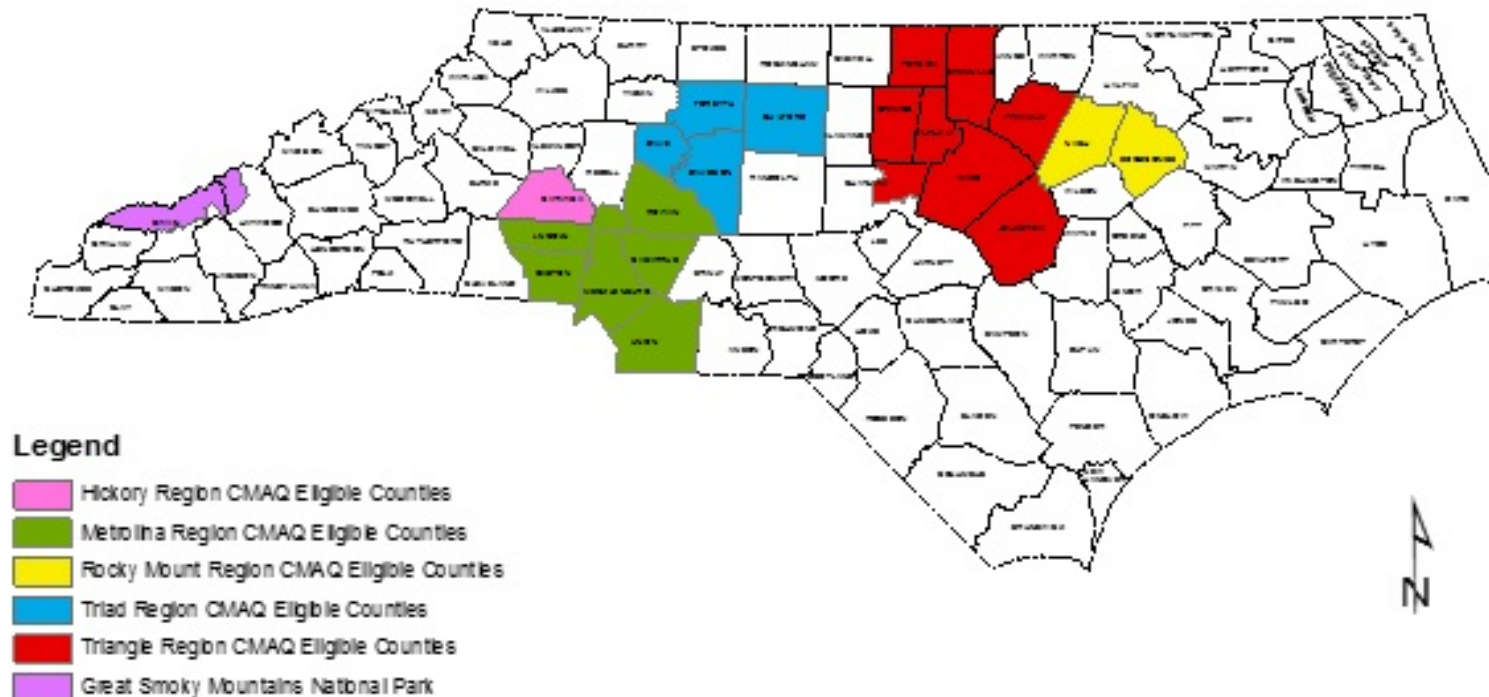
May 27, 2020

What is the CMAQ Program?

- Congestion Mitigation & Air Quality Improvement Program
- Federal-aid program
- Funds transportation projects/programs to improve air quality & reduce congestion
- Focuses on reduction of ozone (O₃), carbon monoxide (CO) and particulate matter (PM_{2.5}) emissions
- NCDOT receives funding and passes it through to eligible areas

What areas are eligible?

- Areas that are **currently** OR **previously** nonattainment or maintenance for O₃, CO or PM



What project types are eligible?

- Diesel engine retrofits
- Idle reduction
- Congestions reduction & traffic flow improvements
- Freight & intermodal projects
- Transportation control measures
- Transit improvements
- Bicycle & pedestrian improvements
- Travel demand management
- Public education & outreach
- Transportation management associations
- Carpooling & vanpooling
- Car-sharing
- Extreme low temperature cold start programs
- Training
- Inspection & maintenance programs
- Innovative projects
- Alternative fuels & vehicles

What project types are eligible?

- **Transit improvements**
 - New transit facilities associated with new or enhanced services
 - Rehabilitation of existing facilities in some cases
 - New transit vehicles (bus, rail or van) to expand fleet or replace existing vehicles
 - Certified diesel engine retrofits
 - Operating assistance for new or expanded transit service
 - Fuel is an eligible expense for these particular projects
 - Transit fare subsidies

How much funding is available?

- NC funding amount is established in Federal transportation legislation
 - FAST Act set up funding through FFY 2020
 - NCDOT establishes a CMAQ target for future years based on past funding
- NC funding is broken out into three categories:
 - Statewide
 - Regional
 - Subregional

NC CMAQ Project Categories

Statewide CMAQ	Regional CMAQ	Subregional CMAQ
35% of NC funding	5% of NC funding	60% of NC funding, further broken down by MPO/RPO areas
Projects proposed & administered by NCDOT	Projects proposed & administered by Local Program Sponsors	Projects proposed & administered by Local Program Sponsors & submitted by MPO/RPO
Must be located in eligible county(ies)	Must be located in at least two eligible <i>regions</i>	Must be located in eligible counties within MPO/RPO
NCDOT provides matching funds	Local Program Sponsor provides matching funds	
Must be at least \$100,000 in total funding		

CMAQ Applications

- All CMAQ proposals require an application
- Applications must include emissions reductions calculations
- Cost estimates should reflect anticipated inflation compounded annually at 5% from the current calendar year
- All applications are reviewed by the Interagency Review Team (IRT) for CMAQ eligibility
 - IRT: NCDOT TPD, Divisions; FHWA; FTA; EPA; NCDAQ

Emissions Calculation Tool

- Applicants will use CMAQ emissions calculation tool to quantify emissions reductions
 - Consistent emissions reductions from applicants

Tentative Timeline

Item Description	Start Date	End Date
Funding allocation analysis	10/1/2020	11/1/2020
Project application due	1/31/2021	
Internal review of applications	2/3/2021	2/28/2021
Award approval letters sent out	3/2/2021	
Project contract due date	9/1/2021	
Funding analysis for competitive projects	9/2/2021	9/21/2021
Competitive/NCDOT applications due	10/16/2021	
Internal review of applications	10/19/2021	11/6/2021
Approval letter for competitive/NCDOT sent out	11/9/2021	

Questions or Comments?

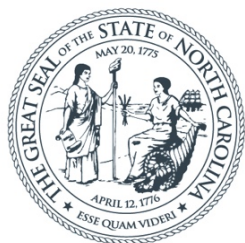
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- Heather Hildebrandt
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NORTH CAROLINA

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Bicycle and Pedestrian | Public Transportation CMAQ Funding for Transit Systems

Heather Hildebrandt, Interim Director

Integrated Mobility Division

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Volkswagen Settlement Transit Bus Program
Brian Phillips, Mobile Sources Compliance Branch, NC Division of Air Quality
Department of Environmental Quality

