

NGVAMERICA

Natural Gas Vehicles for America

RNG Powering Today's Natural Gas Fleets

Land of Sky Clean Vehicles Coalition RNG Workshop

Asheville, NC

January 14, 2020



About NGV America

NGV America is the national organization dedicated to the development of a growing, profitable, and sustainable marketplace for vehicles powered by natural gas and biomethane and for promoting the use of more natural gas in transportation... trucks, trash, transit, and even off-road uses like HHP marine, rail, and construction/mining applications.

200+

NGV America represents 200+ companies, LDCs, fleets, OEMs, environmental and government organizations.



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NGV America Members



South Jersey Gas



Clean Energy



American Gas Association



Quality. Our DNA



APPLIED LNG



Energy to do more



MOMENTUM
FUEL TECHNOLOGIES



for every day life!



Innovation. Experience. Performance.™



Live Smart



Good fun!



DAIMLER TRUCKS



formerly The Laclede Group



DIVISION OF CATALINA CYLINDERS, INC.



Improving life with energy



AN INVESTMENT BANKING APPROACH TO REAL ESTATE TRANSACTIONS

The logo for NGVAMERICA, featuring the text "NGVAMERICA" in a bold, sans-serif font. "NGV" is in blue and "AMERICA" is in white. The logo is centered on a green background with a large white recycling symbol.

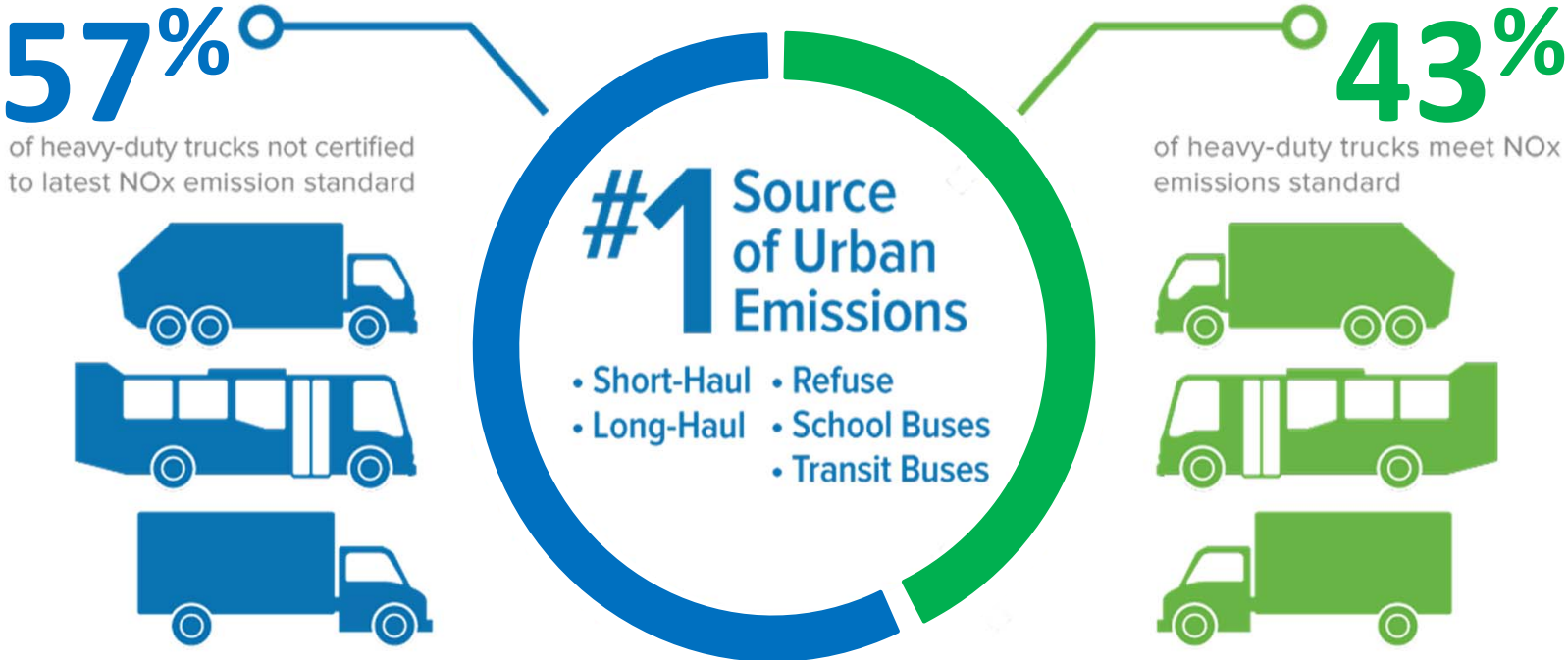
Natural Gas Vehicles for America

The Current Emissions Environment



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Urban Emissions: Leading Sources



Source: DTF Analysis of 2018-2019 U.S. vehicles in operation data (Class 3-8) provided by IHS Markit, October 2019

Not just a California problem...



Source: American Lung Association,
State of the Air Report 2019

- 141.1 million Americans live in areas with air that is unhealthy to breathe (40% of our total population)
- 25 million Americans suffer from asthma (8% of our total population)

Heavy-Duty = Heavy Impact



Heavy-Duty = Heavy Impact

Replacing 1 traditional diesel-burning heavy-duty truck with 1 new Ultra Low-NOx natural gas heavy-duty truck is the emissions equivalent of removing 119 traditional combustion engine cars off our roads.

Source: https://greet.es.anl.gov/afleet_tool

Unlike trucks and buses, passenger vehicles sit idle 95% of the time.



In-use testing results of heavy-duty trucks in port applications found:

» Natural gas vehicles emitted lower NOx:

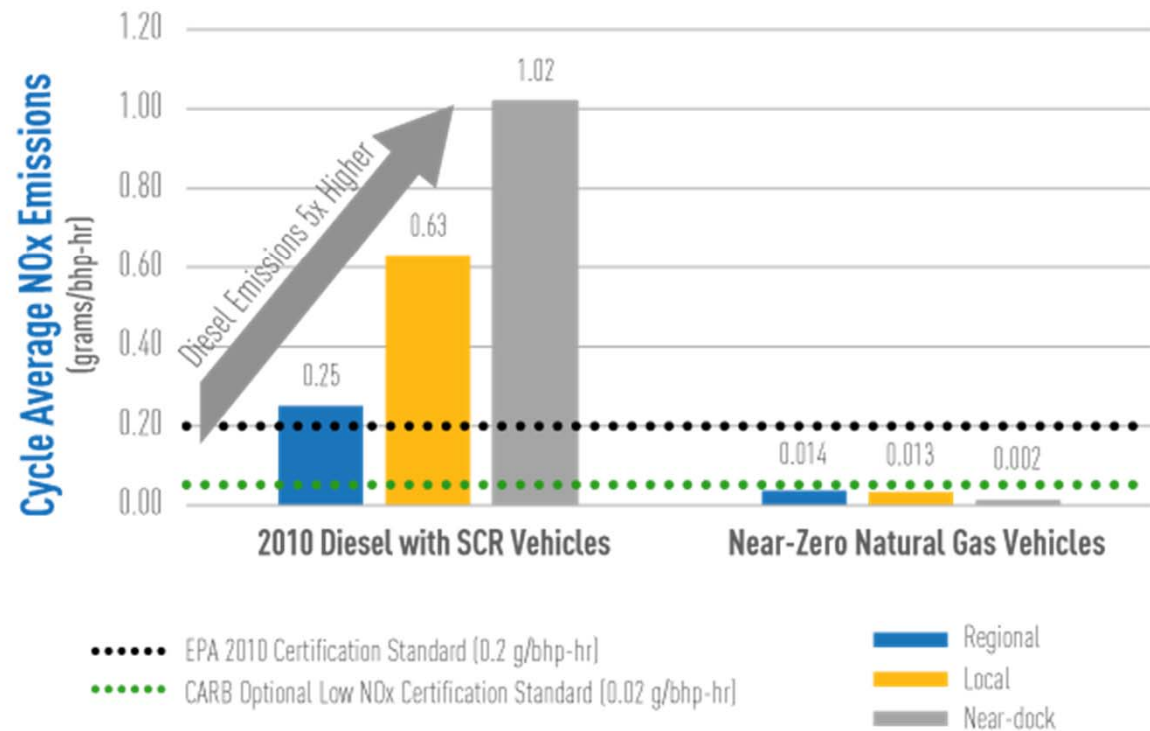
The ISL G natural gas engine emitted lower NOx emissions than its EPA certification standard. Emissions decreased as the duty cycles decreased (i.e., slower speeds, idling, stop-and-go traffic).

» Diesel vehicles emit up to 5x more NOx:

2010 diesel engines with SCR emitted up to 5 times more NOx emissions than its EPA certification standard. Emissions increased as the duty cycles decreased.



