Columbia University
Office of Sustainability

CNG Feasibility Research – Columbia University Shuttle Fleet

Technical Analysis
June 2026

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CNG is a lower-risk, lower-cost bridge that improves shuttle reliability today while preserving Columbia's zero-emission pathway

A phased CNG deployment through Academy Bus and New Flyer, fueled through a third-party contract, addresses the current fleet's reliability and cost pressures without committing capital or foreclosing future electrification

The Challenge

Columbia's electric buses have faced persistent performance and reliability challenges, impacting service consistency and increasing operational risk

- Higher maintenance needs and unplanned downtime
- Charging limitations affecting scheduling and reliability
- Rising costs and constrained infrastructure feasibility

The Opportunity

CNG buses provide a proven lower-risk solution that improves reliability, offers cost stability, and delivers meaningful emissions reductions.

- ~16-21% lower lifecycle cost per bus mile
- High reliability and operational flexibility
- ~20% lower CO_2 emissions vs diesel with pathway to RNG

Our Evaluation

We evaluated the CNG pathway across five decision lenses and found it to be a feasible and strategically sound transitional solution.

- Strong supplier and vehicle availability
- Access to third-party fueling with competitive pricing
- Regulatory and safety requirements are manageable

Our Recommendation

Proceed with a phased CNG deployment through Academy Bus and New Flyer, leveraging third-party fueling to reduce risk and preserve future optionality

- Initiate partner validation and commercial discussions
- Deploy selectively and monitor performance
- Reassess long-term zero-emission options as technologies mature

Immediate Next Steps

Engage key partners to confirm terms, validate assumptions and move toward a pilot deployment

Engage Academy

Confirm operation mode, lease terms and service responsibilities

Engage New Flyer

Confirm pricing, lead times, vehicle configuration and delivery schedule

Engage Fueling Partner

Confirm third-party fueling access, pricing, capacity, and RNG availability

COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

CNG provides a reliable, cost-effective bridge to the future, delivering operational improvements today, while preserving Columbia's long-term zero-emission goals

EVO ELECTRIC VEHICLES ORGANIZATION

CCEG COLUMBIA CLEAN ENERGY GROUP

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Project leadership combines transportation, energy-markets and management-consulting experience

The execution team is led by EVO members with global experience across transportation, electrification and sustainability strategy

Yaseen Ahmid

President

Electric Vehicles Organization

Yaseen Ahmid is a Master of Science candidate in Sustainability Management at Columbia University, specializing in energy markets, Supply Chain and Smart Cities.

He brings two years of management consulting experience, with a strong focus on sustainability, circular economy strategy, and operational transformation. Yaseen has worked across cross-functional teams to support clients on complex challenges involving supply chain planning, resource efficiency, and sustainable growth. His perspective is shaped by both analytical rigor and a deep commitment to practical impact, particularly in emerging markets.

Noemie Remy

Vice- President

Electric Vehicles Organization

Noémie-Camille Remy is a Master of Science candidate in Sustainability Management at Columbia University, specializing in energy markets and decarbonization strategy.

Her background combines energy systems analysis, ESG investment research, and sustainable consulting experience. She has worked on ESG risk monitoring, sustainability benchmarking, and market assessments, translating complex regulatory and financial data into structured, decision-relevant insights. She holds a Bachelor's degree in Business Administration with a focus on Strategic Management from the University of St. Gallen in Switzerland.

Stephanie Brody

EVP, Events

Electric Vehicles Organization

Stephanie Brody is in her fourth and final semester at SUMA and this is her third semester with EVO. She earned her bachelor's degree in Environmental Policy and Urban Planning at Rutgers University.

She has worked at the Alan M. Voorhees Transportation Center as a research assistant and at the New Jersey Department of Environmental Protection for the Office of Climate Resiliency. This background has made her deeply knowledgeable about sustainable transportation.

Marco Giordano

Vice President

Clean Energy Group

Marco Giordano, is a second-year undergraduate student studying Mechanical Engineering at Columbia. His background lies in transportation engineering: He has worked primarily in micro mobility systems in New York City.

He currently works with the Columbia Clean Energy Group on clean energy projects around New York City and Columbia. Through a previous internship at the UN, he has also gained experience with data projects and is particularly interested in how data and policy intersect within the clean energy sector.

A specialist advisory bench deepens our energy value-chain and electrification coverage

Associate consultants bring research, finance and clean-energy expertise spanning the energy market's primary input and output industries

Etienne Rouillard

Associate Consultant

Etienne Rouillard is a first-year undergraduate student at Columbia University studying Economics, Political Science, and Sustainable Development.