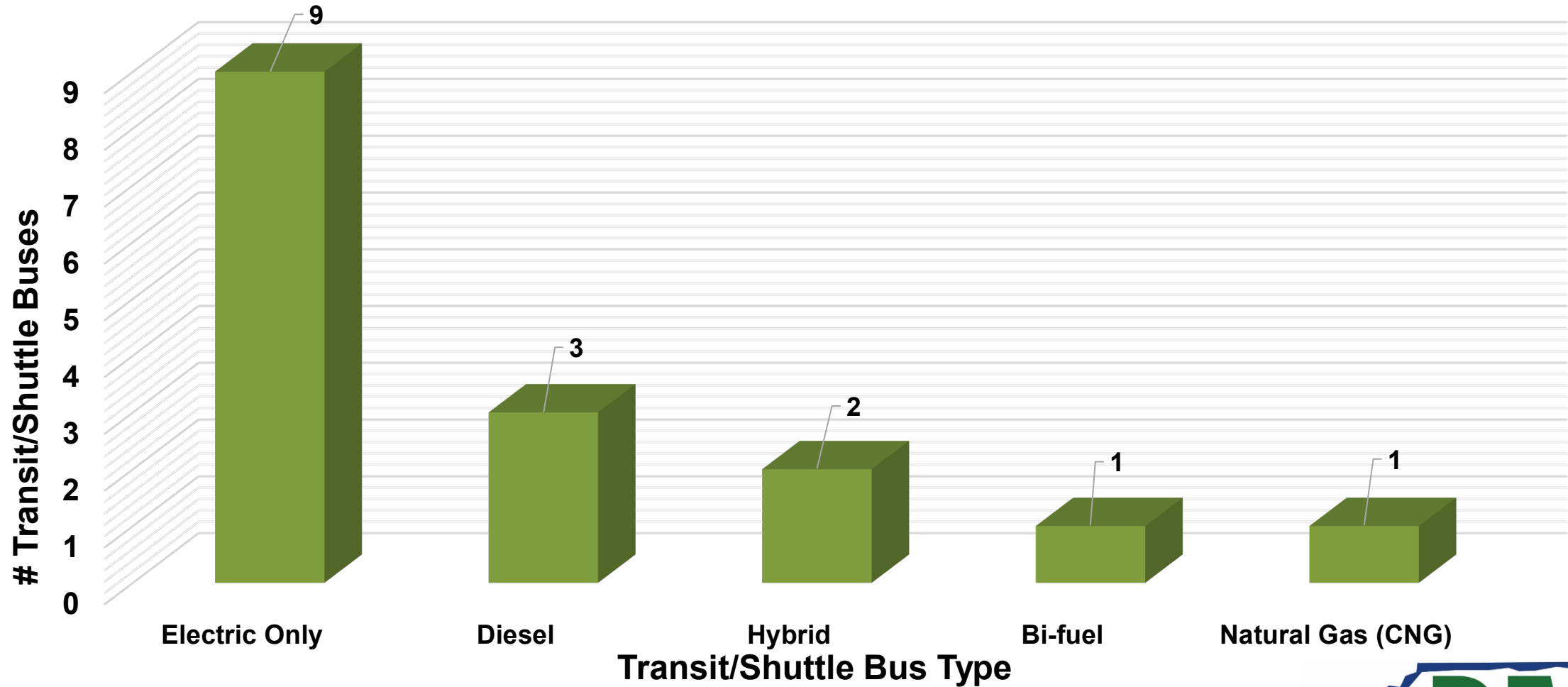


Transit/Shuttle Bus Phase 1 Project Summary

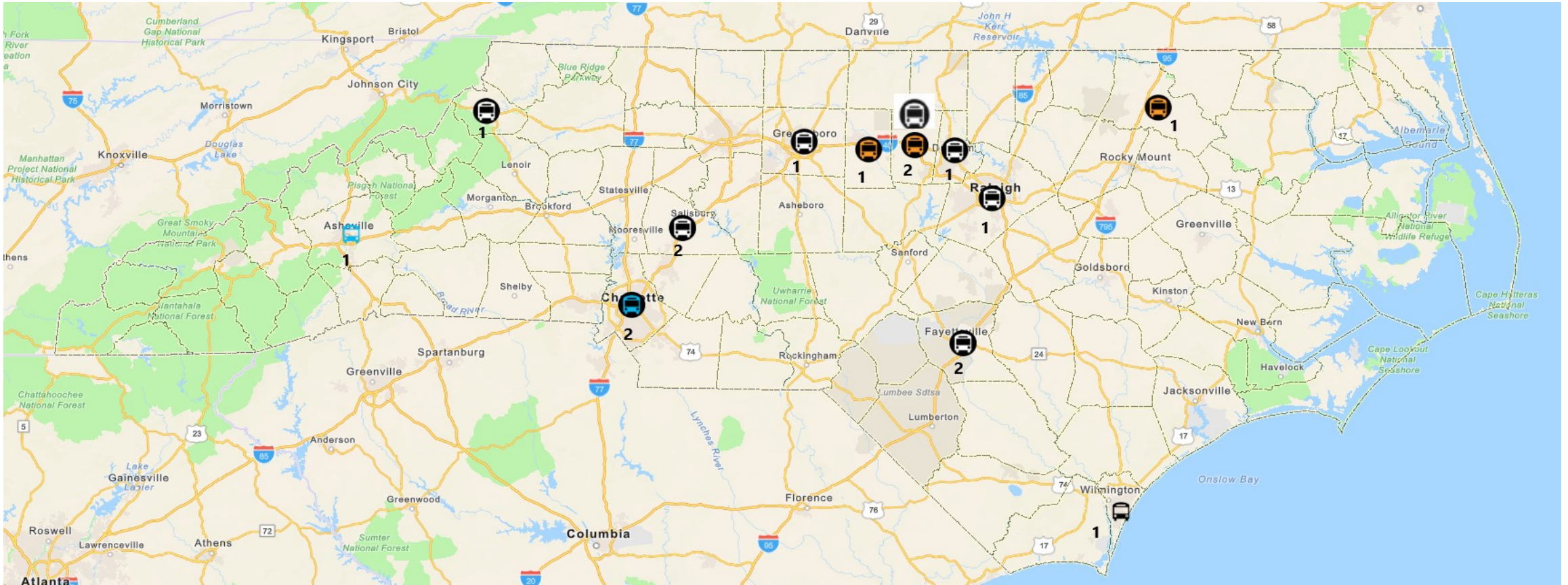
Program	County Classification	Number of Vehicles Funded	Annual Tons of NOx Reduced	Total Amount Funded
Transit/Shuttle Bus	Rural	2	1.1	\$1,201,500
	Urban/Suburban	14	5.5	\$4,934,877
Total	\$6,136,377 (Allocated)	16	6.6	\$6,136,377 (100% Funded)



Transit/Shuttle Bus Fuel Type Distribution



VW Awarded Transit/Shuttle Buses



-  Diesel Transit Buses
-  Electric Transit Buses
-  Hybrid Transit Buses
-  Natural Gas (CNG) Buses
-  Bi-fuel Transit Buses



Next Steps

- **Contract processing for Phase 1 awards will precede in the next two to six months**
- **Second half of 2020 - begin the Phase 2 planning**
- **DAQ prepares Phase 2 RFPs in 2021 for release**

Transit Bus Replacement Program

- **\$6.1 million was available in Phase 1**
- **Eligible buses include 2009 engine model year and older class 4-8 transit buses and shuttle buses.**
- **May be repowered with any new diesel or alternative fueled or all-electric engine or replaced with a new diesel or alternative fueled or all-electric bus. (Must be with engine model year of award or year prior)**
- **Eligible buses must be scrapped.**

Scrappage Requirements

- **“Scrapped” shall mean to render inoperable and available for recycle, and, at a minimum, to specifically cut a 3-inch hole in the engine block for all engines.**
- **If any eligible vehicle will be replaced as part of an eligible project, scrapped shall also include the disabling of the chassis by cutting the vehicle’s frame rails completely in half.**

Phase 1 Eligible Projects

- **Projects submitted by local, state, and tribal government organizations.**
- **Projects submitted by public or private nonprofit organizations.**
- **Projects submitted by public-private partnerships where the lead applicant represents a public sector or public/private nonprofit entity.**

Phase 1 Funding Levels

- **For Government Owned Eligible Buses:
Replacement or Repower**
 - **Up to 100% of the cost of a new diesel or alternative fueled (e.g. CNG, propane, hybrid) transit bus or shuttle bus.**
 - **Up to 100% of the cost of a new all-electric transit bus or shuttle bus, including costs of installation and up to \$50,000 for charging infrastructure associated with the new all-electric transit bus or shuttle bus.**

Phase 1 Funding Levels

- **For Non-Government Owned Eligible Buses:**
Repower
 - **Up to 40% of the cost of a repower with new diesel or alternative fueled (e.g. CNG, propane, hybrid) transit bus or shuttle bus.**
 - **Up to 75% of the cost of a repower with new all-electric transit bus or shuttle bus, including costs of installation and charging infrastructure associated with the new all-electric transit bus or shuttle bus.**

Phase 1 Funding Levels

- **For Non-Government Owned Eligible Buses:
Replacement**
 - **Up to 25% of the cost of a new diesel or alternative fueled (e.g. CNG, propane, hybrid) transit bus or shuttle bus.**
 - **Up to 75% of the cost of a new all-electric school bus, including costs of installation and up to \$50,000 charging infrastructure associated with the new all-electric transit bus or shuttle bus.**

VW Settlement Funding Process

- **The Diesel Vehicle Program is currently designed as a reimbursement process.**
- **Submittal of paid invoices and proof of bus destruction are required prior to reimbursement by DEQ.**

VW Settlement Project Selection Criteria

DEQ will consider factors such as, but not limited to:

- **Cost Effectiveness** (VW\$ funded per NO_x tons reduced)
- **NO_x Emissions Reductions**
- **Location of project**
- **Co-Benefits**
- **Sustainability of the project**
- **Timeliness**
- **Useful life of vehicle replaced**
- **Environmental Justice areas**



More Information

For additional information regarding the VW Settlement, please visit our webpage.

deq.nc.gov/VWsettlement

Contacts

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Program Manager**

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Brian Phillips, Mobile Sources Compliance Branch Supervisor

Phone: 919-707-8426

Email questions to:

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email to the address above with “Subscribe” in the
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Department of Environmental Quality



Questions



Transit Electrification

**Dionne Delli-Gatti, Director of Regulatory and Legislative Affairs for Southeast
Climate and Energy, Environmental Defense Fund**

Dr. Holmes Hummel, Founder, Clean Energy Works

15 States and the District of Columbia Join Forces to Accelerate Bus and Truck Electrification



Northeast States for Coordinated Air Use Management

89 South Street, Suite 602 Boston, MA 02111
Phone 617-259-2000 Fax 617-742-9162
Paul J. Miller, Executive Director

15 STATES AND THE DISTRICT OF COLUMBIA JOIN FORCES TO ACCELERATE BUS AND TRUCK ELECTRIFICATION

SIGN MEMORANDUM OF UNDERSTANDING – PLEDGE TO DEVELOP ACTION PLAN TO ERADICATE TOXIC DIESEL EMISSIONS BY 2050

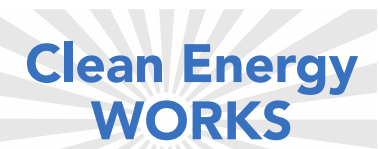
Boston, MA (July 14, 2020) – Today, 15 states and the District of Columbia announced a joint memorandum of understanding (MOU), committing to work collaboratively to advance and accelerate the market for electric medium- and heavy-duty vehicles, including large pickup trucks and vans, delivery trucks, box trucks, school and transit buses, and long-haul delivery trucks (big-rigs). The goal is to ensure that 100 percent of all new medium- and heavy-duty vehicle sales be zero emission vehicles by 2050 with an interim target of 30 percent zero-emission vehicle sales by 2030.

States signing the MOU are: California, Connecticut, Colorado, Hawaii, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington.

The MOU will go a long way toward slashing harmful diesel emissions and cutting carbon pollution. The transportation sector is the nation's largest source of greenhouse gas emissions and also contributes to unhealthy levels of smog in many of the signatory states. Accelerating the electrification of trucks and buses is an essential step to achieve the deep economy-wide emission reductions needed to avoid the worst consequences of climate change and protect the health of millions of Americans. While trucks and buses only account for 4 percent of vehicles on the road, they are responsible for nearly 25 percent of total transportation sector greenhouse gas emissions. In fact, emissions from trucks are the fastest growing source of greenhouse gases, and the number of truck miles traveled on the nation's roads is forecast to continue to grow significantly in the coming decades.

Truck and bus electrification also promises to deliver wide spread health benefits, particularly in communities with heavy truck traffic that are burdened with higher levels of air pollution. Medium- and heavy-duty trucks are a major source of harmful smog-forming pollution, particulate matter, and air toxics. These emissions disproportionately impact low-income communities and communities of color often located near major trucking corridors, ports, and distribution hubs.

The MOU comes at an important transition point for the industry as investment in zero emission vehicle technology for the medium- and heavy duty sector continues to ramp up. Today, at least 70 electric truck and bus models are on the market, and manufacturers are expected to make many more new models commercially available over the next decade. Apart from the public health benefits and avoided health care costs zero emission trucks and buses provide, by 2030,

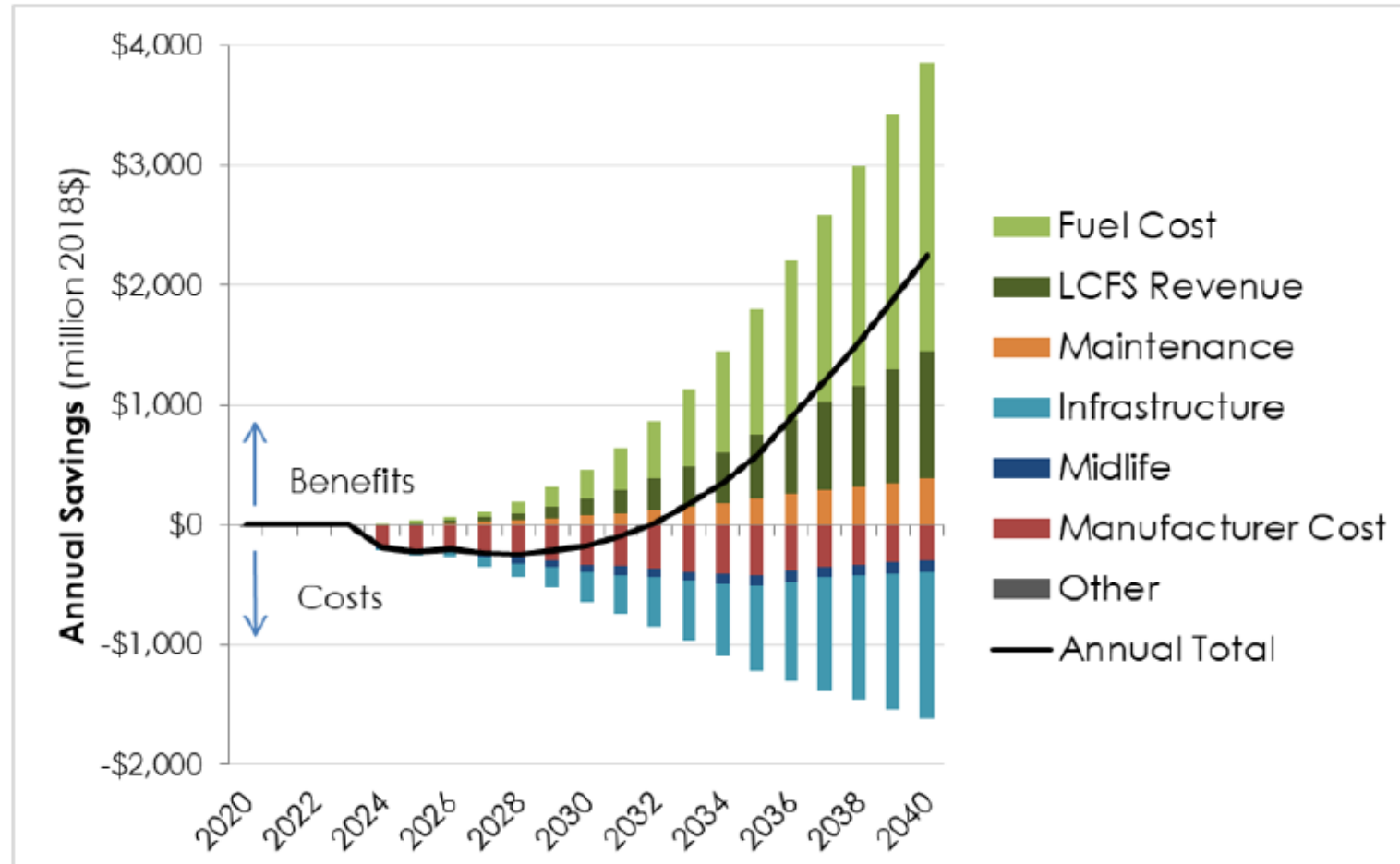


NESCAUM

- Commitment to work collaboratively to advance and accelerate the market for electric medium- and heavy-duty vehicles, including large pickup trucks and vans, delivery trucks, box trucks, school and transit buses, and long-haul delivery trucks (big-rigs).
- The goal is to ensure that 100 percent of all new medium- and heavy-duty vehicle sales be zero emission vehicles by 2050
- An interim target of 30 percent zero emission vehicle sales by 2030.
- States signing the MOU are: California, Connecticut, Colorado, Hawaii, Maine, Maryland, Massachusetts, New Jersey, New York, **North Carolina**, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington.

NESCAUM

Figure ES-1. Benefit and cost effects by year through 2040



Source: California EPS

NESCAUM

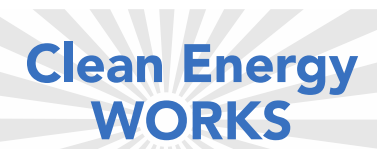
Table ES-3 presents undiscounted and discounted perspectives and adds a new metric to results: average cost per avoided ton of CO₂e. We calculate average cost as total savings through 2040 divided by emissions reductions expected from the proposed rule through 2040.