Comparing NOx Emissions in Port Truck Operations



Urban

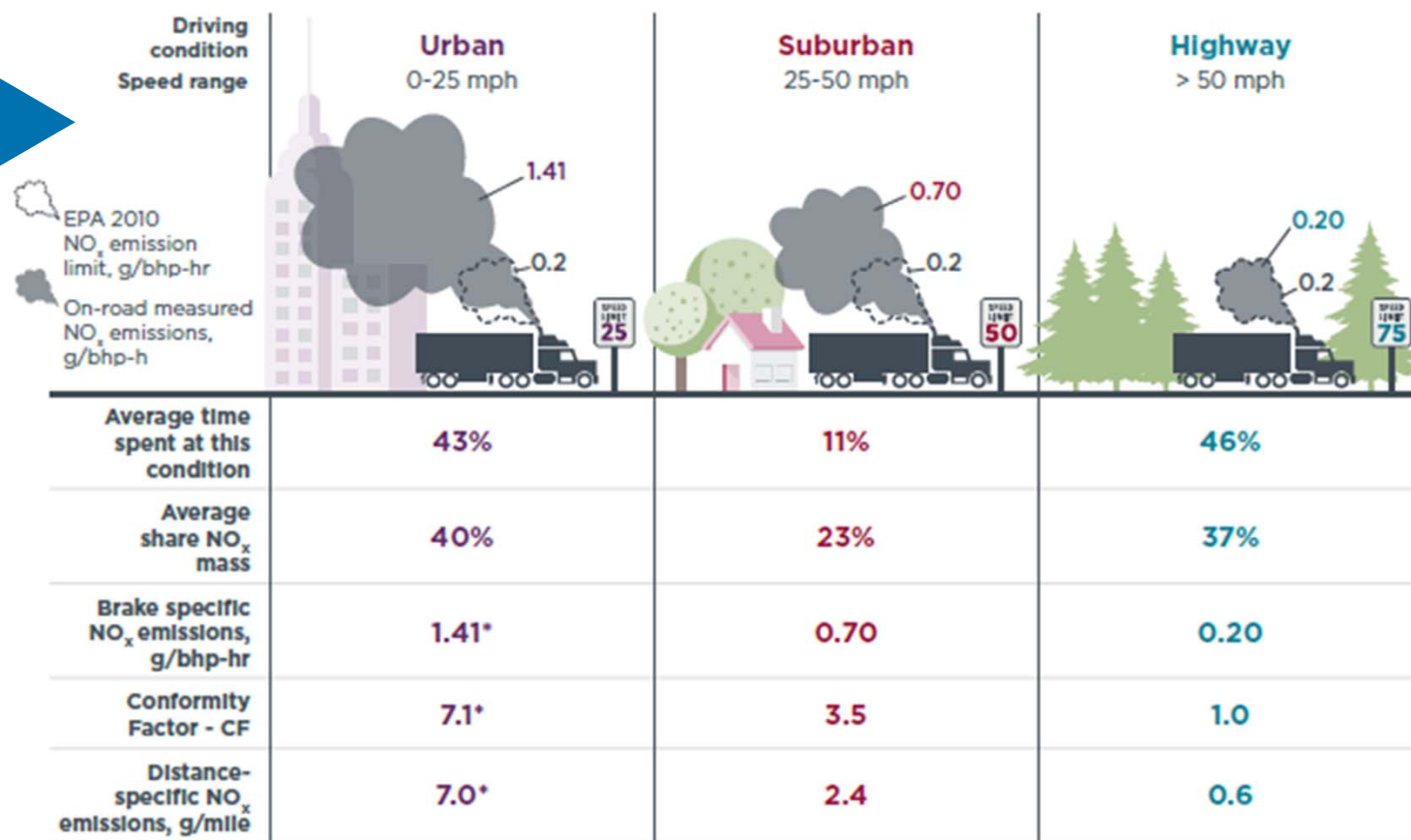
7+ x certs

Suburban

3+ x certs

Highway

Meets certs



* Brake and distance specific NO_x emissions for Urban bin do not include Idle operation, only 1-25 mph operation is included

Figure ES-1 Comparison of line-haul vehicle NO_x emissions under urban, suburban, and highway driving conditions. Conformity factor is defined as ratio of measurement to engine dynamometer emission limits.

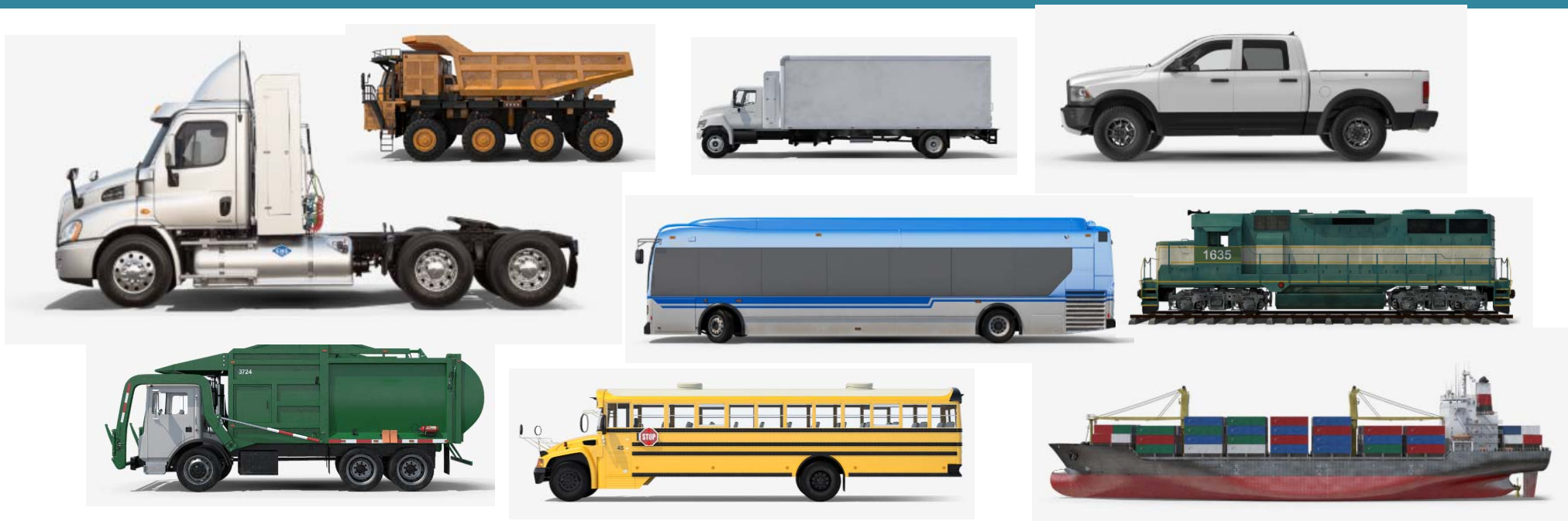
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Natural Gas Vehicles for America

NGVs Matter



Every Medium- & Heavy-Duty and High Horsepower Application



Ready-Right-Now Technology On and Off the Road Today.

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Natural Gas is the #1 Alternative for Heavy-Duty...

Natural Gas: **#1** Alternative Fuel for Heavy-Duty Fleets

17,000 
NG Refuse Trucks
Operate in the U.S.

60%
Of New Refuse
Trucks Are
NGVs



More than 150 U.S. School
Districts Operate **5,500**
NG School Buses



11,000 Natural Gas Transit
Buses Operate in the U.S.

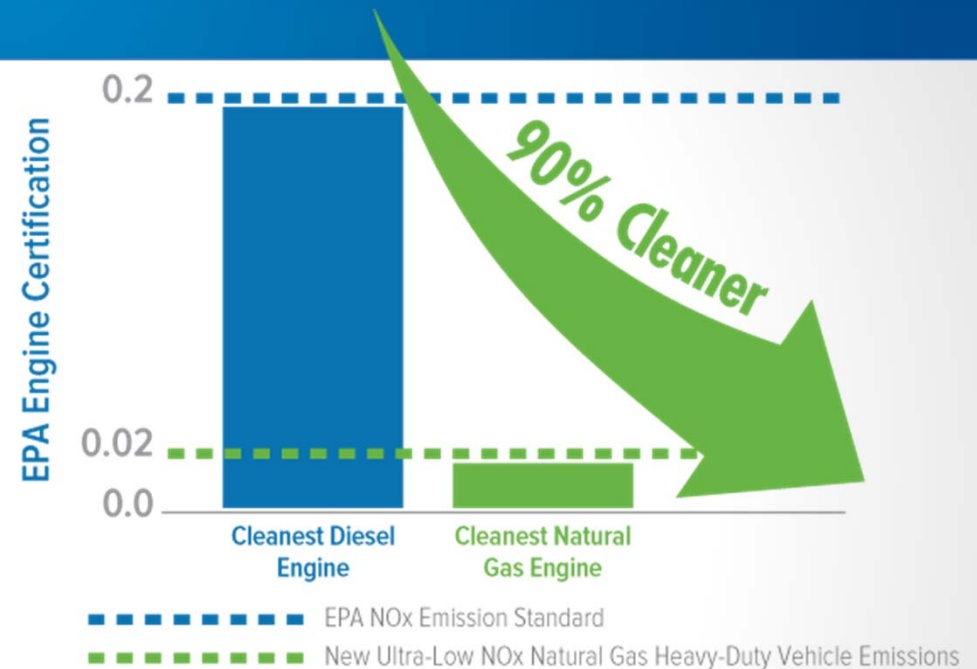


40 Major U.S. Airports
Utilize Natural Gas Shuttles and
Other Ground Transportation

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The cleanest heavy-duty truck engine in the world is powered by natural gas

