



**A comprehensive
guide to **natural
gas engines** for
commercial fleets.**





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01

Understanding natural gas

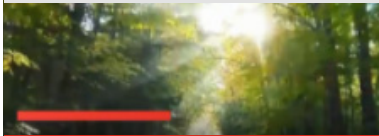
- What is natural gas and how does it compare to other fuels?
- How can natural gas be carbon neutral or negative?



What is natural gas and how does it compare to other fuels?

- Natural gas is a clean-burning fuel that does not generate particulate matter or volatile organic compounds, making it a reliable and financially viable alternative to diesel.
- Liquefied petroleum gas (LPG) and compressed natural gas (CNG) are similar in many ways but have different compositions. LPG is easier to find, with nearly 2,000 publicly-accessible fueling stations in the U.S. and Canada, compared to less than half that number for CNG.
- Liquefied natural gas (LNG) has a higher density than CNG but is less widely available and more hazardous to use.
- Renewable natural gas (RNG) is a clean and environmentally-friendly alternative to fossil natural gas. It can be produced at almost any dairy farm using relatively low-tech equipment. It can fuel nearly any CNG vehicle, making it an effective way for businesses operating fleets to reduce their carbon footprint.
- Natural gas and hydrogen are both used in their gaseous form in vehicle applications, leading to similarities in engine components. However, they differ in availability and storage requirements. Natural gas is stored at lower pressures than hydrogen, which requires safe and lightweight storage tanks. While natural gas vehicles release CO₂, hydrogen vehicles have near-zero greenhouse gas emissions and can reduce emissions by over 99% compared to diesel. That said, hydrogen vehicles face limitations in availability and infrastructure.

COMPRESSED NATURAL GAS (CNG)
VS. LIQUID NATURAL GAS (LNG)



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NATURAL GAS VS. HYDROGEN



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CNG VS LPG, LNG, RNG AND DIESEL



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How can natural gas be carbon neutral or negative?

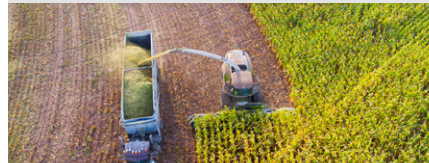
- Renewable natural gas (RNG) is produced from organic matter using anaerobic digestion and additional refining to remove contaminants, resulting in nearly-pure methane.
- Burning RNG is considered carbon-neutral since it doesn't add carbon to the atmosphere. When accounting for the total well-to-wheel carbon emissions, the use of RNG remains low-carbon.
- In some cases, such as when using landfill gas, RNG may even be carbon-negative.
- RNG and CNG are interchangeable and can be blended.
- End users can purchase RNG directly from RNG producers and receive natural gas from utility companies. Businesses wishing to switch their vehicles to RNG often choose to construct a fueling facility on their premises. Fleets can check with their local fuel provider to determine the exact source of their natural gas.
- The growth of RNG is expected.

RENEWABLE NATURAL GAS (RNG)
VS. NATURAL GAS (NG): WHAT'S THE
DIFFERENCE?



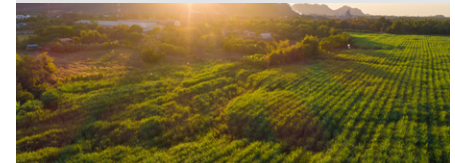
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HOW RENEWABLE GAS DECARBONIZES
NATURAL GAS ENGINES



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HOW MUCH RENEWABLE GAS IS
OUT THERE?