He brings extensive research experience with the University of Michigan in both public health and engineering, where he conducted statistical analyses, cleaned large datasets, and developed tools to improve research accessibility and efficiency. At Columbia, Etienne is involved with Columbia Venture Partners, where he contributes to market research and due diligence on the sourcing team. He is also an analyst at the Columbia Clean Energy Group, working on various clean energy projects in New York.

Madeline Lee

Associate Consultant

Madeline Lee is a first-year undergraduate student at Columbia University studying Environmental Science. She is interested in geoengineering, clean energy, and battery storage.

She brings data analysis and visualization experience through multimedia reporting for the Columbia Daily Spectator, as well as research experience at Lamont-Doherty Earth Observatory testing prototype versions of a volcanic flow modeling software. She is also a member of undergraduate student groups like the Clean Energy Group and Student Union for Sustainable Development.

Eva Califano

Associate Consultant

Eva Califano is a second-year undergraduate student at Columbia University studying Financial-Economics and minoring in Sustainable Development. She is interested in venture capital and working in the startup space.

She brings past carbon accounting experience from her previous internship at ODA architecture where she calculated the firms carbon footprint, synthesized the data, and recommended actionable next steps for footprint reduction. At Columbia, Eva is involved in an Impact Investing network where she previously learned about the ESG framework and cumulated that experience by presenting an investment to stakeholders.

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Columbia's own targets commit it to zero-emission transport, yet the current fleet path is straining to keep pace

The 2030 framework sets clear commuting, fleet and net-zero milestones; sustaining progress now depends on a reliable transitional option as the electric fleet reaches its limits

Net-Zero Commitment

- Net-zero GHG target by 2050
- Plan 2030 sustainability framework launched in 2021

Clean Energy Transition

- 100% zero-emission electricity procurement across Columbia operations
- 14% decline in campus energy emissions vs 2019 baseline

Sustainable Transportation

- Zero-emission on-campus fleet target by 2037 or sooner
- Reduce transportation emissions across fleet, commuting, business travel, and freight

Transportation Reduction

- Reduce drive-alone commuting to below 8% for employees and 0.5% for students by 2030
- Net-zero commuting target by 2040

Sustainable Transportation Priorities

1 Strategies and future

Fleet Transition Strategy	• Hybrid or electric replacement required for retired vehicles through 2027 • Fully electric replacement pathway targeted after 2027
Intercampus Mobility Expansion	• Continue deployment of electric shuttle operations across NYC, New Jersey, and Rockland County corridors • Expand low-emission intercampus transportation capacity
Infrastructure & Technology Evaluation	• Fast-charging infrastructure proposals received in 2025 • Ongoing assessment of alternative low- and zero-emission technologies through Campus as Lab initiatives

2 Current Progress

Fleet Electrification Progress	• 102 total Columbia-owned fleet vehicles
	• 41% of fleet now hybrid or electric:
	  ○ 25 hybrid vehicles
	  ○ 17 fully electric vehicles
	• 6 electric buses operating on intercampus routes since 2018
	• 2 new electric vehicles and 1 hybrid vehicle added in 2024

Operational Progress	• 40% reduction in owned fleet emissions vs 2019 baseline • Evening Shuttle ridership +10% while fuel use declined 5%

The current electric fleet is past its useful life and operationally strained

Columbia's electric buses advanced campus mobility goals, but aging batteries, charging dependency and replacement economics are creating near-term reliability constraints

Columbia fleet overview

6 Buses
New Flyer Xcelsior (2018)

480 kWh / 200 mi
Battery capacity · rated range

Manhattan → NJ → Rockland
Multi-corridor operation

Academy Bus
Third-party operator

Columbia's electric fleet operational reality

1 Aging batteries & real-world failures

- Fleet is 7 years old and past the optimal battery performance window
- NYC winters reduce effective range while HVAC demand increases energy consumption
- Battery replacement can create significant unplanned CapEx exposure

2 Charging & depot dependency

- Charging is concentrated at the Hoboken depot
- Deadheading consumes battery range on non-revenue miles
- No opportunity charging reduces operational flexibility and can remove low-charge buses from service

3 High cost & replacement pressure

- Electric buses cost more upfront than any other bus type (diesel, CNG, hybrid)
- Battery degradation increases maintenance uncertainty and lifecycle costs
- Near-term fleet replacement may require significant vehicle and charging infrastructure investment

TAKEAWAY: Columbia’s challenge is not whether electrification remains the long-term direction — it is how to maintain reliable shuttle service while today’s electric fleet and charging model reach their limits.

CNG advanced because it closes the near-term gaps that EVs and hydrogen do not yet solve

CNG emerged as a credible transitional option through mature technology, supplier familiarity, lower infrastructure complexity and a practical pathway while zero-emission options continue to mature

1 Prior study baseline

Hydrogen feasibility assessment showed potential, but **near-term deployment remains constrained** by cost, fueling, infrastructure and market maturity

2 Operational reality

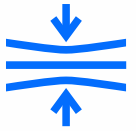
Current electric buses face range, charging, **battery degradation**, and replacement-cost pressure.