Table ES-3. Total savings calculated as average cost and present value (2018 \$s)

	EPS results with CARB battery costs		EPS results with lower battery costs	
	Total savings	Average savings per avoided ton of CO ₂ e*	Total savings	Average savings per avoided ton of CO ₂ e*
Undiscounted	\$7.3 billion	\$414 per metric ton	\$12.4 billion	\$708 per metric ton
Discounted (5%)	\$6.3 billion	\$358 per metric ton	\$10.7 billion	\$612 per metric ton

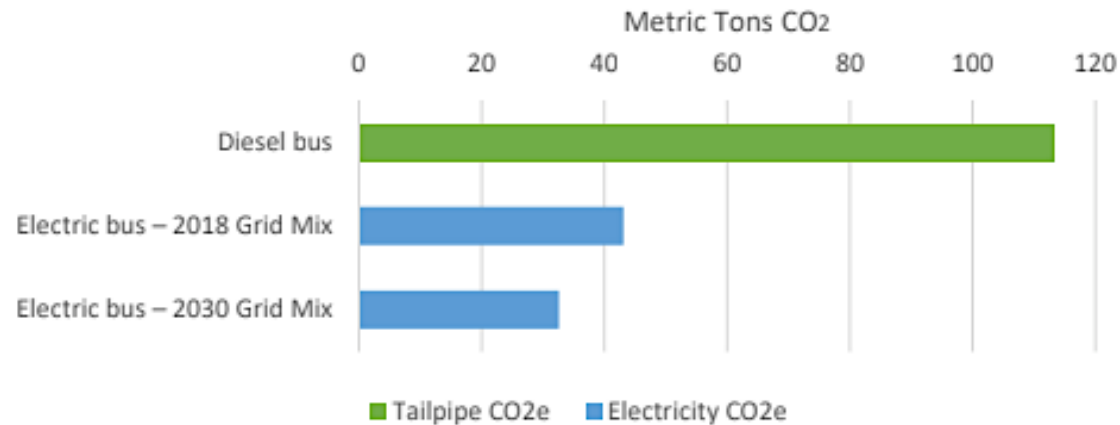
Source: California EPS and CARB ([2020c](#))

Source: CLEAN TRUCKS, BIG BUCKS - California Energy Policy Simulator evaluation of the proposed Advanced Clean Trucks Rule, JUNE 2020
BY CHRIS BUSCH and AMANDA MYERS, ENERGY INNOVATION
JAMES FINE, ENVIRONMENTAL DEFENSE FUND



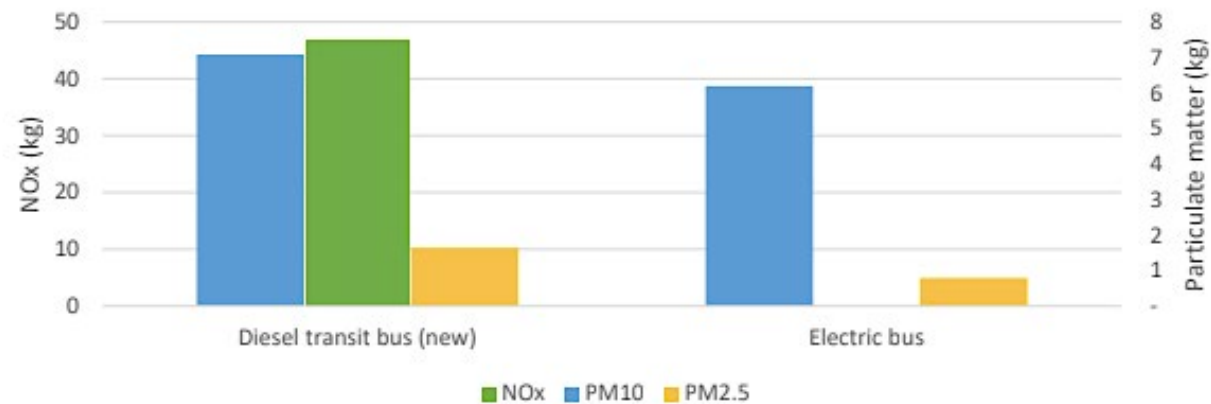
EV buses in North Carolina advance multiple policy objectives in air quality and public health

Annual Carbon Emissions Per Bus (metric tons CO₂)



This analysis prepared for a NC transit agency uses the NC grid resource mix, finding dramatic improvements to carbon dioxide, black soot, and particulates.

Annual Criteria Pollutant Emissions Per Bus



Value Streams from Electrification of Transportation

- ✓ Cleaner air
- ✓ Better public health
- ✓ Avoided damages from climate change

- ✓ Lower fuel costs
- ✓ Lower maintenance costs
- ✓ Lower risk of stranded assets on the path to Executive Order 80 and NC ZEV Pla goals

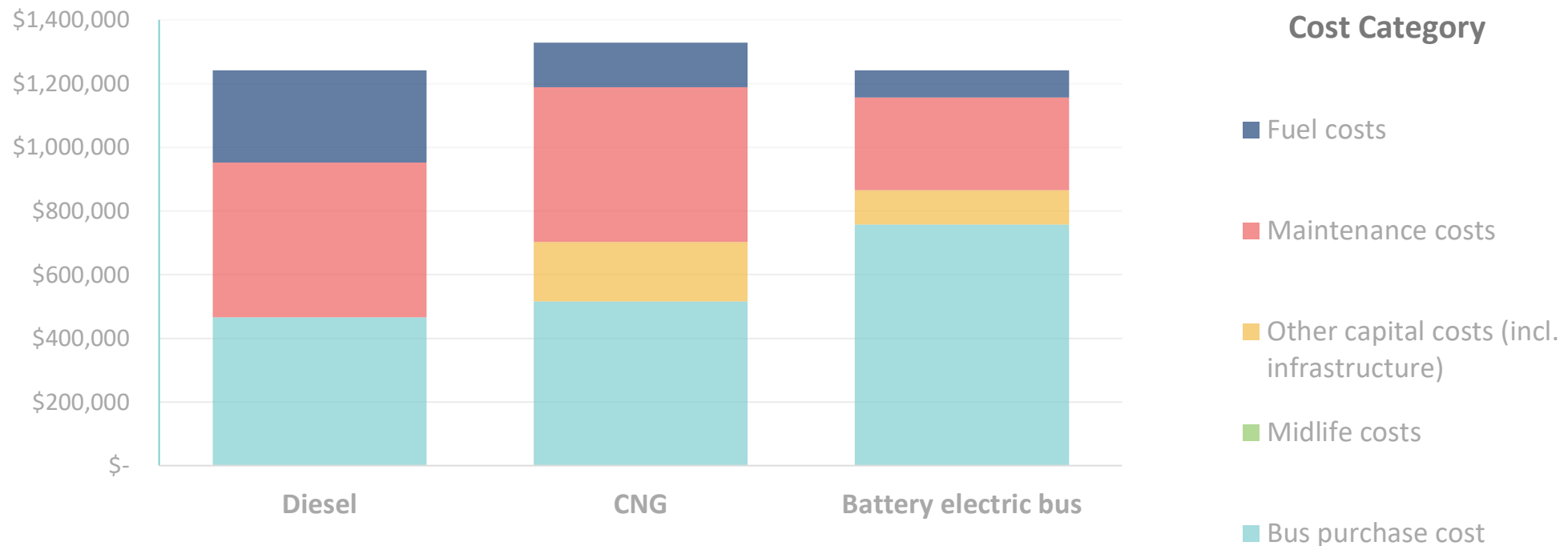
Accelerating Electrification for Transit in North Carolina