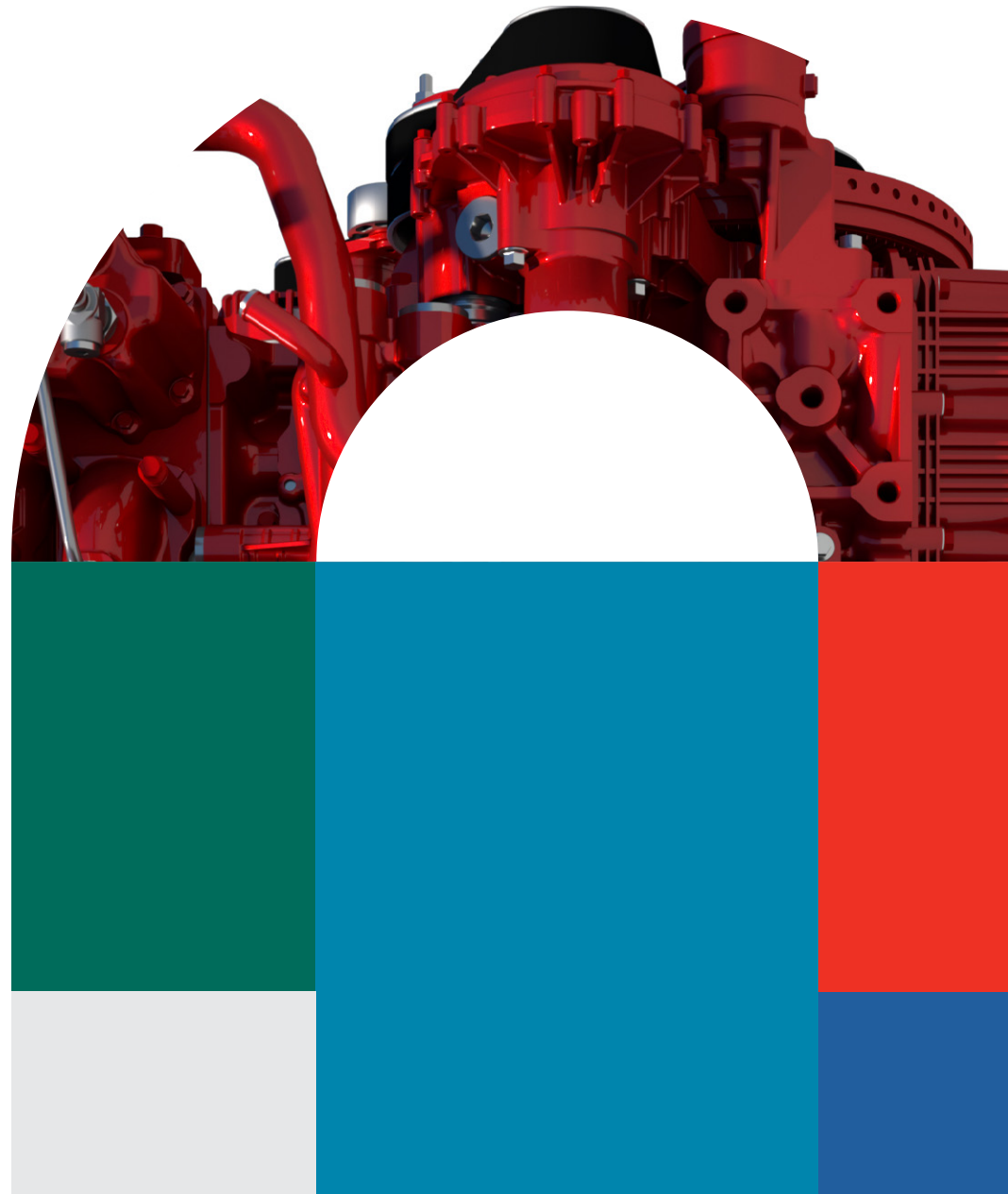


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02

Natural gas engines

- How do natural gas engines compare to diesel engines?
- What are some general insights on natural gas engines?



How do natural gas engines compare to diesel engines?

- Natural gas engines may provide similar performance and drivability to diesel engines but are quieter.
- Natural gas offers convenient refueling options with fast-fill and time-fill systems, saving time and money for fleet operators.
- Natural gas engines have cheaper and easier-to-maintain exhaust systems, resulting in lower maintenance costs. They also offer cost savings on fuel, especially when using renewable natural gas.
- Maintenance intervals differ between natural gas and diesel engines.

NATURAL GAS ENGINES VS. DIESEL ENGINES



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NATURAL GAS ENGINES VS. DIESEL ENGINES



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Natural gas engine insights

- Cummins is developing a range of low-carbon solutions for fleets to help them embark on their journey to zero emissions without causing major disruptions to their day-to-day business operations.
- Natural gas engines and vehicles are among the most mature, proven and least disruptive low-carbon vehicle types available today.
- Natural gas is an abundant domestic fuel source that is not connected to the global oil market. As a result, natural gas is widely available and cheaper than diesel and gasoline.
- Companies like Waste Management, UPS and Walmart are investing in natural gas trucks to reduce their emissions using renewable natural gas.
- Diesel engines cannot run on natural gas since natural gas combustion requires spark plugs.
- Natural gas engines can operate on both compressed natural gas (CNG), liquid natural gas (LNG) and renewable natural gas (RNG).
- There are two cold weather challenges that diesel drivers face, which natural gas drivers will never experience. Natural gas never turns into gel in cold conditions, and its engines don't require Diesel Exhaust Fluid (DEF) that can freeze.

NATURAL GAS ENGINE INSIGHTS FOR
TRUCK AND BUS FLEETS

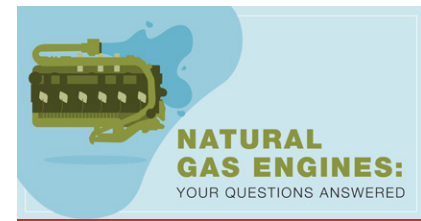


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NATURAL GAS ENGINES QUESTIONS
ANSWERED



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03

Benefits of natural gas engines

- What are some of the main benefits of natural gas engines?
- What are the environmental benefits of natural gas engines?
- What are the financial and economic benefits of natural gas engines?
- What are the benefits of natural gas engines for drivers?



What are some of the main benefits of natural gas engines?

- Natural gas engines emit almost no harmful emissions, reducing air pollution. Fleets that run on renewable natural gas also reduce greenhouse gas emissions.
- Natural gas fuel costs less than gasoline and diesel, and natural gas vehicles do not require extensive exhaust aftertreatment systems.
- Natural gas engines are noticeably quieter than diesel engines, making them an attractive option for service companies, delivery fleets, transit companies and school corporations operating in urban environments.
- Natural gas engines share many of the same components as their diesel counterparts, making it easier for mixed fleets to maintain parts inventory and train service technicians.
- Drivers prefer operating natural gas vehicles, making them an appealing option for companies looking to attract and retain drivers.
- Natural gas is abundant in many parts of the world.

CAN COMMERCIAL
TRANSPORTATION BENEFIT FROM
NATURAL GAS ENGINES?



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BENEFITS OF
NATURAL GAS
ENGINES



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BENEFITS OF NATURAL GAS
ENGINES IN TRANSPORTATION



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NATURAL GAS IN OUR RENEWABLE
FUTURE



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What are the environmental benefits of natural gas engines?