3 CNG rationale

RNG-compatible **CNG provides a lower-complexity bridge** using proven vehicle technology and third-party fueling pathways

Deployability
Proven vehicle platforms with short lead times

Infrastructure practicality
Third-party fueling avoids on-campus capital and associated economic costs



Transition flexibility
Lease structure preserves zero-emission optionality

Why this matters

The question is not whether Columbia University should abandon electrification. Rather, it is whether a transition platform can protect shuttle reliability while keeping Columbia aligned with its long-term zero-emission pathway.

CNG offers the best near-term balance of emissions and operability for Columbia

1 Diesel

- High emissions
- Mature infrastructure
- Misaligned with long-term climate goals

2 CNG / RNG-CNG

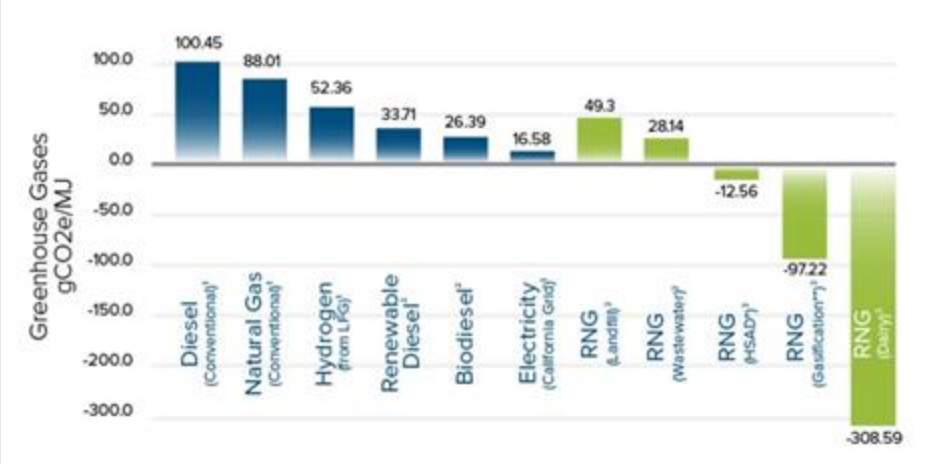
- CNG consistently demonstrates lower lifecycle emissions than diesel
- RNG can further reduce lifecycle emissions relative to conventional CNG
- Practical bridge for long daily routes

3 Battery Electric

- Zero tailpipe emissions
- Best long-term strategic fit
- Current constraints around range, charging, and battery replacement

CNG Research

Carbon Intensity Comparison of Key Transportation Fuels



Key Findings from CNG Literature Review & Implications

Applicability to Columbia:

- Most CNG/RNG studies evaluate transit and commercial fleets with vehicle sizes, route lengths, and duty cycles **comparable to Columbia's bus operations**

Key findings:

- CNG consistently demonstrates **lower lifecycle emissions than diesel**
- RNG can **further reduce lifecycle emissions** relative to conventional CNG
- Battery-electric vehicles remain the **lowest-carbon long-term pathway** but often require significant charging infrastructure investments

Implication for Columbia:

- CNG/RNG can deliver **near-term emission reductions while preserving optionality** for future fleet electrification

Source: California Air Resources Board Low Carbon Fuel Standard Program Q2 2020 Data (Latest comparable published data)
CI values EER adjusted for HD truck applications (1: Lookup table CI values; 2: Average CI values for prior 12 months; 3: Average CI values of registered pathways as of June 2020)
*HSAD, or High Solid Anaerobic Digestion, converts organic (e.g., food and green waste) into RNG.
**Gasification is a thermochemical process that converts organics (e.g., forest biomass) into RNG.

Peer transit agencies have paused EV procurement and turned to RNG-CNG as a working bridge

Regional and institutional examples show CNG can work at scale, with success depending heavily on the fueling model and operating structure

Central Ohio Transit Authority (COTA), OH

Goal	Work towards 2045 net-zero emissions target via multifuel approach while testing zero-emission solutions
EV Issues	Battery degradation, range and performance fell short, high maintenance
Fix	• Paused all future electric bus procurement • Expanded CNG (facilitated by existing CNG infrastructure)
Impact	**$80K/month** avg RNG revenue; **728 mtCO2e/month** GHG Reduction

COTA RNG revenue model

RNG produced → **EPA assigns RINs** → **RINs* sold = revenue** → **COTA earns share of revenue**