100% EV transit bus in Louisville, KY

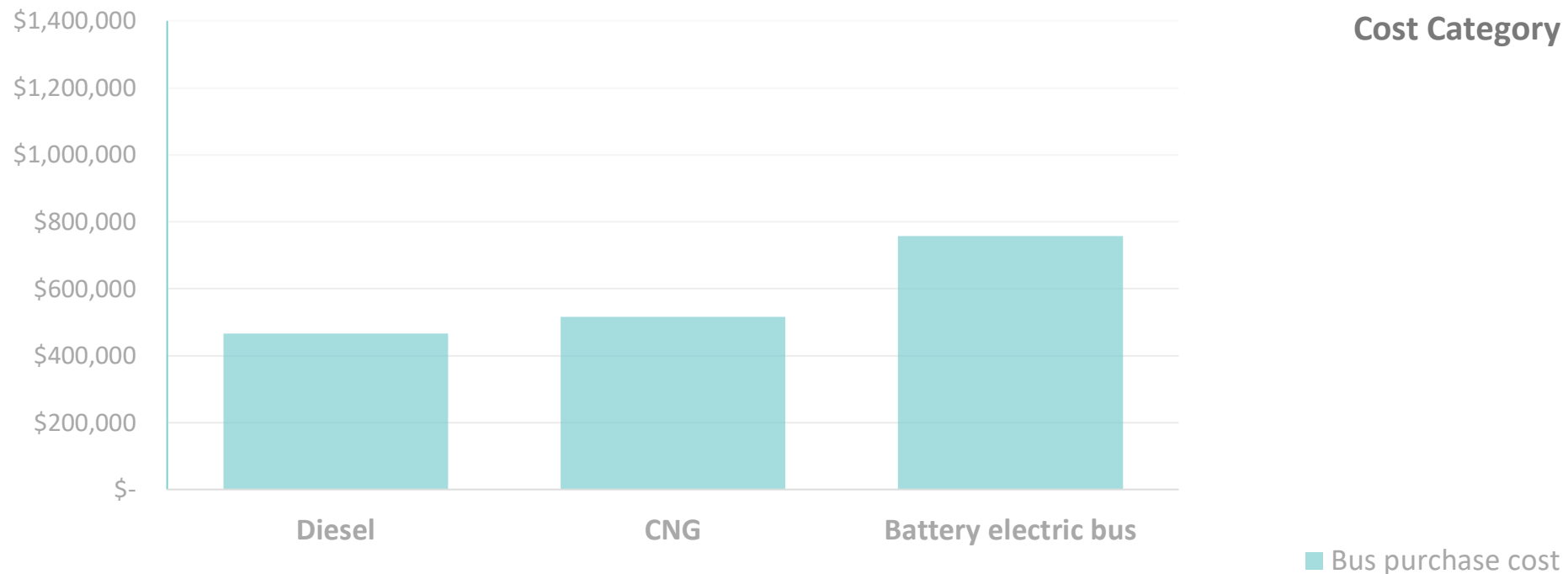
Lifecycle costs of Battery Electric Buses are competitive with fossil options

Total cost of ownership for a bus purchased in 2019 in a sample city: NC



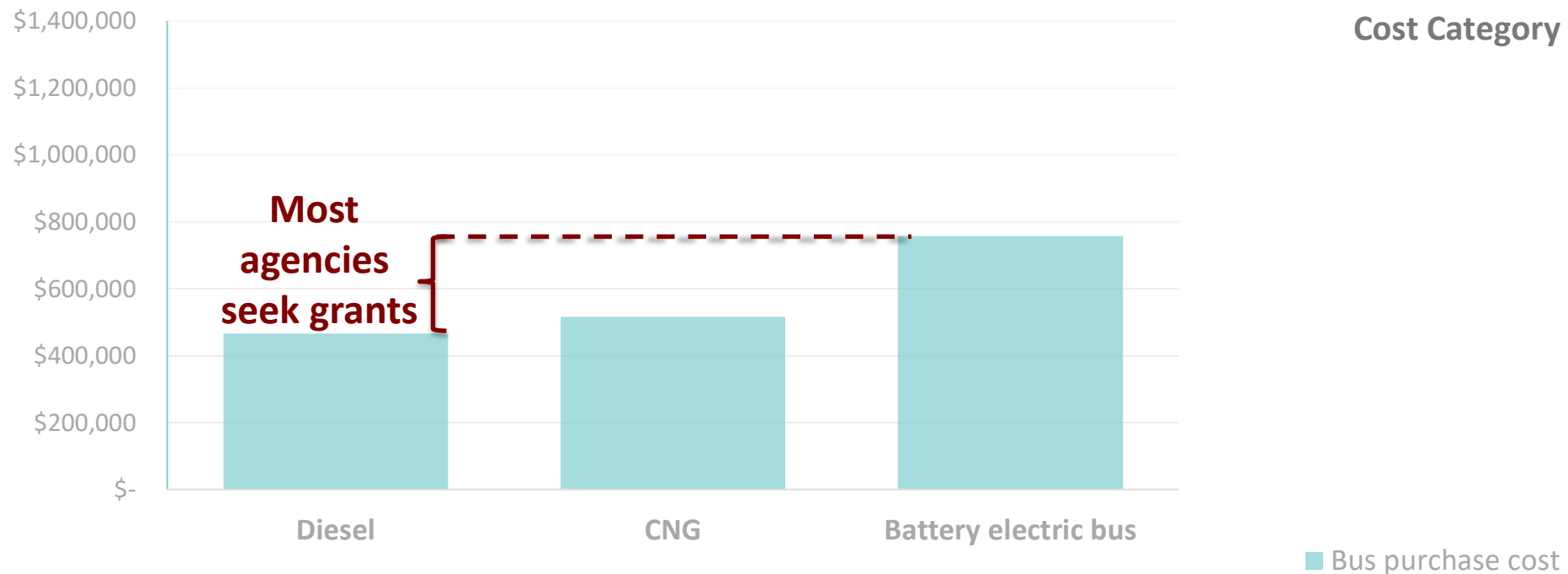
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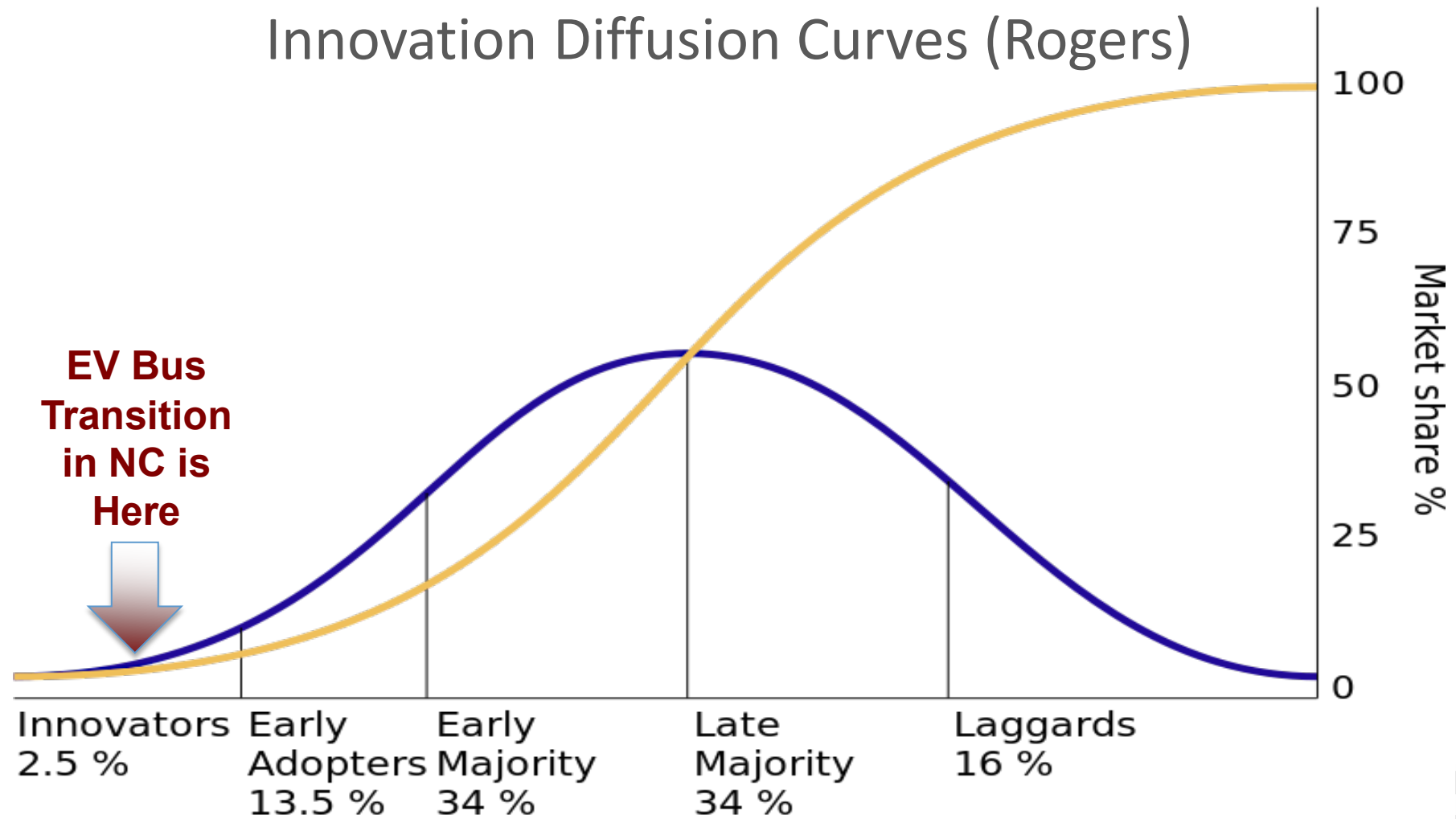


Lifecycle costs of Battery Electric Buses are competitive with fossil options

Total cost of ownership for a bus purchased in 2019 in a sample city: NC



Financial strategies that have helped early adopters are not necessarily scalable to cover all new transit buses



Sources: IEA, *Global EV Outlook, 2017*; BNEF, *Electric Buses in Cities, 2018*; McKinsey, *Focused Acceleration, 2018*.