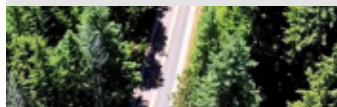
- Natural gas engines typically emit lower overall amounts of greenhouse gas (GHGs) emissions and particulate matter such as carbon dioxide (CO₂) and nitrogen oxides (NO_x) while delivering similar power and performance compared to diesel engines.
- Well-to-wheel emissions, which encompass the total GHG emissions generated from fuel use, production, transportation and generation, demonstrate that compressed natural gas (CNG) can achieve GHG reductions ranging from 13% to 17% with an average reduction of 25% or more for CO₂ emissions compared to diesel.
- The sustainability impact of natural gas is further enhanced when considering renewable natural gas (RNG), primarily produced from methane derived from organic waste decomposition. RNG can significantly reduce the overall carbon intensity. In the case of landfill-sourced RNG, it can even be carbon negative.
- Natural gas vehicles contribute less to air pollution without the need for complex aftertreatment systems designed to remove pollutants from exhaust. Natural gas engines are certified at near-zero low NO_x levels (0.02g/bhp-hr) and release minimal amounts of harmful volatile organic compounds (VOCs) like benzene.
- Natural gas possesses an additional advantage over petroleum fuels. In the event of a leak, any escaped natural gas will rapidly dissipate in the atmosphere, unlike oil and its derivatives such as diesel and gasoline, which can lead to ground and water contamination.
- Natural gas engines can assist companies in advancing their environmental sustainability goals.

THREE REASONS WHY NATURAL GAS IS CENTRAL TO OUR RENEWABLE FUTURE



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WHAT MAKES NATURAL GAS ENGINES INCREASINGLY SUSTAINABLE?



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REDUCE YOUR ENVIRONMENTAL IMPACT WITH NATURAL GAS



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ENVIRONMENTAL SUSTAINABILITY BENEFITS OF NG ENGINES



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REDUCING YOUR FLEETS EMISSIONS WITH NATURAL GAS



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What are the financial and economic benefits of natural gas engines?

- The cost of natural gas fuel is significantly lower than that of gasoline and diesel, providing long-term cost savings for businesses.
- The price of natural gas is stable and not influenced by fluctuations in petroleum fuel prices, offering financial stability for companies that cannot adjust their service prices to account for rising fuel costs.
- Natural gas vehicle aftertreatment systems are maintenance-free and don't require any DEF, DPF filters or active regeneration.
- Abundant government incentives, including tax credits and grants, are available for businesses investing in natural gas vehicles.
- Natural gas vehicles offer driver and operational savings, such as labor hours saved through time-fill fueling systems and a cleaner, quieter engine that improves the quality of life for drivers and mechanics.
- Businesses that switch to natural gas vehicles and experience savings across these cost categories can recover their initial investment in natural gas vehicles.

HOW MANY FINANCIAL BENEFITS OF NG ENGINES CAN YOU COUNT?



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ECONOMIC BENEFITS OF NATURAL GAS ENGINES



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What are the benefits of natural gas engines for drivers?

- Natural gas vehicles do not cause fuel leaks or spills, making them safer for drivers and mechanics to handle.
- Natural gas engines operate quieter than their gasoline and diesel counterparts, reducing fatigue for drivers.
- Natural gas vehicles avoid winter weather issues such as diesel fuel turning into a gelatin-like substance, as natural gas has a boiling point of -258°F .
- Natural gas vehicles do not require Diesel Exhaust Fluid (DEF), which can freeze and cause problems in cold weather conditions.
- Testimonials from other drivers who use natural gas engines can help alleviate doubts and encourage adoption.

HOW DO DRIVERS EXPERIENCE NATURAL GAS ENGINES?



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04

Natural gas engine applications



What applications work well with natural gas engines?



What applications work well with natural gas engines?