*Renewable Identification Numbers

Metropolitan Transportation Authority (MTA), NY

Goal	Transition 5,800+ bus fleet into 100% zero-emissions vehicles by 2040; committing to state mandate
EV Issues	Frequent breakdowns, battery issues, low availability: • 60% of electric buses available for full day of service, compared to 91% of diesel buses
Fix	• Paused buying new electric buses • Purchasing short-term low-emissions alternatives, including CNG powered by renewable natural gas
Suppliers	RNG from Clean Energy Corporation; Serviced by Trillium NYC

KEY INSIGHT: Peer operators facing EV deployment constraints have adopted RNG-powered CNG as a pragmatic transitional solution while continuing long-term zero-emission strategies

Sources: COTA Resources and Responsibility Plan (2025); MTA Capital Plan (2025); Clean Energy Partnership Announcement with MTA (2020); Streetsblog NYC (2025)

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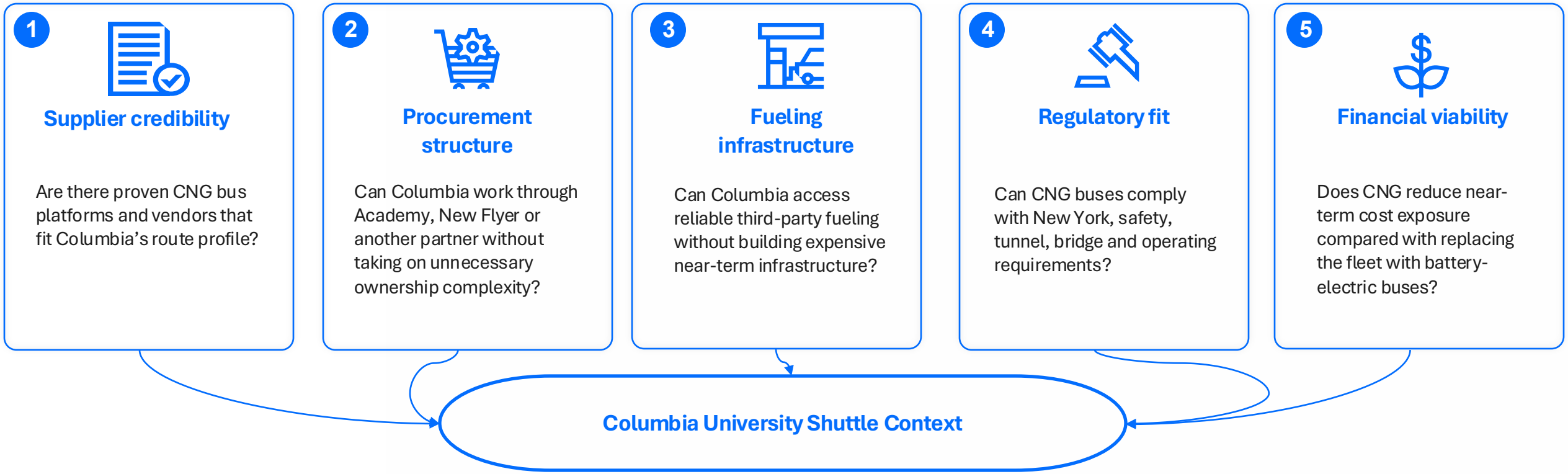
We assessed CNG feasibility across five decision lenses

The analysis tested whether CNG can be procured, fueled, regulated, financed and operated in a way that fits Columbia's shuttle context



Why this matters

Can Columbia deploy a lower-risk transitional fleet option while maintaining reliability, reducing cost exposure, and preservingthe long-term zero-emission pathway?

New Flyer Xcelsior CNG is the most practical fit on range, fleet familiarity and implementation friction

Compared with Gillig and ElDorado platforms, the Xcelsior CNG meets Columbia's seating, range and accessibility needs while leveraging the incumbent OEM relationship

	NEW FLYER XCELSIOR CNG	GILLIG LOW FLOOR/BRT CNG	ELDORADO AXESS CNG
Vehicle sizes	25ft 40ft 60ft	29ft 30ft 40ft	33ft 35ft 40ft
Capacity range	33-62 seated 2 wheelchair positions	Varies by length Multiple styling options (BRT, Trolley, Low Floor)	19-43 seated Multiple Layout Configs + 2 wheelchairs
Engine	**Cummins L9N CNG** EPA compliant	**Cummins L9N CNG** 90% NOx reduction vs diesel	**CNG power**
CNG range	350 - 400 mi Long-range daily ops	Not specified	Not specified
Key features	LED headlights · electronic instrument panel · Smart Rider Ramp · rear-view camera system · narrow A-pillars	Advanced suspension · lightweight composite fuel cylinders · integrated fuel access panel · easy serviceability	Customizable floor plans · flexible seating layouts · heavy-duty platform
Customization	**Limited** Standardized heavy-duty transit platform	**Moderate** BRT, BRT Plus, Low Floor Plus, Trolley	**High** Modular floor plans, seating configs

A contracted third-party fueling model is the recommended pathway, avoiding up to $1.8M in on-site CapEx

Fueling access is the main infrastructure question. The analysis suggests Columbia should prioritize a contracted third-party fueling model over building new on-site infrastructure or relying on public stations.