- Certified in 2018 by the U.S. Environmental Protection Agency and California Air Resources Board



The Cummins Westport Ultra-Low NOx engine is certified to a **0.02 g/bhp-hr** standard, which is:

- 90% cleaner than the EPA's current NOx standard
- 90% cleaner than the latest available diesel engine





Natural Gas

Technology Cost \$150,000
NOx Reduced 5,582 lbs



Diesel

Technology Cost \$100,000
NOx Reduced 1,716 lbs



Electric

Technology Cost \$290,000
NOx Reduced 5,715 lbs



Natural Gas

Technology Cost \$300,000
NOx Reduced 4,375 lbs



Diesel

Technology Cost \$270,000
NOx Reduced 544 lbs



Electric

Technology Cost \$670,000
NOx Reduced 4,423 lbs



Natural Gas

Technology Cost \$526,500
NOx Reduced 4,078 lbs



Diesel

Technology Cost \$477,775
NOx Reduced 134 lbs



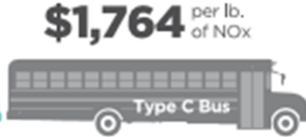
Electric

Technology Cost \$836,330
NOx Reduced 4,128 lbs



Natural Gas

Technology Cost \$125,000
NOx Reduced 1,391 lbs



Diesel

Technology Cost \$100,000
NOx Reduced 57 lbs



Electric

Technology Cost \$300,000
NOx Reduced 1,583 lbs

NGVs Deliver the Largest & Most Cost-Effective NOx Emissions Reductions

Across All HD Applications:

- ✓ Heavy-Duty Trucks
- ✓ Refuse Trucks
- ✓ Transit Buses
- ✓ School Buses

Source: Emission comparisons are based on results using Argonne National Laboratory's HDVEC tool (<https://afleet-web.es.anl.gov/hdv-emissions-calculator/>) and include modeling of new low-NOx natural gas engines and the diesel in-use emissions option.



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Domestic Source

#1 Natural Gas Producer in the World

Continual supply by harnessing renewable sources

90+
years
supply of recoverable shale natural gas



Natural Gas Fuels America

An American Fuel Sourced by American Labor Using American Technology



50

Renewable natural gas is produced in every U.S. state. 34 states produce geologic natural gas



4.1 million

4.1 million natural gas industry jobs nationwide



#1

America is the world's leader in natural gas production and technology



Natural gas fueling pays into the federal highway trust fund

\$\$\$\$\$

Choose American. Choose Natural Gas.



Find out more about clean fleet initiatives at www.ngvamerica.org

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Meet Success



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UPS is doubling down on natural gas.



Defining The Clean Fleet: UPS Setting The Standard



6,000 New Natural Gas Trucks by 2022 

\$450M Investment to Reduce Emissions 

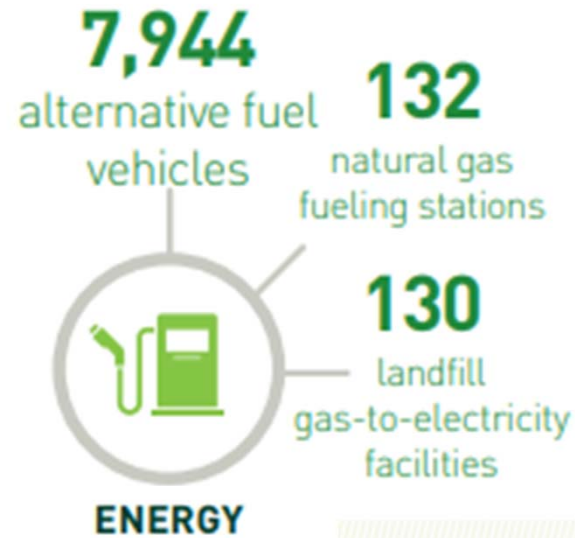
\$1B Invested over the past 10 years 

5 New CNG Fueling Stations by TruStar Energy 
New Fuel Systems by Agility Fuel Solutions

230M Gallons of Renewable Natural Gas (RNG) Purchased over the Next 7 Years 

12% Reduction in Greenhouse Gas Emissions by 2025 

Waste Management is driving change.



ON-ROAD FLEET EMISSIONS REDUCTIONS

(percent reduction in MTCO₂e emissions from a 2010 baseline)



Amazon's Shipment Zero.

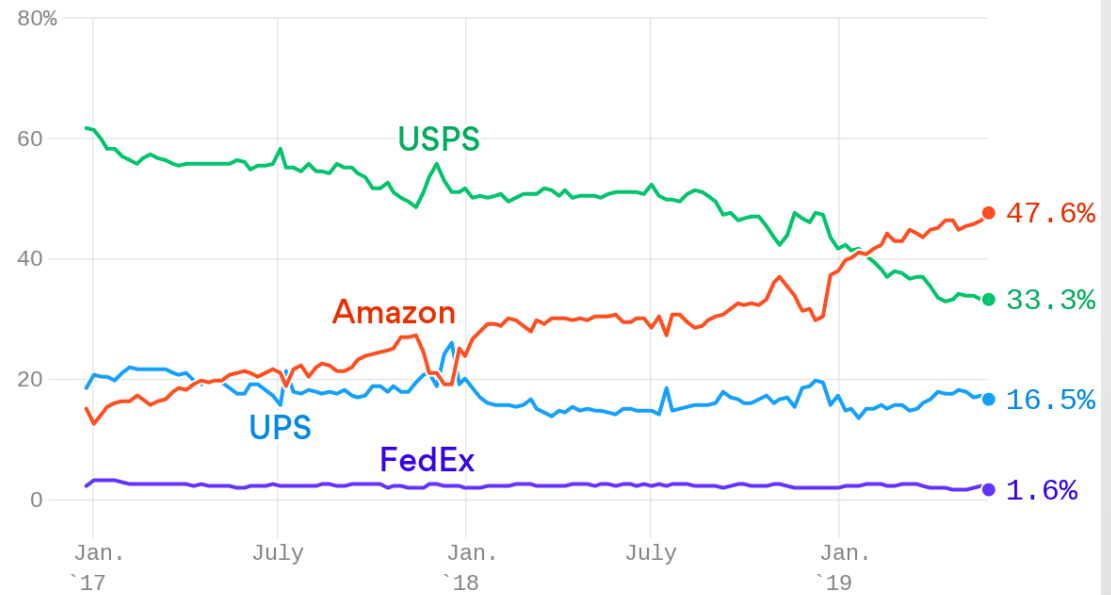
Net zero carbon shipments as part of its Climate Pledge include natural gas heavy-duty

THE Paris...
CLIMATE 10 years
PLEDGE Early



Share of Amazon shipments by carrier

Weekly, Dec. 26, 2016 to May 27, 2019



The Sobering Reality of Electric Trucks



Source: "Availability of Medium-Duty E-Trucks Is Limited as Testing Continues," July 23, 2019, [Transport Topics](#)

“Unfortunately, there is no business case today for a sane and sober customer to buy a battery-electric truck.”

DAIMLER

Roger Nielsen, CEO
Daimler Truck N.A.

Why Wait?



“Waiting for electric vehicles is like seeing the sign at the bar that says, ‘Free beer tomorrow.’”



Scott Phillippi, Senior Director of Maintenance and Engineering

Source: “Availability of Medium-Duty E-Trucks Is Limited as Testing Continues,” July 23, 2019, [Transport Topics](#)





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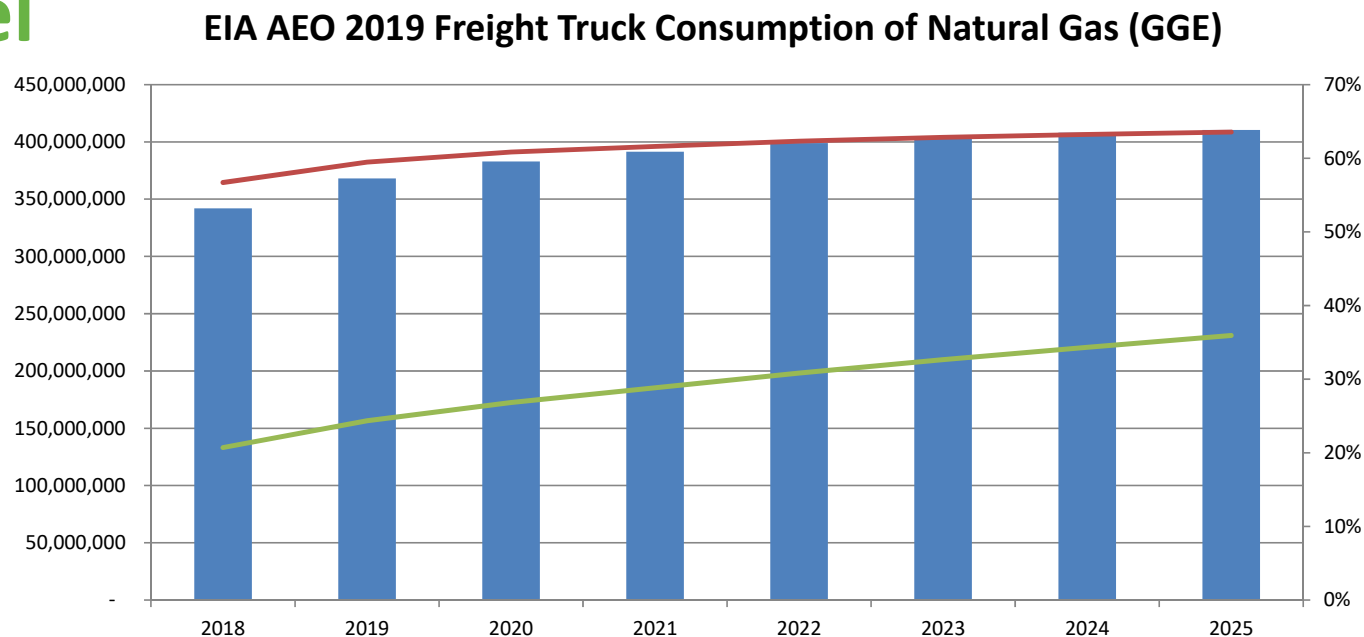
Natural Gas Vehicles for America