Vocational trucks such as refuse trucks, dump trucks and yard spotters



Transit and school buses



Medium-duty trucks: local and semi-local applications



Regional haul trucks



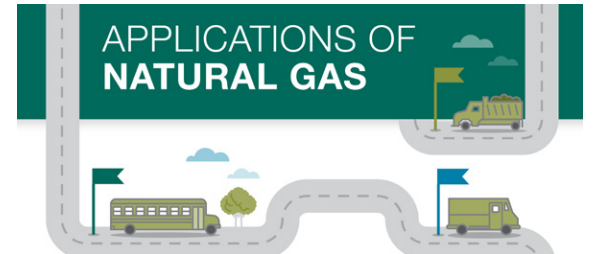
Heavy-duty trucks

EXAMPLES OF NATURAL GAS ENGINES ON TRUCKS AND BUSES

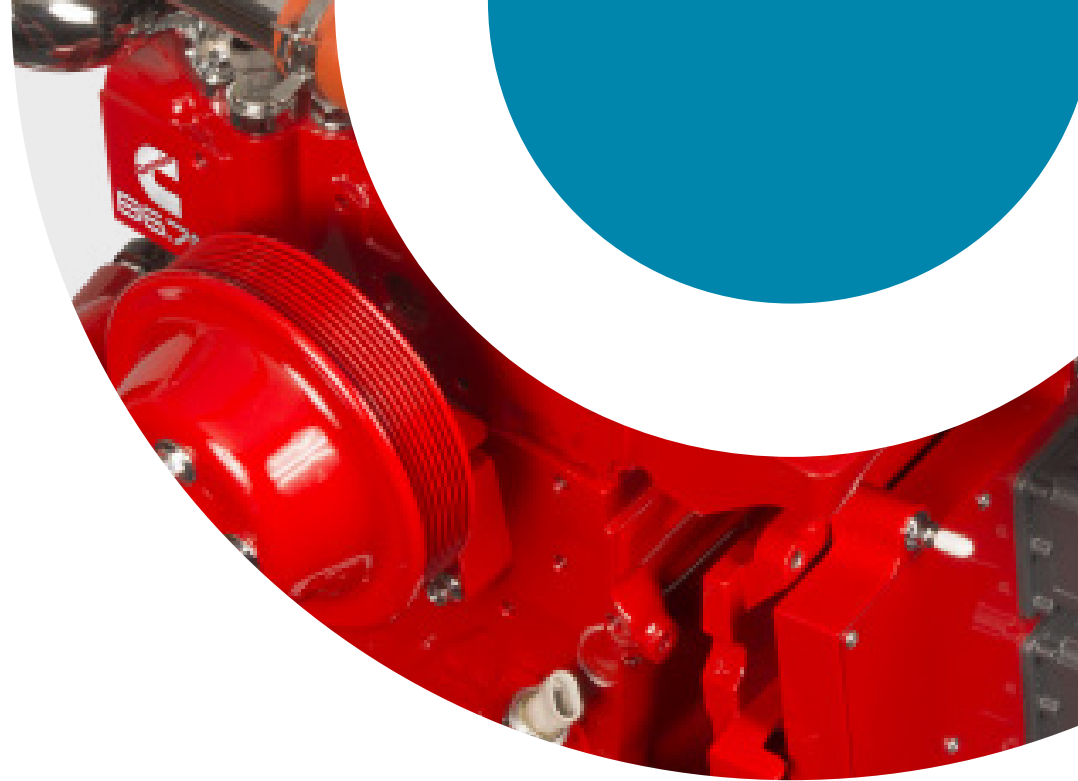


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APPLICATIONS OF NATURAL GAS



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05

What are some other considerations to keep in mind?

- What is the infrastructure readiness?
- Are natural gas engines and vehicles safe?
- Why is natural gas a well-positioned fuel to transition your fleet?
- When is the right time to switch to natural gas engines?

What is the infrastructure readiness?

- Renewable natural gas (RNG) can be fully interchangeable with traditional natural gas, and its industrial production is experiencing a boom driven by growing demand.
- Natural gas benefits from a well-established midstream and downstream infrastructure, including pipelines for transportation between natural gas-producing regions and population centers, as well as distribution networks that deliver natural gas to homes and businesses in most urban and suburban areas.
- While natural gas is widely available, it may not always be readily accessible for use in vehicles. Currently, there are approximately 1,500 compressed natural gas (CNG) fueling stations in the United States, compared to about 145,000 gasoline stations.
- Businesses interested in natural gas vehicles have the option to invest in private fueling infrastructure, with many natural gas fuel suppliers willing to subsidize the infrastructure costs and recoup the investment over several years through a slightly higher fuel price.
- There are three main types of natural gas refueling facilities: fast-fill stations, time-fill stations and hybrid combination-fill stations.
- The use of natural gas in motor vehicles has seen significant growth in the past six years, with 121,000 natural gas-powered vehicles on U.S. roads as of 2021, including transit buses, school buses and garbage trucks.
- Cummins has produced over 85,000 natural gas engines for medium- and heavy-duty vehicles.

WHAT IS THE CURRENT STATE OF NATURAL GAS
REFUELING INFRASTRUCTURE?

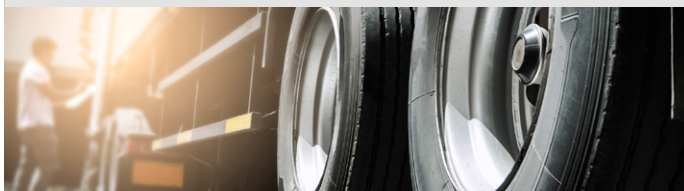


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Are natural gas engines and vehicles safe?

- Natural gas engines are a safe technology, benefiting from Cummins' decades of knowledge in designing internal combustion engines to ensure their safety and reliability.
- In some respects, natural gas is safer than liquid fuels as it tends to dissipate at a faster rate if a leak occurs inside the engine compartment.
- Compressed natural gas (CNG) vehicles store fuel in sturdy gas cylinders under high pressures, which are subject to stringent design standards and safety margins. These standards include pressure relief valves, a pressure regulator and a shut-off valve.
- Maintaining leak-free natural gas fuel systems is crucial, and regular inspections and maintenance are essential to prevent leakage.
- The top five safety design elements for CNG maintenance facilities are ventilation, controlling paths of migration, designing space heating in accordance with guidelines, installing electrical wiring and equipment to prevent ignition due to sparking, and implementing methane, control systems and alarms.
- Local Clean Cities coordinators serve as excellent resources for fleets and facility maintenance managers who have questions about safety measures or need assistance accessing their facilities.

SAFETY CONSIDERATIONS AROUND NATURAL GAS ENGINES



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Why is natural gas a well-positioned fuel to transition your fleet?

- Natural gas engines are a suitable choice for commercial vehicles due to their quieter operation, reduced air pollution and potential cost savings for fleets.
- Maintenance crews may have a more pleasant experience working on natural gas engines as they are not covered in soot and the fuel is less likely to spill.
- Natural gas engines have simpler maintenance requirements since they do not require complicated exhaust treatment systems. Some components of natural gas engines, such as spark plugs, require special care and differ from those in diesel engines. CNG vehicles must follow the manufacturer's recommended maintenance intervals, including proper oil changes using the correct engine oil specification.
- Implementing a refueling plan is crucial for a successful transition to natural gas vehicles. Slow fuel fill stations are cost-effective and efficient options for refueling natural gas vehicles. Fast-fill solutions are available for quickly refueling natural gas vehicles.
- Compressed Natural Gas (CNG) engines are well suited for fleets that return to a central depot each night and can refuel "behind the fence." This refueling system is ideal for transit buses, refuse trucks, urban delivery trucks and regional haul semi-trucks.
- Natural gas is readily available through established distribution channels, and supplies are abundant.
- Transportation industry partners, including Cummins, are investing in new products and refueling infrastructure to facilitate the integration of natural gas vehicles into long-haul fleets.