1 On-site fueling infrastructure

- Expensive and slow to build
- Installation can cost up to $1.8M depending on size and capacity
- Adds permitting, siting, and operational complexity

2 Third party contract

- Leverages existing CNG infrastructure
- Potential access to high-volume fueling sites through transit or supplier agreements
- Reduces upfront CapEx and deployment burden

3 Public CNG stations

- Publicly accessible options exist near Columbia
- Long deadhead distances create service inefficiency
- 25 to 45 minutes each way can erode operational benefits

Criteria	On-site fueling infrastructure	Third Party contract	Public CNG stations
CapEx burden	Low favorability	High favorability	Medium favorability
Deployment speed	Low favorability	High favorability	Medium favorability
Operational control	High favorability	Medium favorability	Low favorability
Route efficiency	High favorability	Medium favorability	Low favorability
Scalability	Medium favorability	High favorability	Low favorability

TAKEAWAY: Pursue a third-party fueling agreement that gives Columbia reliable access to existing CNG fueling infrastructure while avoiding near-term on-campus capital investment.

No regulatory barrier blocks CNG deployment; compliance is managed through specs, training and contracts

Three New York requirements apply to CNG bus operations, all are manageable, and one is a net community benefit

1 Certificate of Fitness

Requirement

Required for anyone handling CNG engine systems; $25 application and $15 renewal every three years

How Columbia complies

Resolved through standard CNG safety and handling training for drivers – low cost, quick to administer

2 AFV bridge and tunnel rules

Requirement

Natural gas vehicles using NYC bridges and tunnels must carry AFV markings and keep fuel capacity under 150 lbs

How Columbia complies

Recommended CNG bus models meet the capacity threshold; markings written into procurement specifications

3 NYC Noise Code

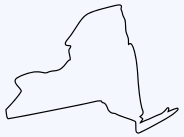
Requirement

Prohibits exhaust noise audible from 200 feet – a constraint for older diesel platforms

How Columbia complies

CNG engines run up to 10 dB quieter than diesel, improving residential quality of life along shuttle routes

New York policy context



Limited CNG-specific policy barriers identified, but state policy continues to favor zero-emission vehicles; manufacturers must sell a growing share of zero-emission buses through 2040. CNG should be positioned as a bridge, not a permanent detour.

Federal policy context – potential upside

EPA Renewable Fuel Standard pathways may enable RNG-related value: Renewable Identification Number (RIN) revenue-sharing can be negotiated through supplier agreements, partially offsetting fuel costs. Supplier structure determines who captures this value.

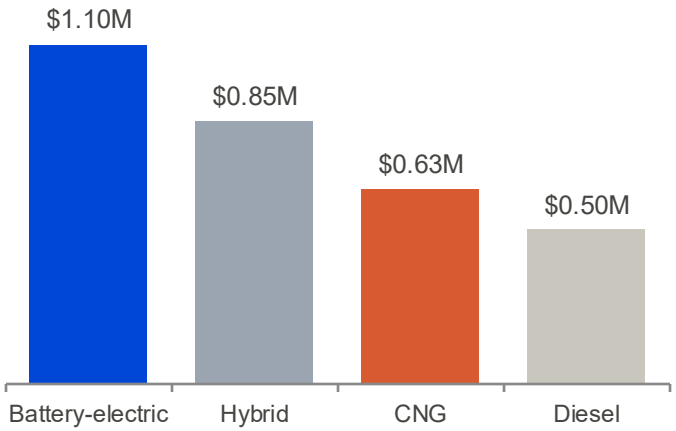
TAKEAWAY: Regulation is not a barrier; embed Certificate of Fitness training, AFV markings, fuel-capacity limits and RNG/RIN terms into procurement and supplier contracts from day one

Sources: FDNY Certificate of Fitness requirements; NYC DOT alternative fuel vehicle rules; NYC Administrative Code (noise); EPA Renewable Fuel Standard program. Verdicts feed the Regulatory fit lens in the feasibility scorecard.

CNG cuts near-term capital exposure by ~40% per vehicle and avoids charging infrastructure CapEx entirely

Directional economics from published procurement and federal lifecycle data; Columbia-specific figures to be confirmed via Academy and New Flyer quotes

1. Upfront capital per 40-ft bus



Ranges: BEB $1.0–1.2M · CNG $600–650K (midpoints shown). BEB bar excludes charging and depot CapEx.