Funding for initial deployments has been critical to getting started

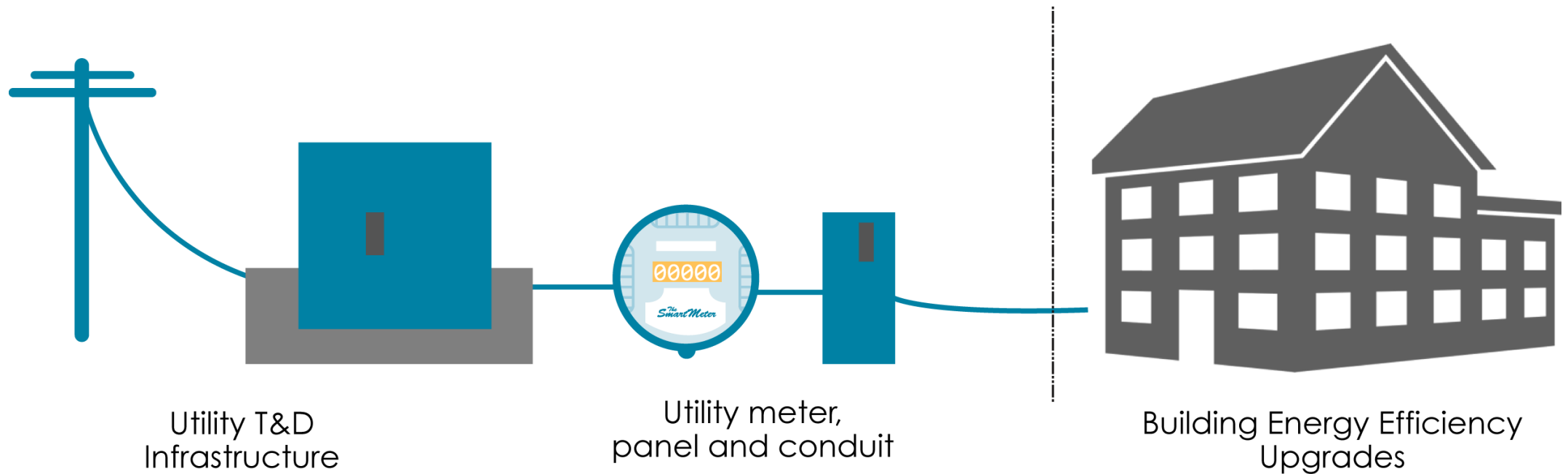
Instrument	Sustainable	Scalable	Customer Balance Sheet Treatment	
Taxpayer funding	Solid Yellow	Solid Red	Solid Green	} Highly sought grants
Polluter funding (carbon price)	Diagonal Hatching	Diagonal Hatching	Solid Green	
Ratepayer funding	Diagonal Hatching	Solid Red	Solid Green	

Covering the incremental upfront cost with grants is not scalable or sustainable.

Financing options can extend the impact of funding available for the incremental upfront cost

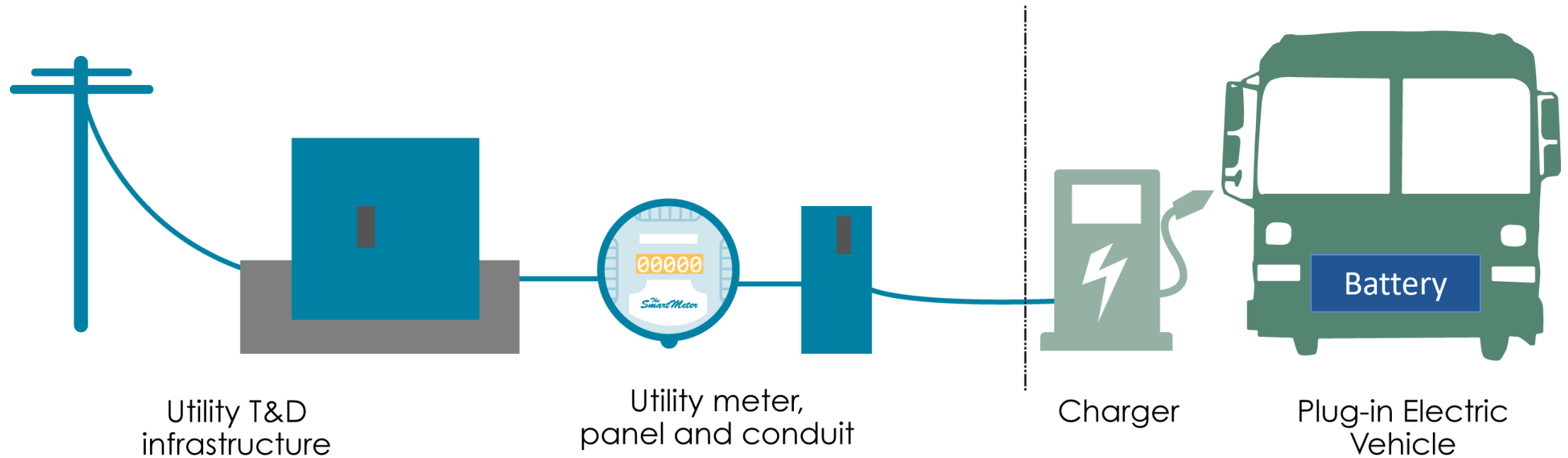
Instrument	Sustainable	Scalable	Customer Balance Sheet Treatment	
Taxpayer funding	Orange	Red	Green	Highly sought grants
Polluter funding (carbon price)	Red diagonal stripes	Red diagonal stripes	Green	
Ratepayer funding	Red diagonal stripes	Red	Green	
Debt financing (bonds)	Green	Green	Balance sheet liability (Yellow)	Financing
Operating leases / fleet services	Green	Green	Balance sheet liability (Yellow)	
Utility tariffed on-bill investment	Green	Green	Green	←

Utility tariffed on-bill investments “behind the meter” have already unleashed capital for efficiency upgrades



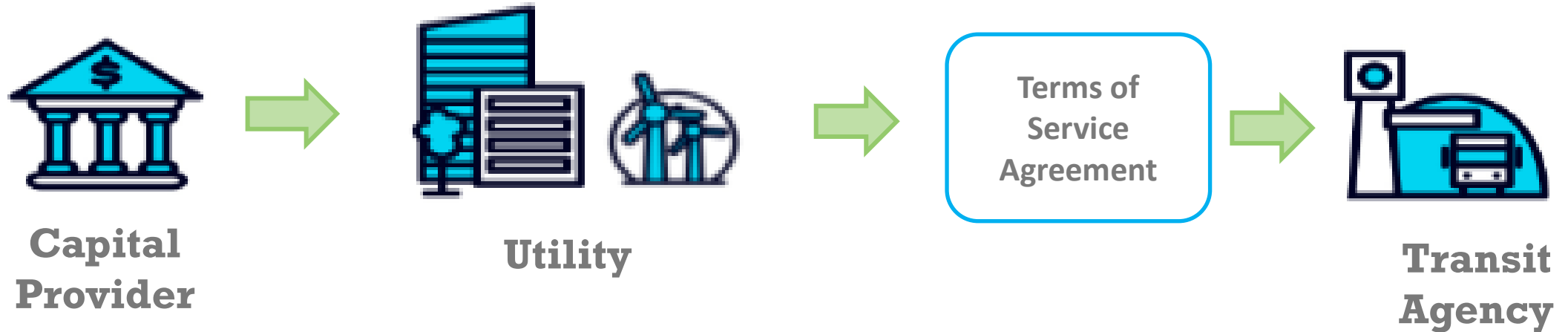
Inclusive financing reduces first cost barriers for all

What would happen if we applied the same approach to electrification in transportation, starting with transit buses?