REDUCE YOUR ENVIRONMENTAL
IMPACT WITH NATURAL GAS



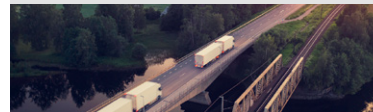
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DON'T MISS THE LATEST ON
NATURAL GAS ENGINES



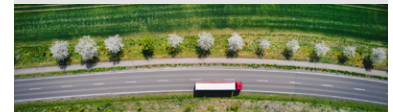
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HOW TO TRANSITION YOUR FLEET
TO NATURAL GAS ENGINES



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NG IS WELL-POSITIONED TO
FUEL VEHICLES FOR TODAY'S
ENERGY TRANSITION



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When is the right time to switch to natural gas engines?

Infrastructure considerations

- Compressed Natural Gas (CNG) engines are suitable for fleets that return to a central depot each night to refuel “behind the fence.” This system is well-suited for transit buses, refuse trucks, urban delivery trucks and regional haul semi-trucks.
- Setting up onsite refueling capacity involves initial setup costs. However, many natural gas fuel suppliers offer options to install fuel pumps with no upfront payment, providing stable fuel costs over the contract’s duration.

Maintenance and servicing considerations

- Service facilities for CNG vehicles should include safety features such as ceiling-level ventilation systems and methane detectors.
- CNG vehicles must adhere to the manufacturer’s recommended maintenance intervals, including proper oil changes with the correct engine oil specification.

- Considering refueling infrastructure and maintenance facilities, the economic benefits of natural gas engine-powered vehicles can outweigh the switching costs.

Emission regulations

- Switching to natural gas can be a cost-effective method to meet emissions standards and save on fuel costs when replacing trucks or engines.
- The Cummins X15N™ engine not only meets but exceeds these regulations, ensuring compliance for years to come.
- Natural gas engines assist fleets in reducing emissions and operating costs without significant disruptions to their day-to-day operations.

WHEN TO SWITCH TO A NATURAL GAS ENGINE: KEY FACTORS TO CONSIDER



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WHEN TO SWITCH TO A NATURAL GAS ENGINE



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06

What are the different natural gas engines available?



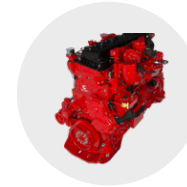
CLICK ON THE LINKS BELOW TO LEARN MORE ABOUT EACH OF OUR NATURAL GAS ENGINES



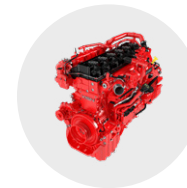
B6.7N



L9N



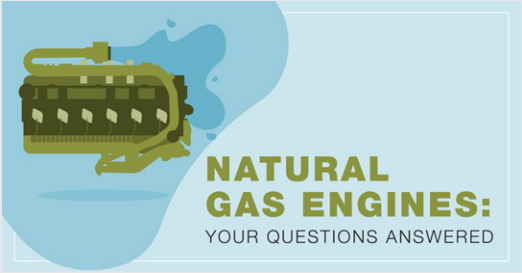
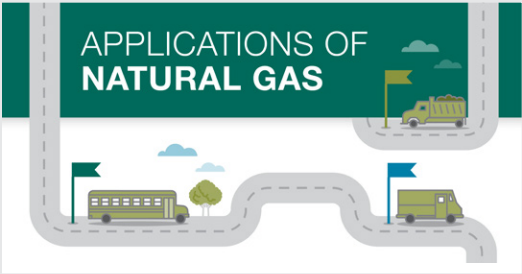
ISX12N






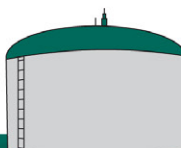




























X15N

07

Appendix



COMPARISON OF LOW TO ZERO CARBON FUELS

	 COMPRESSED NATURAL GAS (CNG)	 RENEWABLE NATURAL GAS (RNG)	 AUTOGAS (LPG)	 LIQUEFIED NATURAL GAS (LNG)
Definition and origin	Fossil fuels from ground. Mostly methane	Comes from fermenting organic waste in large industrial tanks. Mostly methane	Mixture of light hydrocarbons with 60-90% propane	Natural gas is compressed and cooled to extremely low temperature, at which point it turns to liquid
Burns clean (no volatile organic compounds) and silently	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
No diesel exhaust fluid	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
No cold weather problems	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> LNG can cause freeze burn
Fueling stations	Around 1,000 public fueling stations (US and Canada)	RNG can be fully interchangeable with traditional natural gas. Fleets can check with their local fuel provider to find out the exact source of their natural gas.	Around 2,000 public fueling stations (US and Canada)	55 public fueling stations (US)
Physical state	 Gas	 Gas	 Liquid	 Liquid
Cummins engine availability	Now: B6.7N, L9N, ISX12N Future product: X15N	Now: B6.7N, L9N, ISX12N Future product: X15N	Future product: B6.7 propane	Now: B6.7N, L9N, ISX12N Future product: X15N
Carbon emission reductions compared to diesel	18-30%	100% (carbon zero or negative)	7%	15-20%
Applications	Now:  Bus  Vocational truck  Medium duty truck  Regional haul  Class 8 day cab Soon:  Heavy duty truck	Now:  Bus  Vocational truck  Medium duty truck  Regional haul  Class 8 day cab Soon:  Heavy duty truck	Soon:  School bus  Medium duty  RV  Pick up truck  Urban delivery truck  Terminal truck	Now:  Bus  Vocational truck  Medium duty truck  Regional haul  Class 8 day cab Soon:  Heavy duty truck
Other notes	There are two types of refueling experiences: fast-fill and time-fill	This fuel can be used in CNG vehicle. Blending it with CNG is also possible	LPG is the third most widely used fuel in the world behind gasoline and diesel	LNG is denser than CNG, but it is more complicated to use and has additional safety concerns



SCAN THIS QR CODE FOR MORE INFORMATION ON LOW TO ZERO CARBON FUELS
If this information is relevant to your needs, don't forget to check out our natural gas engines at www.cummins.com/engines/natural-gas