Market Opportunities



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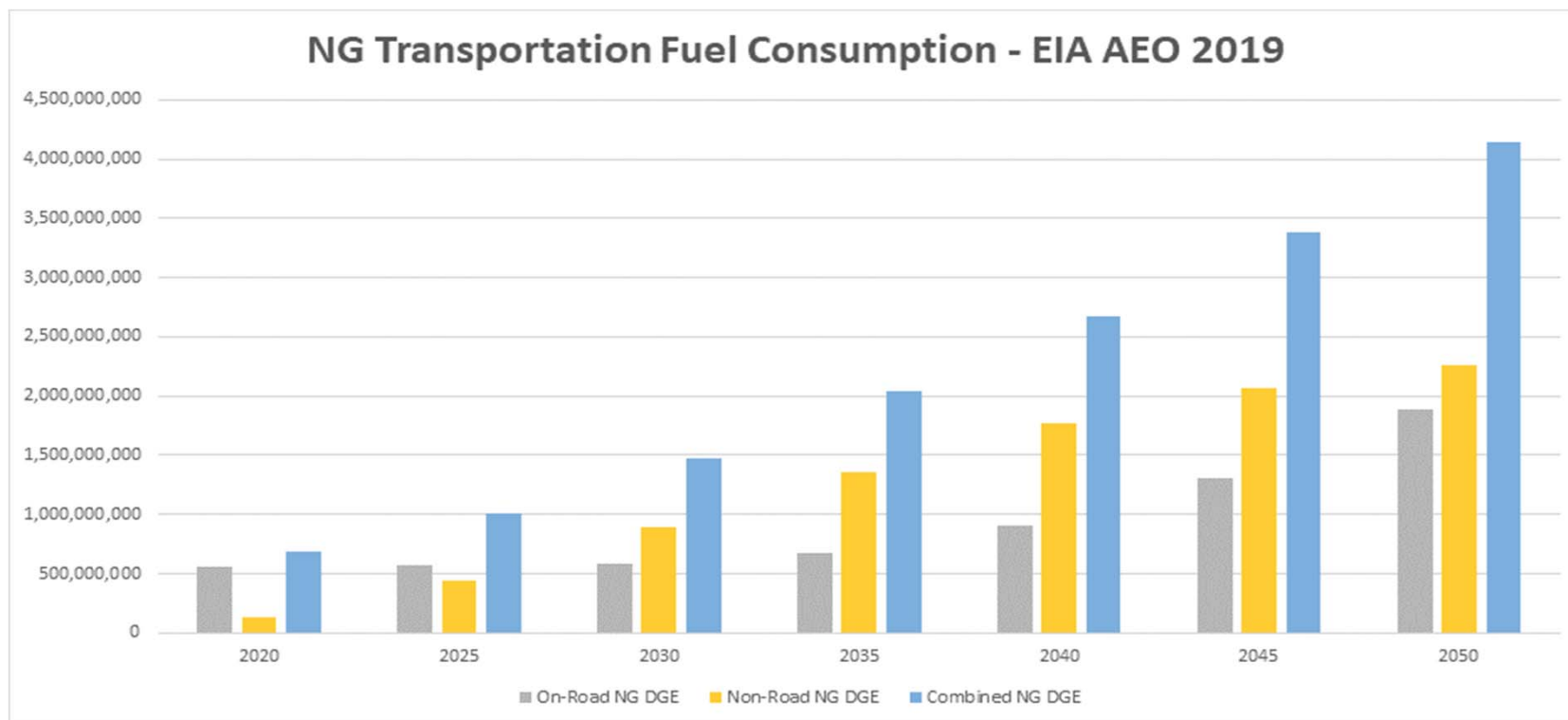
Freight Truck Fuel Consumption



Importance of Freight Trucks

- Red line indicates percentage of fuel consumed by freight trucks—greater than 60%
- Green line shows freight vehicle percentage of all vehicle inventory – currently less than 30% but growing over time

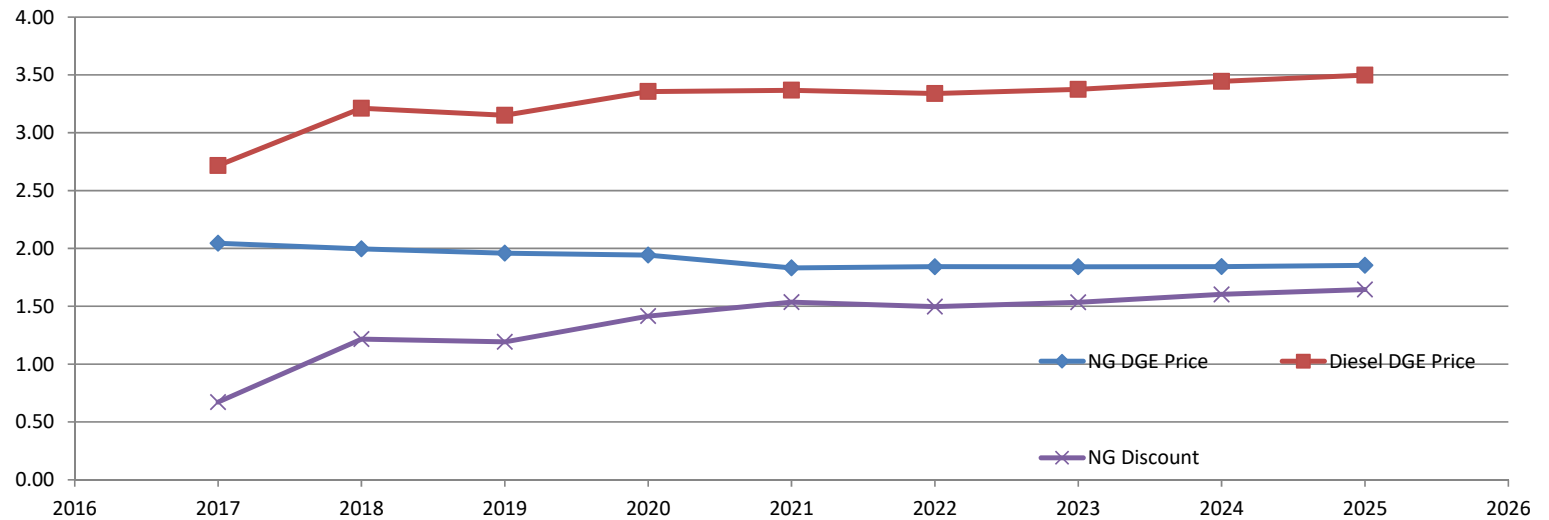
NG Transportation Fuel Consumption On-Road and Non-Road



- AEO 2019 shows growth trend in on-road, non-road and total natural gas use in transportation
- Figures from Transportation Table 37 (AEO 2019)
- Freight trucks account for about 30% of vehicles but almost 60% of fuel use
- Non-road includes marine and rail but not pipeline fuel

Natural Gas Provides Long-Term Fuel Cost Savings

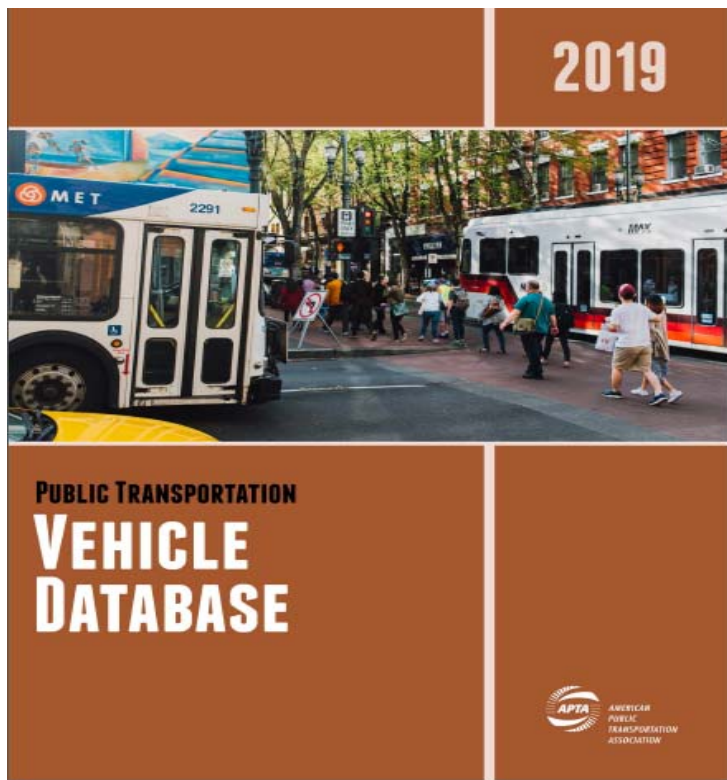
EIA AEO 2019: Projected Fuel-Price Differential (prices per \$DGE)