Academy lease converts CNG cost to OpEx, no Columbia CapEx.

2. Lifecycle cost per bus-mile

~16–21% lower per mile in modelled fleet scenarios, driven by purchase price and charging infrastructure. BEB shown at midpoint of $7.36–$7.81 range.

Corroborated: NREL field data shows ~93% CNG availability vs 63–89% for BEB fleets; BEB energy savings offset by CapEx

3. Columbia illustrative scenario (6 buses)

A · Replace with new BEBs

6 × $1.0–1.2M ≈ $6.0–7.2M vehicles, plus depot and charging upgrades, plus battery replacement risk on existing fleet

B · CNG bridge via Academy lease

Recommended

Vehicle cost borne by Academy, recovered through lease; third-party fueling avoids ~$1.8M on-site build, net Columbia CapEx ≈ $0

Illustrative (pending Academy lease terms)

Federal funding has moved in this direction; the FTA's Nov 2025 $2B bus grant round prioritized CNG and hybrid fleets with no battery-electric awards, Columbia's bridge strategy aligns with current federal procurement priorities

Sources: AEI analysis of FTA bus inventory data (2026); MTA New Flyer BEB procurement; NREL Foothill Transit BEB evaluation; Connor (2024) WVU lifecycle cost model; FTA Low-No / Buses & Bus Facilities awards, Nov 2025. Benchmark values, not Columbia-specific estimates.

CNG adoption is viable, but execution risk is concentrated in the fueling ecosystem

Three fueling-related risks (supply reliability, partner lock-in, and operational maintenance) determine whether the economics are realized

High Risk

Fuel Supply Reliability & Resilience

Risk: Limited redundancy in natural gas supply creates exposure to shortages and price increases

Why it matters: Disruptions at a single supplier or pipeline can cascade into fuel shortages and service interruptions

Success factor: Secure backup supply arrangements and contingency fueling protocols to ensure continuity

Medium Risk

Infrastructure Dependency on Partners (Lock-in)

Risk: CNG operations may depend heavily on a small number of depot and O&M partners

Why it matters: Partner underperformance or limited alternatives directly impacts fueling availability and fleet reliability

Success factor: Build redundancy into vendor contracts, SLAs and maintenance coverage to reduce lock-in-risk

Medium-High Risk

Operational Performance & Maintenance Reliability

Risk: Compressor downtime or slow repairs can halt fueling and disrupt bus operations

Why it matters: Even strong economics fail if buses cannot be fueled consistently to maintain daily service

Success factor: Require uptime guarantees, rapid-response maintenance, and clear depot execution ownership

Takeaway **Mitigating these three risks is critical to ensure reliable fueling, minimize downtime, and realize the full value of a CNG transition**

The CNG recommendation is testable: each pathway has explicit win conditions and a defined checkpoint

Rather than asserting a single answer, the analysis defines what would have to be true for each pathway to win, and when each condition gets tested

1 Stay on current EV pathway

Wins if...

- Battery audit shows multi-year remaining life on the 2018 fleet
- Charging expansion is funded and depot constraints resolve
- Fleet availability recovers toward diesel-level benchmarks

Tested by: *Battery degradation rate and fleet availability data*

2 CNG Bridge via Academy lease

Wins if...

- Academy lease economics confirm the directional cost case
- Third-party fueling secured at competitive $/DGE with capacity guarantees
- Deployment achievable within ~12 months on priority corridors

Tested by: *Partner terms from Academy, New Flyer and fueling discussions*

Recommended

3 Accelerated zero-emission reset

Wins if...

- Next-generation BEB range and reliability prove out in NYC duty cycles
- Federal or state funding for battery-electric fleets returns
- Depot charging becomes feasible at acceptable cost

Tested by: *Technology and funding landscape at the Year 3 review*

Takeaway: The CNG bridge is the only pathway whose conditions can be tested in the next six months at near-zero cost; if partner terms disappoint, Columbia walks away having committed nothing

Conditions synthesize the operational, fueling and financial analyses in Section 3; checkpoint timing per the phased roadmap in Section 4.

CNG passes all five feasibility lenses, with execution risk concentrated in fueling access

Each lens from the assessment framework resolves to a clear verdict; remaining open items map directly to the partner engagement plan