APPLICATIONS OF NATURAL GAS

Vocational truck

(refuse trucks, dump trucks, terminal tractors)



Quieter

great customer satisfaction in urban environments



Less pollution

improved air quality in urban settings

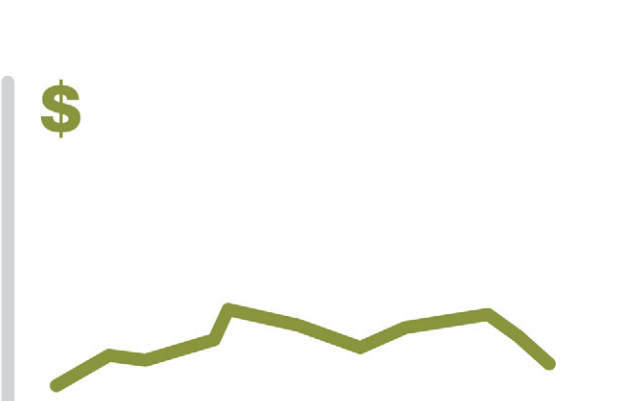


Reduced fuel costs

waste management companies or municipalities that own landfills can produce renewable natural gas (RNG)

Transit and school buses

Fuel prices are lower and more stable, saving school districts a significant amount on annual fuel cost



30% of all transit buses in the US in 2019 operated on natural gas (according to the US DOE)



In cities and neighborhoods, natural gas engines...



Don't produce exhaust odor from idling buses resulting in better air quality



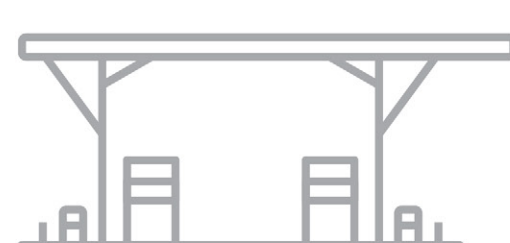
Reduce kids' exposure to air pollution



Run quieter than diesel engines = less noise around you



These vehicles conveniently return at the end of the workday to refuel



Medium-duty trucks

(semi local applications, urban delivery and last-mile delivery)

Vehicles can complete a day's work without refueling, and they conveniently return to refuel overnight

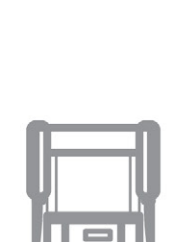
UPS has committed to purchasing more than 6,000 CNG trucks between 2020-2022



Regional haul trucks

(longer range transportation)

Natural gas engines can be used on trucks that run fixed routes between locations where NG fuel stations are available



On-highway natural gas trucks offer route flexibility; they don't need to be refueled in-route

RNG captures methane that would have otherwise been emitted into the atmosphere through natural decomposition, making it a carbon-negative option



SCAN THIS QR CODE FOR MORE INFORMATION ON THE DIFFERENT APPLICATIONS OF NATURAL GAS ENGINES

If these examples resonate with your needs, don't forget to check out our natural gas engines on <https://www.cummins.com/engines/natural-gas>

BENEFITS OF NATURAL GAS ENGINES

1 THE MATURE, PROVEN AND LEAST DISRUPTIVE ALTERNATIVE POWER TECHNOLOGY AVAILABLE TODAY

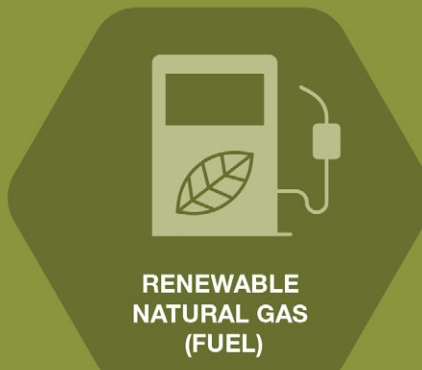
A great fit for a **variety of applications**

The integration of natural gas engines **doesn't require radical changes** in **vehicle technology** or transportation **infrastructure** of support networks

The learning curve **isn't as steep** as many people think

2 KIND TO THE ENVIRONMENT

Natural gas engines can utilize **renewable natural gas (RNG)**



Natural gas can't **spill**, **puddle** or **contaminate** the ground



3 CUT GREENHOUSE GAS EMISSIONS

13-17% LOWER

well-to-wheels greenhouse gas emissions using a **compressed natural gas (CNG)** vehicle compared to equivalent gasoline vehicles

RNG can help fleets reach **sub-zero** greenhouse gas (GHG) emission levels

4 PROMOTE COST SAVINGS



In the US, retail prices of CNG have been **consistently lower** than diesel since the 2000s = stable prices without drastic swings

Municipalities and refuse companies that own landfills can capture methane generated through waste decomposition and sell to RNG fuel producers, **offsetting their fuel costs**