Natural Gas vs. Diesel:

- CNG priced at about 69 cents less than diesel-gallon equivalent (based on pump prices end of April 2019)
- California CNG about \$1.55 less than diesel

Natural Gas in Transit



Combined Percentages - 2019				
Includes Bus, Commuter Bus and Rapid Transit				
	Existing	Built in 2018	Ordered	Potential
NG Total	10724	778	689	578
All Bus Total	38778	2104	2500	2122
NG %	28%	37%	28%	27%
Demand Response Vehicles - 2019				
	Existing	Built in 2018	Ordered	Potential
NG	871	102	73	279
Total	9899	925	426	592
NG Percentage	9%	11%	17%	47%

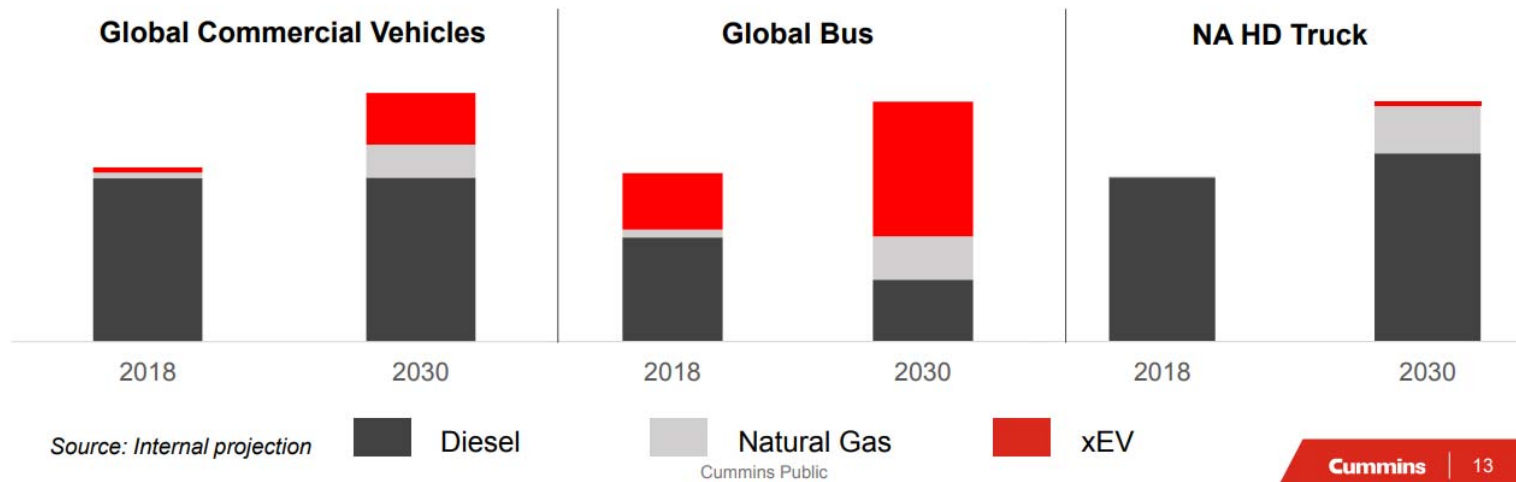
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NGVs to Comprise 20% of NA HD Truck Market in 10 Years

Slow and varied technology transition

PACING FACTORS

- 1 | Infrastructure
- 2 | Regulations
- 3 | Technology maturity
- 4 | Economics



Source: Cummins Analyst Day, November 21, 2019. Found at: <https://investor.cummins.com/events>

Increased Interest in RNG

Waste to Gas



Landfill



Wastewater

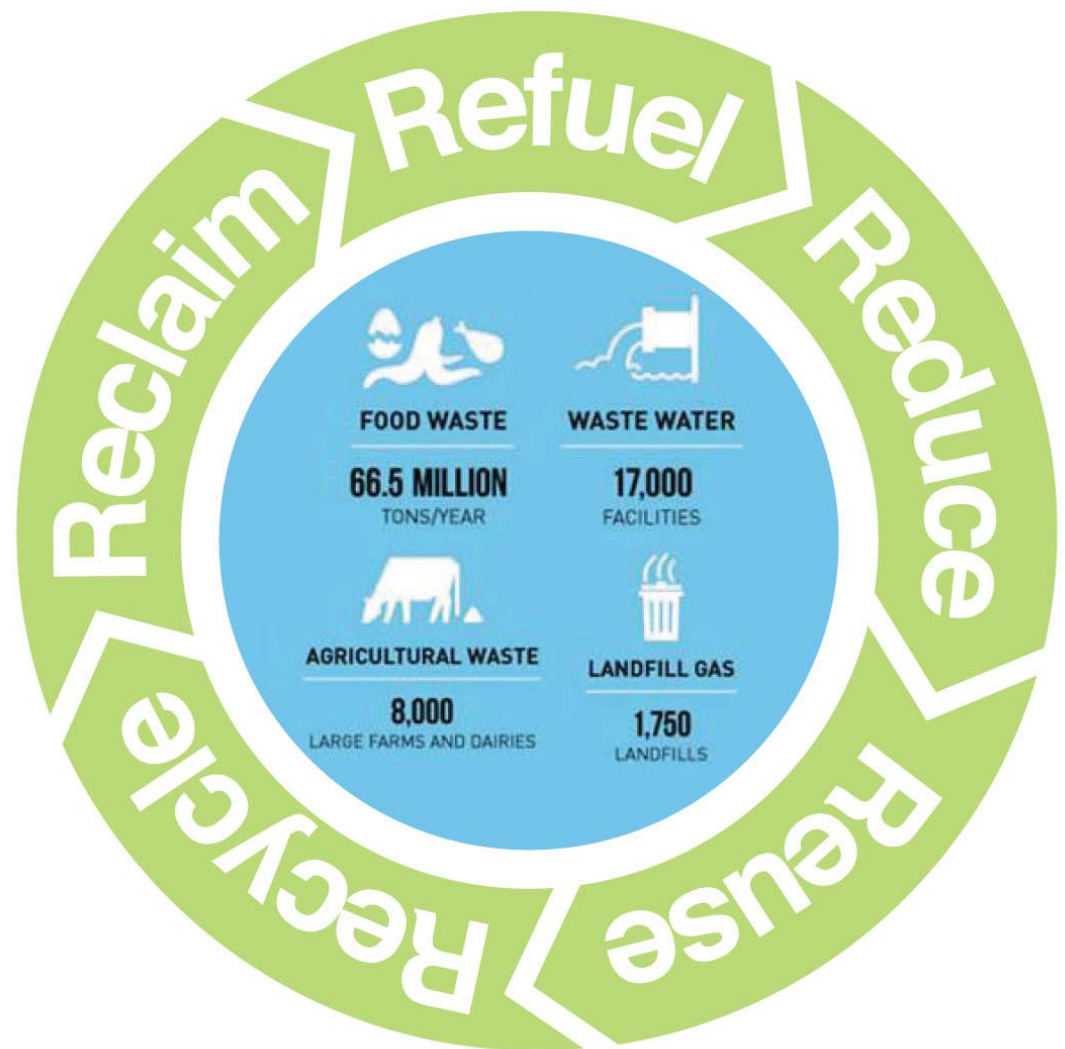


Food Waste



Agriculture

**Promise of RNG:
North America
has abundant
sources of
renewable
natural gas that
can be harnessed**



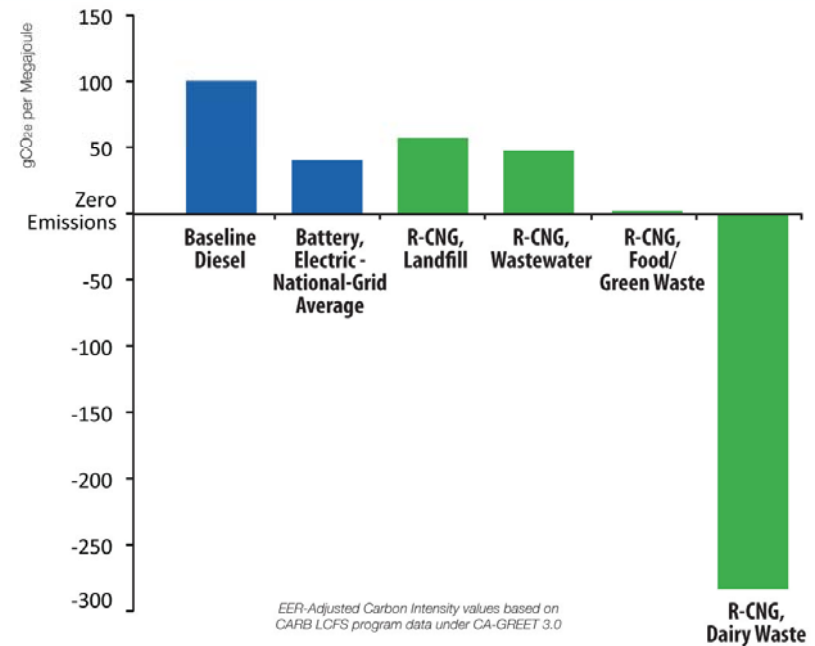
RNG: the most sustainable transportation fuel available today