Decision lens	Verdict	Basis	Open item to confirm · owner
Supplier credibility	**Feasible**	New Flyer Xcelsior CNG meets seating, range (350–400 mi) and accessibility needs; incumbent OEM minimizes implementation friction	2026 pricing, lead times, vehicle configuration *New Flyer*
Procurement structure	**Feasible with conditions**	Lease through Academy avoids ownership complexity and preserves the existing operating relationship; commercial terms not yet confirmed	Lease structure, maintenance responsibility, SLAs *Academy*
Fueling infrastructure	**Feasible with conditions**	Third-party contract avoids ~$1.8M on-site build and 25–45 min public-station deadhead; highest concentration of execution risk	Site access, pricing, capacity, RNG availability *Fueling partner*
Regulatory fit	**Feasible**	Certificate of Fitness, AFV bridge/tunnel rules and NYC noise code all manageable; recommended models compliant as specified	Compliance terms embedded in procurement specs *Academy / supplier*
Financial viability	**Feasible**	~40% lower upfront capital per vehicle and ~16–21% lower lifecycle cost per bus-mile; lease model reduces Columbia CapEx to ~$0	Lease economics, fueling $/DGE, maintenance $/mile *Academy / Columbia*

Takeaway: the question shifts from "is CNG feasible?" to "can terms be confirmed?"; every open item above resolves through the Academy, New Flyer and fueling partner engagements in Section 4

21 Verdicts synthesize the supplier, fueling, regulatory and financial analyses in Section 3. "Feasible with conditions" denotes lenses where commercial confirmation is required before deployment.

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Columbia's most feasible near-term pathway is a phased CNG deployment through Academy and New Flyer

The most practical near-term option is a low-complexity CNG pathway that minimizes infrastructure burden and preserves flexibility for future transition

Current Context

Sustainability Goals

- Reduce emissions from on-campus fleet vehicles
- 100% zero-emission electricity by 2030
- Net-zero emissions by 2050

Operational Issues

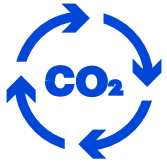
- Battery degradation
- Range limitations
- Low fleet availability
- High charging dependency

Pathway Options

Retain Electric Bus Fleet

- Maintain zero-emissions progress, aligning with goals
- Accept operational issues, maintenance costs, and low bus availability

Transitional RNG-CNG pathway



- Reduce operational and infrastructure strain
- Leverage mature transit technology
- Support phased transition toward future zero-emissions fleet

Recommendation: Switch to CNG

1. 

Academy purchases RNG-compatible CNG buses using existing supplier relationships

2. 

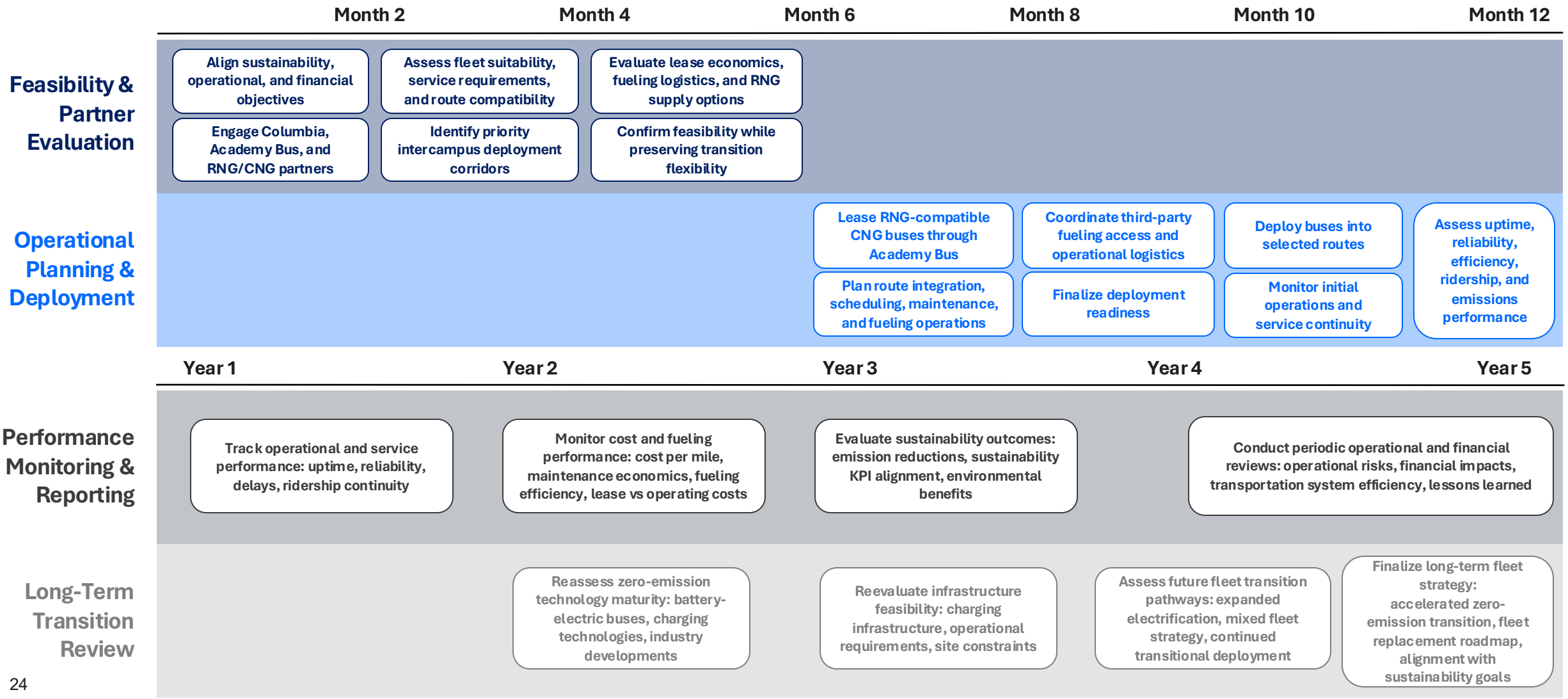
Columbia leases buses through Academy to reduce upfront infrastructure and procurement complexity