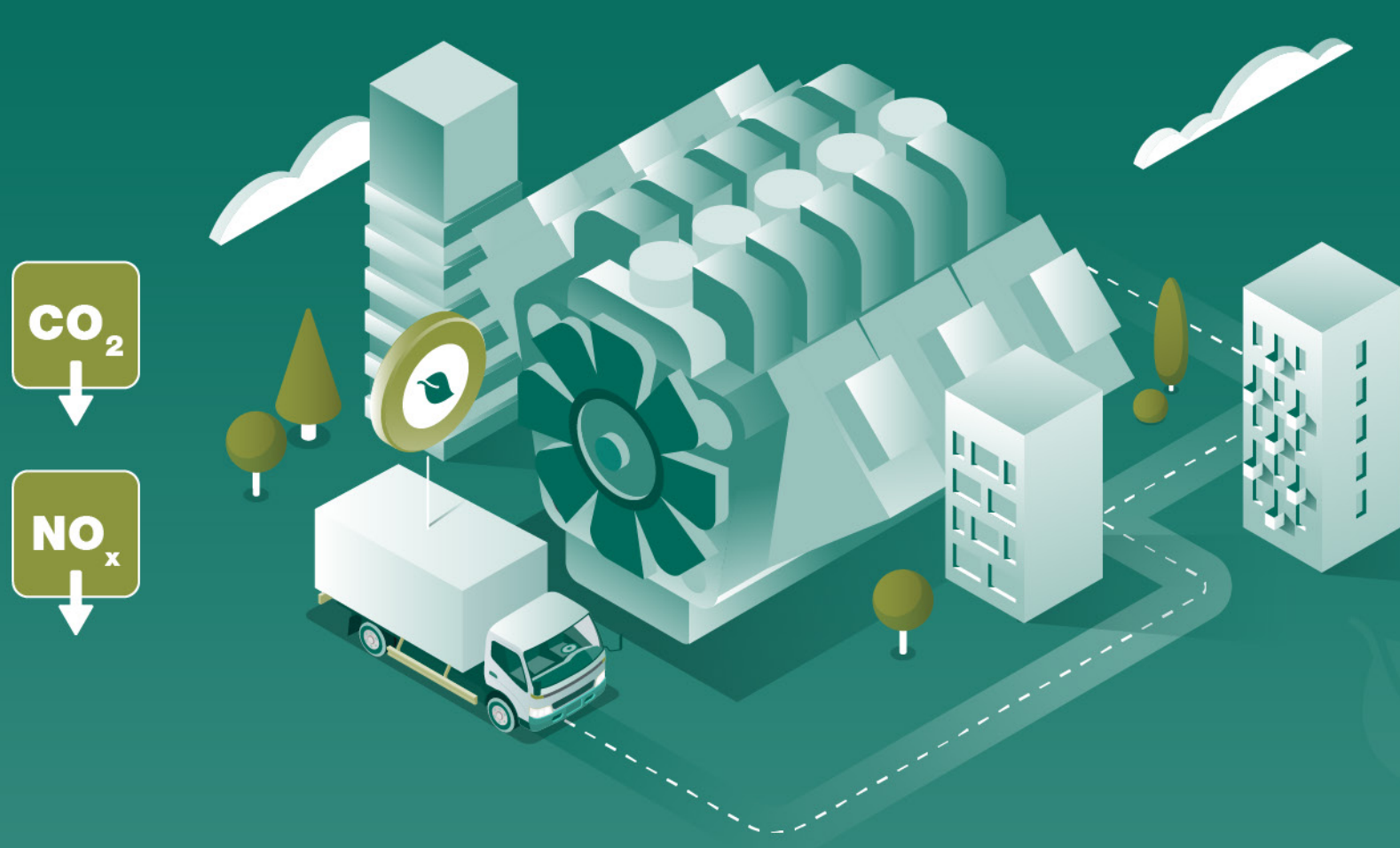
SCAN THIS QR CODE FOR MORE INFORMATION ON THE DIFFERENT APPLICATIONS OF NATURAL GAS ENGINES

If these examples resonate with your needs, don't forget to check out our natural gas engines on <https://www.cummins.com/engines/natural-gas>

ENVIRONMENTAL SUSTAINABILITY BENEFITS OF NATURAL GAS ENGINES

1 WHAT MAKES NATURAL GAS AN ENVIRONMENTALLY FRIENDLY FUEL?

Compared to a diesel engine, for the same number of miles driven, a natural gas vehicle usually results in a lower overall amount of greenhouse gases (GHGs) and particulate matter, like carbon dioxide (CO₂) and nitrogen oxides (NO_x), while delivering similar power and performance



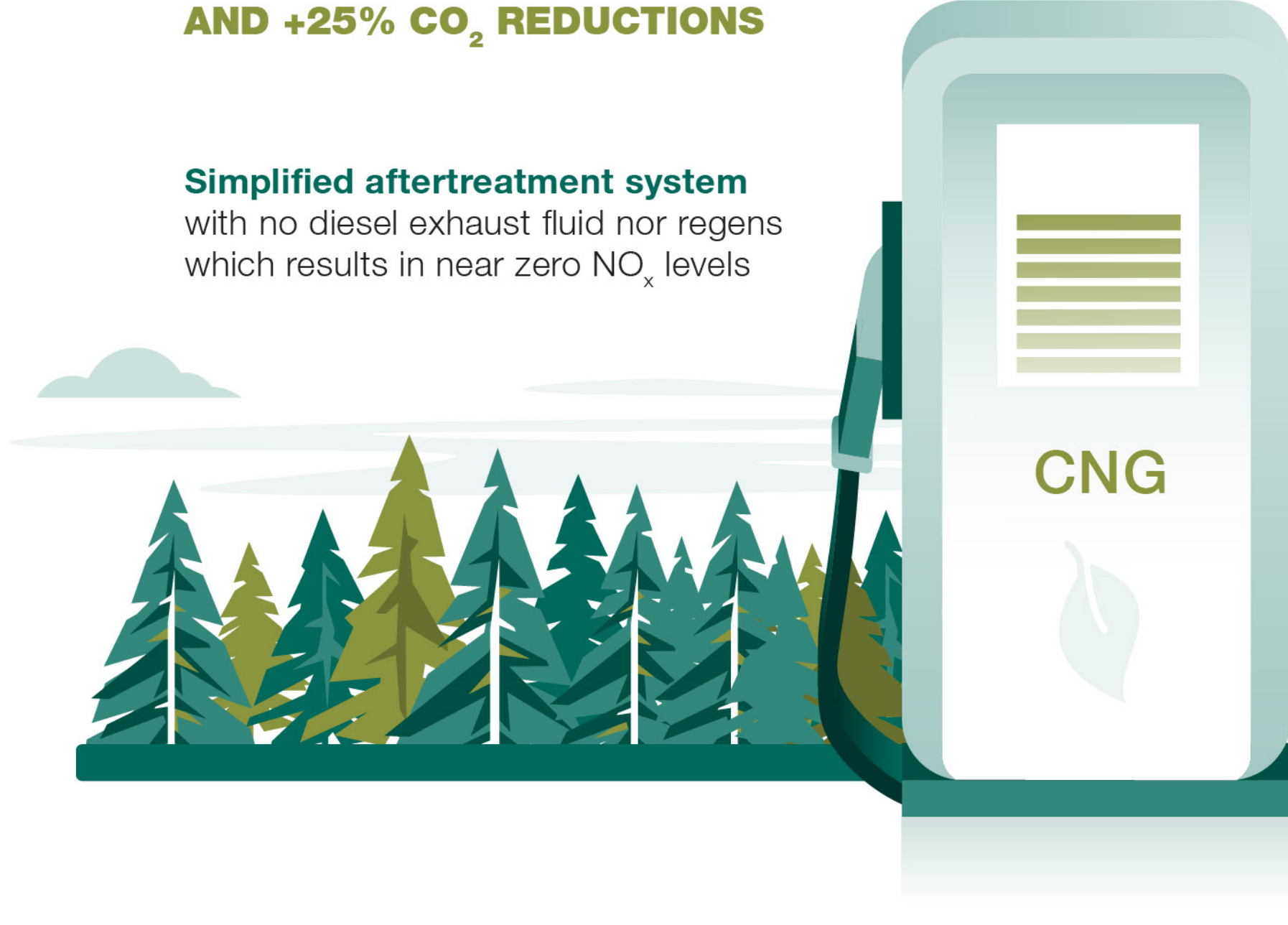
2 NATURAL GAS ENGINES LOWER GHG EMISSIONS