Electric vs. Diesel vs. RNG: Carbon Intensity of Transportation Fuels



RNG offers significant reductions in carbon intensity



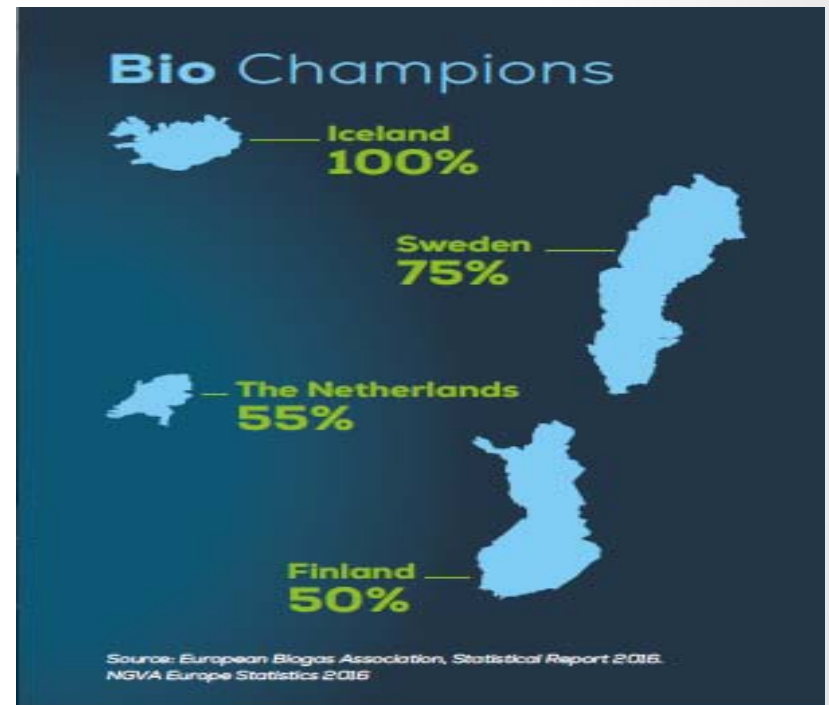
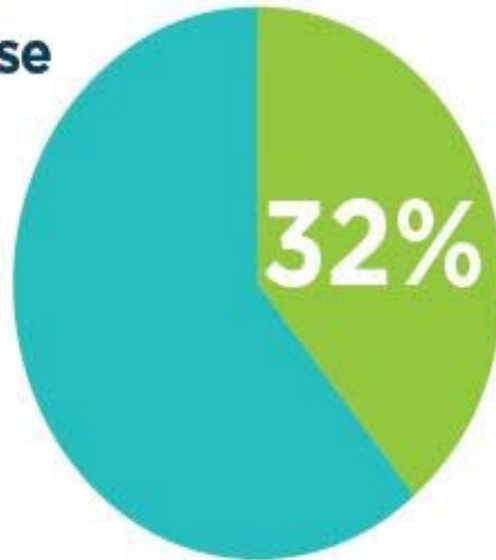
Source: EER Carbon-Intensity values based on CARB LCFS program data under CA-GREET 3.0

RNG Use Here and Abroad is Growing

2018 NGV Fuel Use

In 2018, **32%**, of all on-road fuel used in natural gas vehicles was RNG

- Total NGV Fuel Use
645 Million GGE
- RNG Component
204 Million GGE



RNG Growth 2014 - 2018

RNG Growth



Over the last five years, RNG use as a transportation fuel has increased **577%**, displacing **7+ million tons** of carbon dioxide equivalent (CO_{2e}).

Note: GGE = gasoline gallon equivalent. EGE= ethanol gallon equivalent. EGE units are converted to GGE using a 0.67 multiplier (77,000 Btu/115,000 Btu). Total Natural Gas in Transportation Figure derived from U.S. EIA's Annual Energy Outlook (2019). RNG numbers derived from U.S. EPA RFS Reporting. Total greenhouse gas emissions and associated carbon dioxide equivalent (CO_{2e}) metric tons identified using the California Air Resources Board's Low Carbon Fuel Standard carbon intensity scores as well as the U.S. DOE's Argonne National Laboratory Heavy-Duty Vehicle Emission Calculator.

Massive RNG Growth Potential Reported By Multiple Agencies

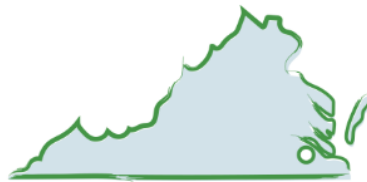
Report	RNG Potential (Billion DGE)*	Percent of 2018 On-road Diesel Consumption**
American Gas Foundation (2019) ²	13.8 - 32.5	35%-81%
American Gas Foundation (2011) ³	6.9 - 17.8	17%-45%
DOE Billion Ton Study (2011) ⁴	9 - 68.5	23%-171%
National Petroleum Council (2012) ⁵	34.7	87%
NREL (2014) ⁶	5.6†	14%



Established November 2018, Align Renewable Natural Gas (RNG)SM is a partnership between Dominion Energy and Smithfield Foods to align the interests of farmers, food processors, neighbors, municipalities, energy consumers, and policymakers to convert biomass into renewable energy.



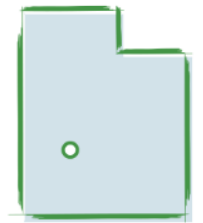
Phase 1 Proposed Locations



Virginia
19 farms



North Carolina
48 farms



Utah
26 farms

Source: <https://www.alignrng.com>



element
MARKETS

Smithfield.



RNG produced from swine manure at Valley View Farms located in Greencastle, Missouri is transported and injected into California pipelines through this strategic partnership.

Product	Carbon Intensity (gCO ₂ e/MJ)
Bio-CNG	-345.68
Bio-LNG	-334.41
Bio-L-CNG	-330.87

Source: Green Car Congress, "Three CA LCFS pathway applications for swine manure to Bio-CNG, Bio-LNG, and Bio-L-CNG; negative triple-digit CIs" December 29, 2019 (<https://www.greencarcongress.com/2019/12/20191229-lcfs.html>)



RNG Powering Success Across the USA

- [Clean Energy](#) commits to 100% RNG by 2025
- [UPS](#) agrees to 2019 purchase agreement for 170 million gallons of RNG (20 – 25 million gallon equivalents per year through 2027)
- [LA Metro](#) has saved nearly \$500,000 in fuel costs with RNG, generated additional revenue from carbon credits, and committed in 2019 to expand use of RNG to 100% in its 2000+ CNG buses
- [NY MTA](#), the nation's largest transit authority, issued 2019 RFP to refuel its 800 natural gas buses on RNG
- [SoCal Gas](#) commits to selling RNG at 31 of its operated fueling stations in California
- [WM](#) currently operates more than a third of its fleet on RNG from its own landfill facilities with plans for more in the future

Driving Down Emissions with RNG

Put into Perspective, RNG as a Transportation Fuel is ...



Lowering greenhouse gas emissions equivalent to removing **1,539,565** gasoline passenger cars from our roads for one year



Reducing CO₂ emissions equivalent to **815,950,377** gallons of gasoline or **712,313,458** gallons of diesel consumed.



That's equal to the total energy used by **868,321** U.S. homes for one year



Avoiding greenhouse gas emissions equivalent to running **1,537** wind turbines for one year



or replacing **275,434,003** traditional lightbulbs with LEDs



Sequestering carbon equal to growing **119,902,624** tree seedlings for ten years



or **8,534,274** acres of U.S. forests for one year

Note: Assumes 7,251,351 metric tons of CO₂e reduced over last five years through increased RNG usage calculated using CARB's LCFS carbon intensity numbers. GHG equivalency results calculated using the U.S. EPA's calculator.

What does this really mean?



NGVs + RNG offer the cleanest commercially available path to reduce heavy-duty vehicle emissions (for likely a decade or more).



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Natural Gas Vehicles for America

Market Influences



The Rise of the “Belief-Driven” Buyer

Impacting purchasing decisions on everything: eat, wear, and use...

Consumers believe brands should take a stand on societal issues. Impacting public perception of company, its future sales, and its stock value

Brands now an important way for consumers to express themselves. Consumers want companies to align with their core beliefs

Source: Edelman, 2018

The Rise of the “Belief-Driven” Buyer

Consumers still focused on brand trust, but it means so much more...

MANY REASONS CONSUMERS NEED TO TRUST BRANDS MORE

Reasons why trusting the brands they buy is becoming more important



Source: 2019 Edelman Trust Barometer Special Report: In Brands We Trust?

The Rise of the ESG Investor

Focus Not Just on Profit, but on Needs of Customers, Employees, and Planet

Investors agree that corporations need to have multi-stakeholder commitment

84% of respondents said maximizing shareholder returns can no longer be the primary goal of corporations and that business leaders need to commit to balancing the needs of shareholders with customers, employees, suppliers and local communities.