3. 

Maintain deployment while monitoring maturation of zero-emission bus technologies and infrastructure

A phased roadmap moves Columbia from feasibility validation to controlled deployment

The recommended pathway is implemented in stages, allowing Columbia to test assumptions, manage risks, and reassess zero-emission technologies before committing to broader fleet decisions



Columbia should validate the CNG pathway through targeted partner engagement

The next phase confirms strategic transition objectives, commercial terms, vehicle availability, fueling access and operation al responsibilities with the partners most likely to shape implementation

1 COLUMBIA — **Role:** Strategic Alignment & Decision Prioritization

WHAT TO CONFIRM

- Confirm decision priorities: cost, emissions, reliability, or flexibility
- Validate operating cost and emissions reduction targets
- Confirm alignment with Columbia's long-term fleet transition and sustainability goals
- Identify priority intercampus routes for deployment
- Validate fleet utilization, service levels, and operational requirements

DECISION UNLOCKED: Is an RNG-ready CNG bridge strategy aligned with Columbia's priorities?

2 Academy — **Role:** Operating Partner

WHAT TO CONFIRM

- Willingness to lease or operate RNG-compatible CNG buses
- Maintenance responsibility and service-level expectations
- Contract structure, timing, and transition path from current electric buses
- Whether current EV issues are fleet-specific, route-specific, or technology-wide

DECISION UNLOCKED: Can Columbia transition through its existing operating partner?

3 NEW FLYER — **Role:** Vehicle Platform Partner

WHAT TO CONFIRM

- 2026 pricing, lead times, and availability for RNG-ready Xcelsior CNG buses
- Vehicle configuration for Columbia's routes and seating needs
- CNG range, maintenance requirements, and warranty terms
- Compatibility with Academy's operating and maintenance model

DECISION UNLOCKED: Is New Flyer the lowest-friction deployment option?

4 FUELING PARTNER — **Role:** Infrastructure Access Partner

POTENTIAL PARTNERS

Clean Energy, MTA, trillium

or other regional CNG infrastructure operators

WHAT TO CONFIRM

- Third-party fueling access
- Site location, capacity, and hours of operation
- Pricing, volume commitments, and SLAs
- RNG availability and potential RIN value-sharing

DECISION UNLOCKED: Can fueling be secured without on-campus infrastructure?

Decision Area	Confirmation	Owner	Output
Vehicle availability	**Pending**	New Flyer / Academy	Fleet configuration and lead time
Lease or operating model	**Pending**	Academy	Commercial structure
Fueling access	**Pending**	Fueling partner	Site access and pricing
Regulatory compliance	**Pending**	Academy / Supplier	Certification and operating requirements
Financial case	**Pending**	Columbia University (Sustainability & Transportation)	Updated cost comparison

TAKEAWAY: First confirm Columbia's transition priorities; once aligned, the recommendation can be validated through Academy, New Flyer and fueling partner discussions

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The Electric Vehicles organization connects Columbia students to the sustainable transportation ecosystem across campus, New York City and Industry

Campus as a Living Lab

Utilize Columbia's resources to enhance the experience for members who are interested in the intersection of sustainability, transportation and the clean energy transition

Industry and Career Pathways

Bring practitioners, site visits and market insights to our members

Consulting and Research

Provide opportunities for members to engage in consulting engagements and research for real clients

ELECTRIC VEHICLES ORGANIZATION

Columbia Clean Energy Group is Columbia's premier undergraduate organization exploring the world of clean energy through policy, finance, law and technology

Clean energy-centered community

CCEG fosters an undergraduate community and professional network for students passionate about the renewable energy transition.

Industry connections and education

Members learn the fundamentals of clean energy through site visits, expert panels, and conferences

Consulting and research

Partnerships with Columbia organizations, as well as clean energy companies and nonprofits, allow members to gain firsthand experience in the sector

Thank you

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