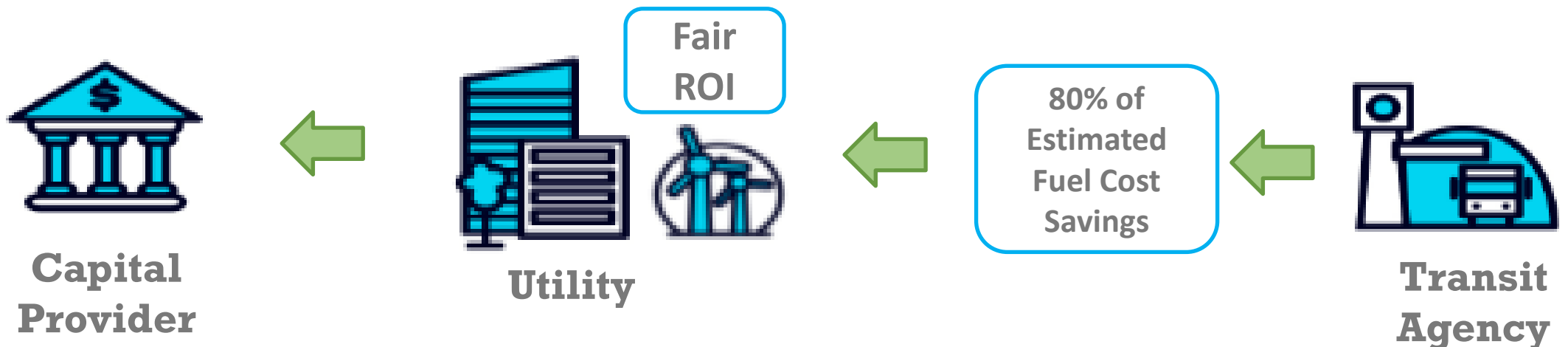


on-site charging stations
and on-board batteries

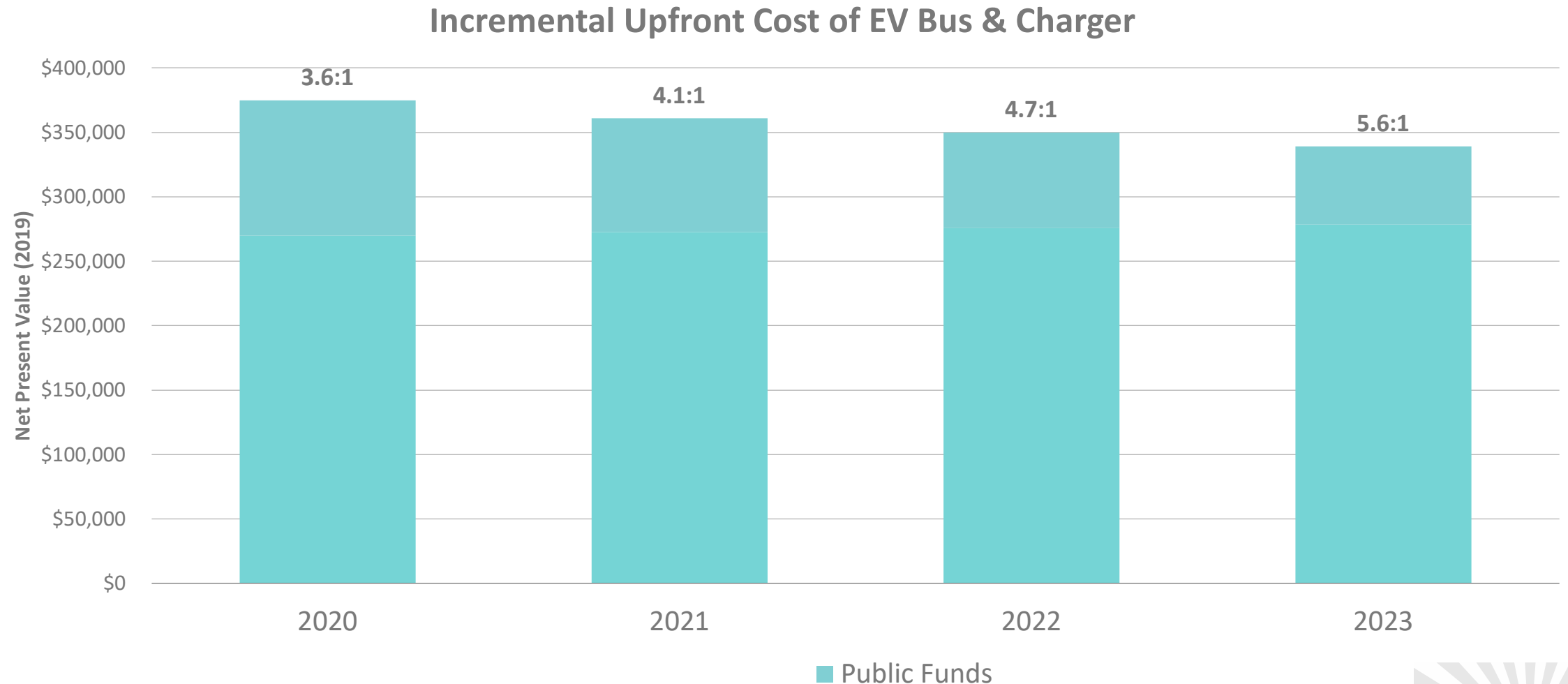
A utility can invest in site-specific, cost-effective upgrades...



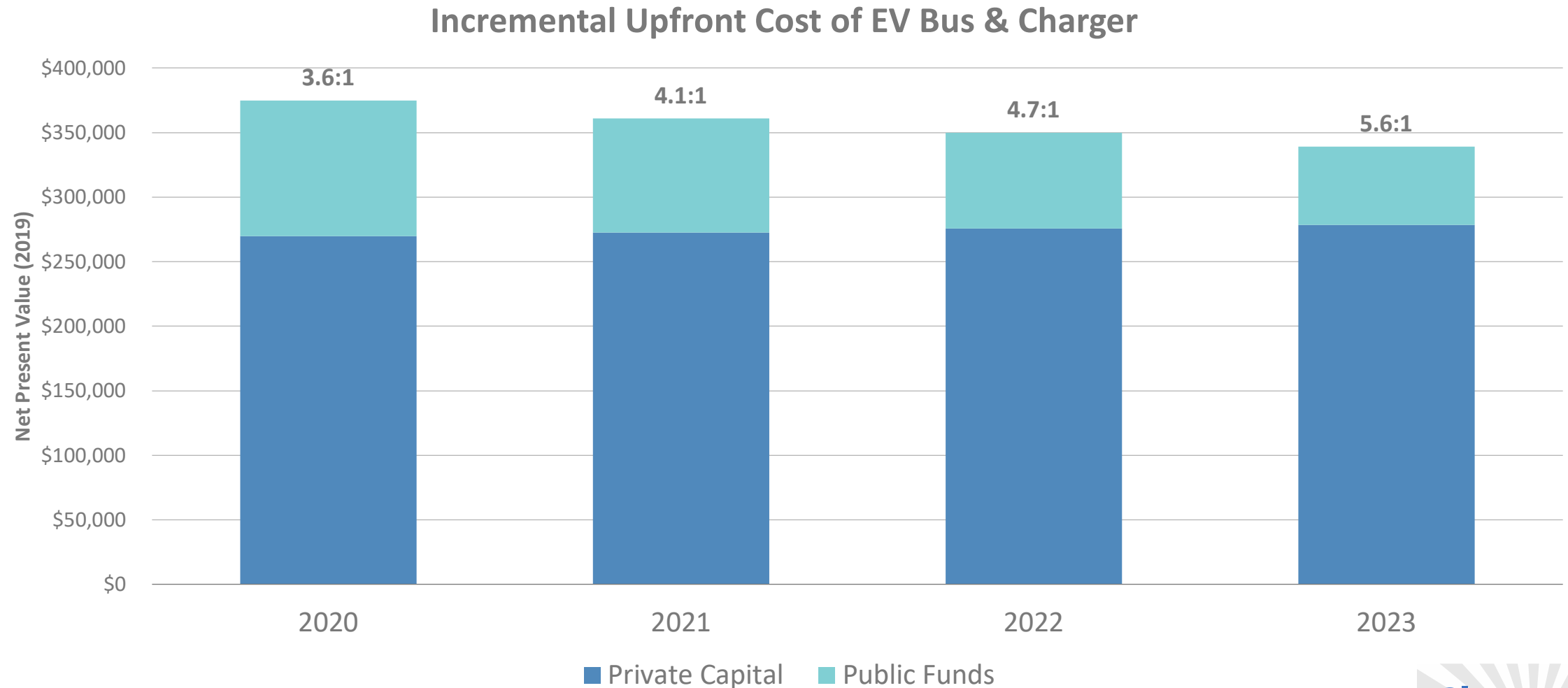
... and recover its costs (for battery and charger)
via a flat charge on the bill that is less than estimated savings



Grant funding for the incremental cost (battery and charger)