Investors are investing more in ESG-excelling companies

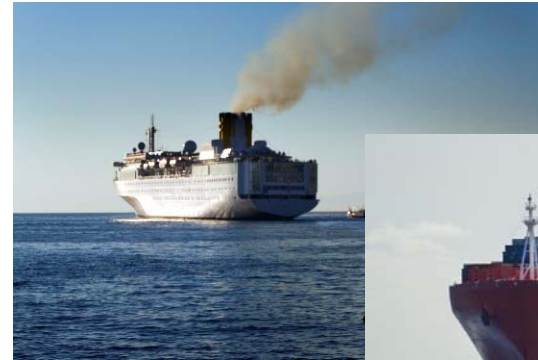
More than half of investors believe that ESG practices positively impact trust, with 61% having increased their investment allocation to companies that excel when it comes to ESG factors.

Investors are changing their voting and engagement policy to be more attentive to ESG

87% of respondents said that their firms have changed their voting and/or engagement policy to be more attentive to ESG risks and 56 percent of investors globally are hiring more ESG-focused staff. 86% of investors would consider investing with a lower rate of return if it meant investing in a company that addresses sustainable or impact investing considerations.

IMO 2020 Compliance

January 1, 2020: all fuel used to power marine vessels must contain no more than 0.5% sulfur, down from 3.5% sulfur by mass



Four Ways to Comply:

- Bunker current Heavy Fuel Oil (HFO); add expensive and unproven “scrubbers”
- Blend low sulfur fuels with conventional HFO
- Switch to LNG
- Switch to compliant Marine Gas Oil (MGO)

Compliant MGO fuel:

- Comes from middle distillates, just like diesel
- Oil industry not prepared for increased demand, refineries at capacity
- 3% of global diesel demand in 2015 to 10% in 2021

Municipal Diesel Restrictions/Bans

Is U.S. Next?



Paris, Mexico City, Madrid, Athens

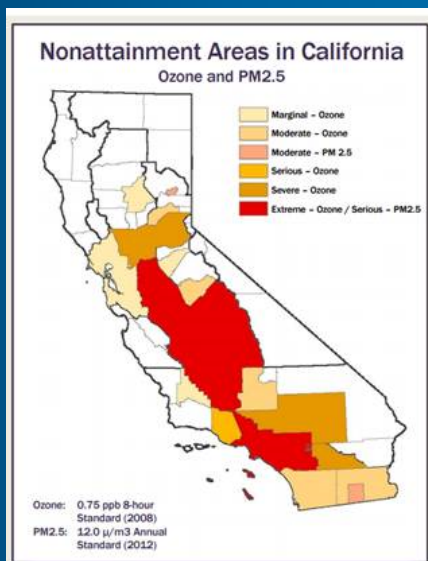
- Restrictions increase annually
- Ban all diesel by 2025

Hamburg, Germany

- Partial ban began 2018



As of 10/1/2018, all newly registered trucks servicing ports to be MY 2014 or newer

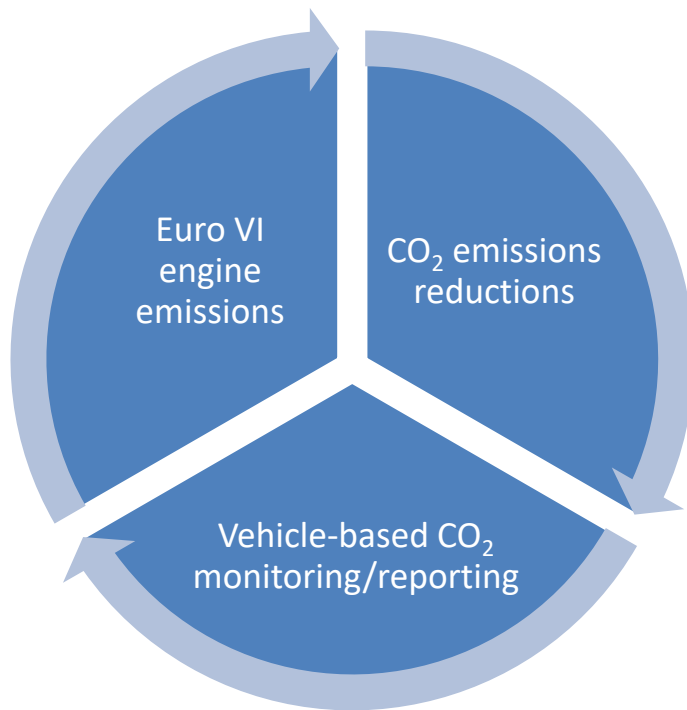


Ports of LA/Long Beach



EU Heavy-Duty CO₂ Standards

New Mandate Passed April 18th



CO₂ emissions reduction targets:

- 15% by 2025, and 30% by 2030
- 2019 baseline emission level (period from 1 July 2019 to 30 June 2020)
- 2030 target is subject to revision in 2022

Fines:

- 2025-2029, OEMs missing the target will have "excess emissions premium" of 4,250 €/gCO₂/t-km
- 2030-on, 6,800 €/gCO₂/t-km

Incentives:

- 2025-on, ZLEV shall represent at least 2% of the new sold fleet
- The ZLEV factor shall reduce the average specific emissions of an OEM by a maximum of 3%.

Review:

- First review by end of 2022
- No later than 2023, review of full life-cycle CO₂ emissions

EPA Cleaner Truck Initiative

Stricter New Federal HD Emissions Are Coming

Q Search

Bloomberg

Sign In

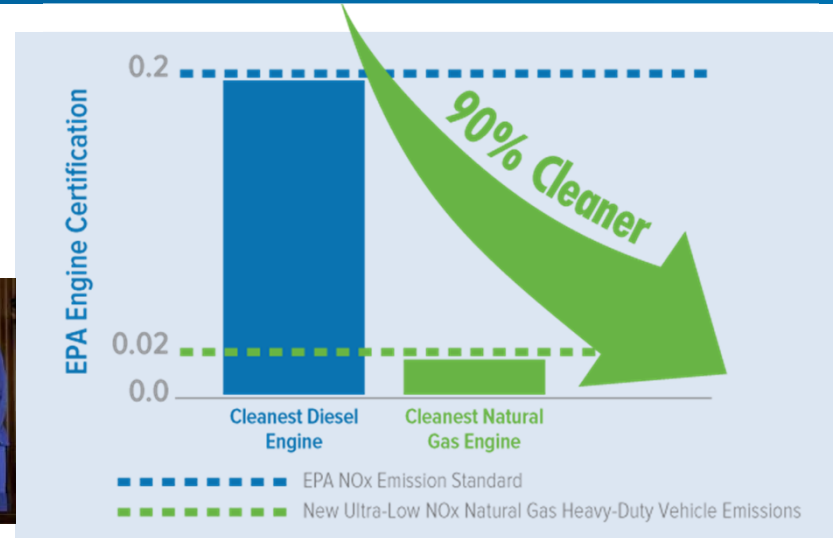
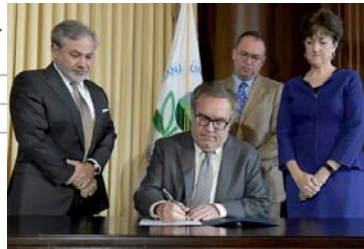
Climate Changed

Trump's EPA to Propose Tougher Big-Rig Pollution Rules, Source Says

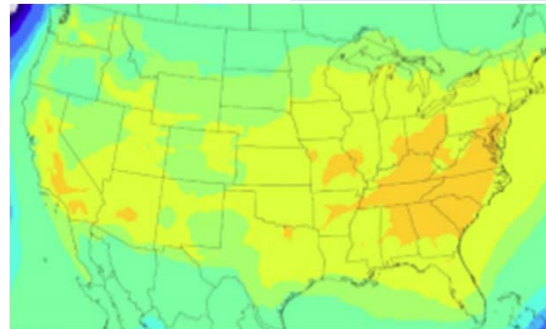
By [Ryan Beene](#)

November 12, 2018, 12:29 PM EST Updated on November 12, 2018, 5:15 PM EST

- ▶ 'Clean Trucks' initiative follows push to roll back rules
- ▶ Clean-air advocates cautiously optimistic but want details



- Advanced Notice Jan. 6, 2020
- Focus primarily on NOx emissions
- Timeframe 2024 – 2027
- 0.02 g/bhp-hr NOx std. looks doubtful
- Potential early credit opportunity



On-Road HD Diesel NOx contribution to Ambient Ozone in 2025

Source: EPA



NGVAMERICA

Natural Gas Vehicles for America

Empowering Your Success



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Technology & Development

Safety

- Manufacturing Facility Training / Accreditation
- CNG Fuel System Inspection Intervals
- Incident Investigations & Root Cause Analysis
- NGV Maintenance Facility Modifications

Sustainability

- Emissions & Environmental Messaging
- Research & Development
- Mobile Pipeline

High Horsepower

- LNG
- Marine & Rail
- Research & Development
- Emissions & Environmental Messaging

NGV Industry Promotion

- Interactive Website
- Weekly NGV newsletter
- Targeted online industry promotion
- Policymaker emails
- Webinars
- Social Media
- Digital campaigns

Cleaner Air Starts with Cleaner Trucks

Champion Natural Gas Transportation with VW Settlement Funding

Structure your state's VW Settlement Plan around basic clean air tenets:

- ✓ **Fuel Cleaner Alternatives to Diesel.** Given that the Volkswagen Environmental Mitigation Trust was created to address nitrogen oxide (NOx) pollution associated with non-compliant diesel vehicles, funding should be prioritized for clean, alternative fuel vehicle projects that focus on maximizing NOx reduction for the resources allocated.
- ✓ **Accelerate the Cleanest-Breath Technologies.** Provide a larger incentive and greater overall funding for medium- and heavy-duty engines that deliver greater NOx reductions than currently required.
- ✓ **Account for Real World Emissions.** Target funding for technologies that have demonstrated the ability to deliver actual lower in-use emissions when operated in real-world conditions.
- ✓ **Target Critical Emissions Reductions.** Provide the highest level of funding to applications that produce the largest share of NOx emissions. In most regions, this means prioritizing for school-bus, regional haul, and refuse trucks.
- ✓ **Support Ready-to-Go Products.** Prioritize funding for commercially-available products that are proven and ready for use.
- ✓ **Fuel Vehicle's Over Pricing.** Prioritize funding for clean vehicles rather than existing infrastructure for greater emissions impact.
- ✓ **Scale Funding to Realize the Cleanest Engines Available.** At a minimum, provide equal pricing alternative fuels that force non-compliant, cleanest vehicles in the private sector at 20% of the cost of the vehicle and public sector vehicles at 40%.
- ✓ **Mix Private and Public.** Ensure that funding incentives adoption by both public and private fleets.
- ✓ **Push Partnerships.** Incentive projects that include partnerships that provide a match such as a construction of a new CNG or LNG station in funded locales.
- ✓ **Realize 50-Year Reductions.** Accelerate funding in the early years to maximize and compound NOx reduction benefits over time.
- ✓ **Use Best Tools.** In evaluating actual emission benefits associated with proposed projects to be funded, use tools that reflect current technologies and performance under real-world operation duty cycles. Argonne National Laboratory's Heavy-Duty Vehicle Emissions Calculator (HDVEC) is the most current and complete.

NGVAMERICA
Natural Gas Vehicles for America

Find out more about championing clean air in your state at www.ngvamerica.org/vwactioncenter



Natural gas vehicles are 90% cleaner than the current EPA NOx standard.



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Natural Gas Vehicles for America

Take the fast-track to reduced emissions.

Natural gas is now. See how >



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Natural Gas Vehicles for America

2019
clean fleet month
NGV ROAD RALLY

Cleaner air starts with cleaner buses.

Minimize your students' exposure to harmful emissions and save money at the same time by transitioning your school bus fleet to natural gas power.

Natural gas buses provide communities across the U.S. with a clean, reliable, and cost-effective transportation option for school children.



Formulate a New Emission Statement for Your School District

No Proven Commercially-Available School Bus Powertrain Solution Today Runs Cleaner than Natural Gas.



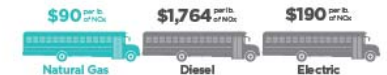
Help Your Students Catch Their Breath

Breathing in vehicle particulate pollution (including nitrogen oxides, or NOx) increases the risk of asthma, lung cancer, heart disease, and premature death. Today, there are 6.2 million Americans with asthma under the age of 18, and asthma is the leading chronic disease in children. It is also the leading reason for missed school days.

Source: Centers for Disease Control and Prevention

Natural gas engines are the only zero emission equivalent or near-zero engines that are certified by both the U.S. Environmental Protection Agency (EPA) and California Air Resources Board (CARB) to perform 90 percent cleaner than their cleanest diesel-burning counterparts. And when powered by renewable natural gas captured from agricultural, food, landfill, or wastewater waste, the result in some cases can be carbon neutral or even negative product.

Source: U.S. EPA, CARB



Most Cost-Effective NOx Emissions Reductions

Dollar-for-dollar, natural gas vehicles deliver the most cost-effective NOx emissions reductions. Natural gas school buses are up to 95 percent more cost-effective than diesel alternatives and 53 percent more cost-effective than limited and unproven electric options.

Source: Argonne National Laboratory, HDVEC Tool

Find out more about championing reduced bus emissions for your students at www.ngvamerica.org.

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2020 Work Products

- **Weight Allowance Flyer**
- **NREL's Foothills Transit Study Review**
- **2019 Total On-Road RNG Fuel Usage**
- **NGV Market Dashboard**
- **Mobile Pipeline White Paper**
- **NGV Sustainability Report**
- **Monthly Infrastructure Reports**

Run your fleet on natural gas? Work with a partner who does?

NGVAmerica recently secured a three-year extension of the Alternative Fuels Tax Credit for years 2018, 2019, and 2020. Now what?

Join us for a webinar to discuss the particulars of this \$0.50/gallon excise credit, how to claim it, and how best to ensure its extension after 2020.

REGISTER NOW



AFTC Natural Gas Fleet Webinar

Wednesday, January 15, 2020 at 2:00 p.m. ET

Register at https://ngvamerica_aftc_whatsnext.eventbrite.com

This no-cost webinar is open to all corporate, fleet, and individual participants; NGVAmerica membership is not required, though pre-registration is. Questions? Contact membership@ngvamerica.org.

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Driving Down Emissions with Renewable Natural Gas



Proven natural gas vehicles are 90% cleaner than current EPA standards. Fueling with biomethane (RNG) improves even further. Waste captured and conditioned underground, yields ultra-carbon-neutral, or carbon-negative lifecycle.

2018 NGV Fuel Use

In 2018, 32% of all on-road fuel used in natural gas vehicles was RNG.

- Total NGV Fuel Use: 645 MBtu GGE
- RNG Component: 204 MBtu GGE

Put into I

Lowering greenhouse gas emissions equivalent to removing 1,539,565 gasoline passenger cars from our roads for one year.

Reducing CO₂ emissions equivalent to 815,950,371 gallons of gasoline or 712,313,458 gallons of diesel consumed.

Cleaner Air Starts with Cleaner Trucks



Heavy-duty trucks and buses are the #1 sources of urban emissions.

74%

3 out of 4 heavy-duty trucks on our roads today are not certified to EPA's latest NOx standard.

Source: DTG Analysis of 46 vehicles in Operation Data, December 2018

Natural Gas is NOW

Heavy-Duty = Heavy Impact

Replacing 1 traditional diesel-burning heavy-duty truck with 1 new Ultra LowNOx natural gas heavy-duty truck is the emissions equivalent of removing 119 traditional combustion engine cars off our roads.

Source: https://www.ngvamerica.org/eng_just



The Cleanest Heavy-Duty Truck Engine in the World is Powered by Natural Gas

90% cleaner than EPA's current NOx emissions requirement, 90% cleaner than the cleanest diesel engine.

In real-life study, natural gas engines emitted lower NOx emissions than certified diesel engines emitted for more than their EPA certification.

Source: University of California, Irvine testing of heavy-duty trucks in port applications, November 2018

Go Carbon-Free with Renewable Natural Gas

When Renewable Natural Gas captured from agricultural, food, landfill or wastewater is used as transportation fuel, even greater CO₂ and greenhouse gas emission reductions are achieved, up to 125% lower than the cleanest diesel.

RNG is carbon-neutral, even carbon-negative. Up to +803.3 ERM-Adjusted Carbon Intensity.

Source: California Air Resources Board, February 2017

RNG Use is Growing Rapidly

32% of natural gas used in on-road transportation in 2018 was RNG, a 577% increase since 2014.

Source: Total Fuel Use in Transportation Figure derived from U.S. EEO's Annual Energy Outlook (2019), www.eia.doe.gov

Natural Gas Makes Sense

Compared to expensive electric or fuel cell technologies still in development, investing in natural gas vehicles is the most cost-efficient solution, delivering more miles per gallon and far more emission reductions than any other available alternative.

right here, right now, today.

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WHY NGV? ENVIRONMENT VEHICLES FUEL POLICY OPPORTUNITIES



ENVIRONMENT

If we want cleaner air, we need cleaner vehicles.

Natural Gas Vehicles are 90% cleaner than the EPA's current NOx standard and emit up to 21% fewer GHG emissions than comparable gas and diesel vehicles. When fueling with Renewable Natural Gas, GHG emissions can be reduced up to 125%.

[Learn More](#)



NGVAmerica.org

Your source for all NGV industry news and information.



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Why wait? Get clean air and combat climate change today with natural gas vehicles. Learn more and view our introductory video at www.ngvamerica.org.

RENEWABLE NATURAL GAS
This 20...
Coast...
RNG



Replacing one traditional diesel HD truck with one, new Ultra Low-NOx natural gas HD truck is the emissions equivalent of removing 119 traditional gas cars from the road

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If we want cleaner air, we need cleaner vehicles.



Natural Gas Vehicles are 90% cleaner than the EPA's and CARB's current NOx standard. And when fueled by Renewable Natural Gas captured from agricultural, food, landfill or wastewater waste, results can be carbon-neutral or even carbon-negative.



Most Cost-Effective NOx Emissions Reductions for Medium- and Heavy-Duty Applications

World's Cleanest Heavy-Duty Truck Engine Runs on Natural Gas

Proven, Affordable, Commercially-Available, Ready-Right-Now Technology

Extensive domestically-sourced CNG, LNG & RNG production and distribution infrastructure



Join us as a Member!
Visit: www.ngvamerica.org/sign-up/



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