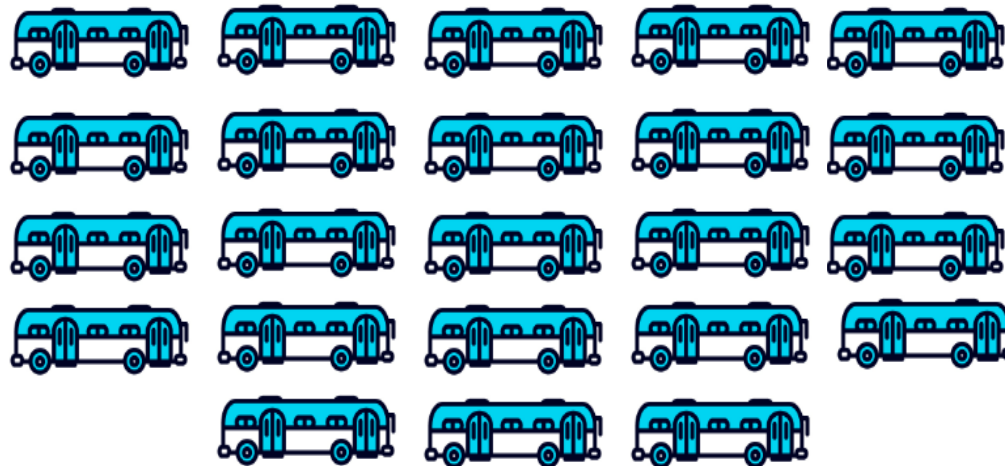
Grant funding for the incremental cost (battery and charger) can be capitalized instead through a utility service agreement



\$2 M for EV transit buses is enough to pay for the incremental upfront cost of 5 electric buses...

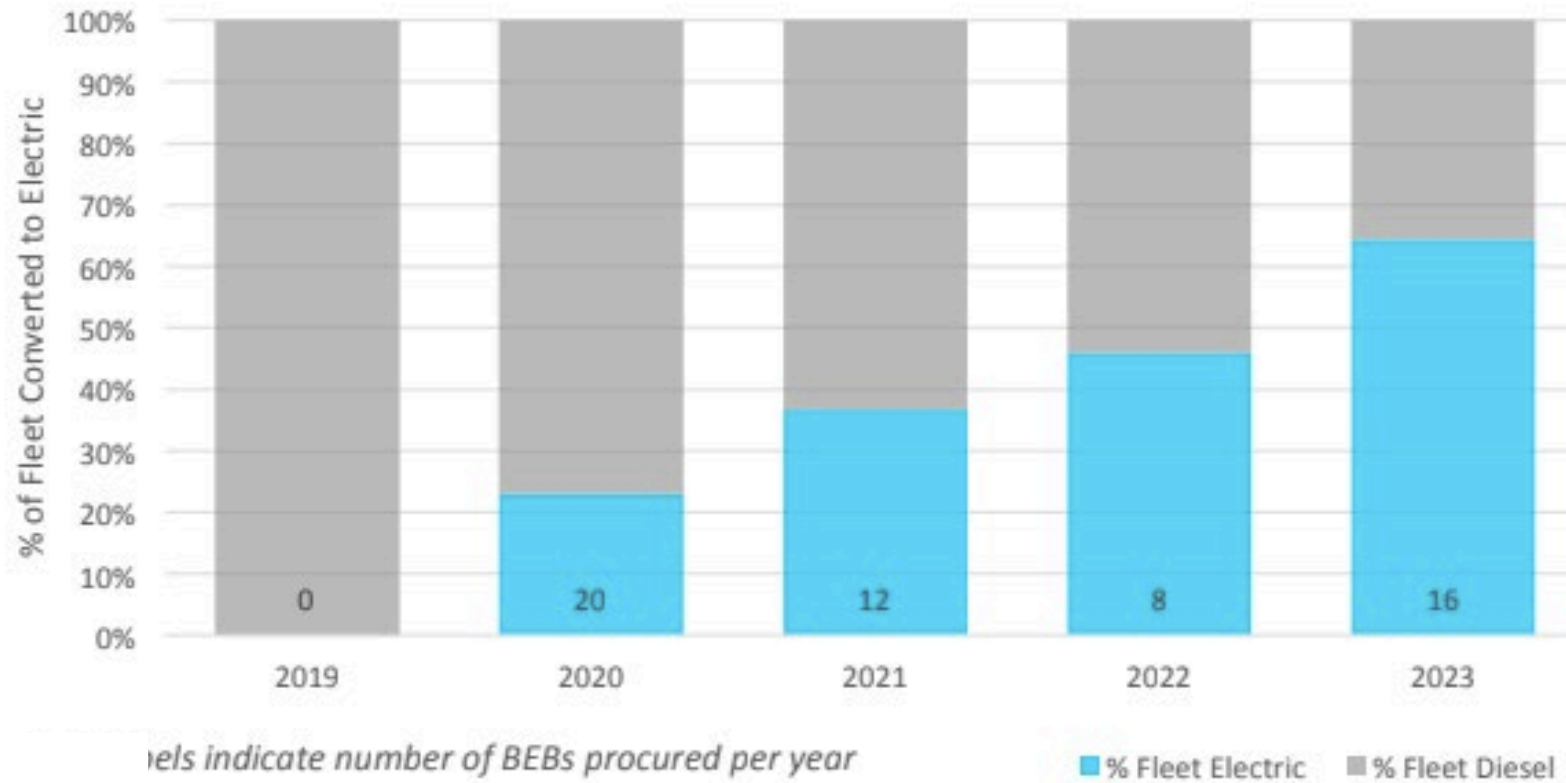


...or, with PAYS for Clean Transport, \$2 M would cover the incremental cost of **18** electric buses



Scalable solution from first EVs to full fleet transition with each new year of bus procurement

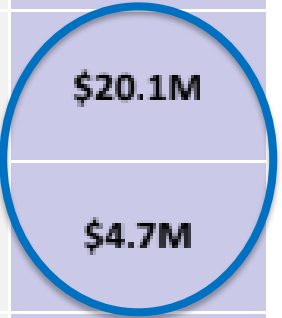
Figure 6: Modeled Fleet Transition to Electric Buses for Lake City, 2019-2023



The upfront incremental cost for 56 new buses over 4 years would drop by more than 3/4 with a utility tariffed on-bill investment program

Table 6: Estimated total cost for electrification of planned procurement of 56 buses (2020-2023)

	2020	2021	2022	2023	Total
Estimated number of buses to be procured	20	12	8	16	56
Total Incremental upfront cost (\$ million)	\$7.5M	\$4.3M	\$2.8M	\$5.4M	\$20.1M
Total Copayment needed (\$ million)	\$2.1M	\$1.1M	\$.6M	\$1.0M	\$4.7M
Ratio of full incremental cost to copayment	3.6:1	4.1:1	4.7:1	5.6:1	4.3:1



3/4 drop in upfront cost barrier when a utility offers a tariffed on-bill investment

Validators



Driving Sustainable Investment



**Climate Strategies
Accelerator**

**Flare
AWARDS**

**KEELING
CURVE
PRIZE**

Partners



Rural transit systems now have new EV options, and some NC electric cooperatives have led the way for utility on-bill investment

Half a dozen models of paratransit and mid-size transit vehicles are now on the market, and the FTA Rural Transit program has \$650 million/year

EV STAR

Product Specifications



Duke EV Pilot

- ❑ NC Public Utilities Commission is considering a proposal from Duke Energy for a broad EV pilot program.
- ❑ Includes an EV transit bus charging station program
 - ❑ Designed to deploy charging stations for EV transit buses.
 - ❑ Duke will install and own qualifying EVSE selected by the transit agency.
 - ❑ Duke Energy proposes 60 stations in the Duke Energy Carolinas service territory and 45 stations in the Duke Energy Progress service territory
- ❑ EDF asked that Duke offer tariffed on-bill financing for school districts and transit agencies be included in the pilot

Potential Action Items and Next Steps

- ❑ **Review a sample financial analysis** completed for a NC transit agency with Duke Energy's input, showing multiplier effect of tariffed investment
- ❑ **Arrange a call with executives** at your transit agency to discuss a financial strategy for achieving a zero-emission fleet transition
- ❑ **Request a tailored financial analysis** for the option of a site-specific utility investment (with tariffed terms for an on-bill cost recovery)



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Discussion

The background features abstract, overlapping geometric shapes in various shades of green, ranging from light to dark, creating a modern and dynamic feel. The shapes are primarily triangles and polygons, some with soft gradients and others with solid colors. The overall composition is clean and professional.

Thank You!