COMPRESSED NATURAL GAS:

13-17%

GHG EMISSION REDUCTION AND +25% CO₂ REDUCTIONS

Simplified aftertreatment system with no diesel exhaust fluid nor regens which results in near zero NO_x levels



3 HOW DOES RENEWABLE NATURAL GAS DECARBONIZE NATURAL GAS ENGINES?

Renewable natural gas (RNG) is sometimes known as biomethane or upgraded biogas. Anaerobic digestion, a process in which bacteria break down organic matter, produces biogas

Additional refining removes contaminants such as CO₂ and nitrogen. At that point, biogas becomes renewable natural gas—nearly pure methane

Chemically, renewable natural gas and compressed natural gas (CNG) are identical. Both fuels are interchangeable and can be blended. Fleets can check with their local fuel provider to find out the exact source of their natural gas



Sometimes, RNG can qualify as a carbon-negative fuel when obtained from landfills. Landfills tend to release methane, a potent greenhouse gas, due to naturally occurring fermentation. Recovering that methane and using it as a fuel prevents it from being released into the atmosphere

4 REDUCING CRITERIA AIR EMISSIONS WITH NATURAL GAS ENGINES

Natural gas engines are certified at near zero NO_x levels (0.02g/bhp-hr) and release minimal amounts of harmful volatile organic compounds (VOCs) like benzene

SWITCHING TO NATURAL GAS ENGINES PROVIDES AN IMMEDIATE POSITIVE LOCAL IMPACT ON AIR QUALITY



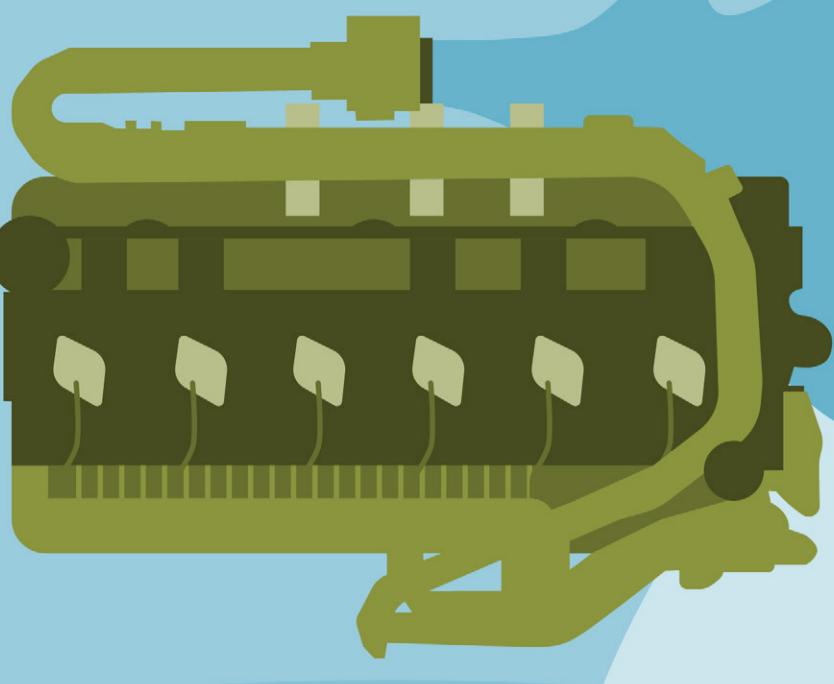
5 NO ENVIRONMENTALLY HARMFUL SPILLS

If a leak occurs, any natural gas that escapes will almost instantly dissipate in the atmosphere. Leaking natural gas into the air is not without environmental impact. With natural gas, soil contamination is not a problem



SCAN THIS QR CODE FOR MORE INFORMATION ON THE ENVIRONMENTAL SUSTAINABILITY BENEFITS OF NATURAL GAS ENGINES

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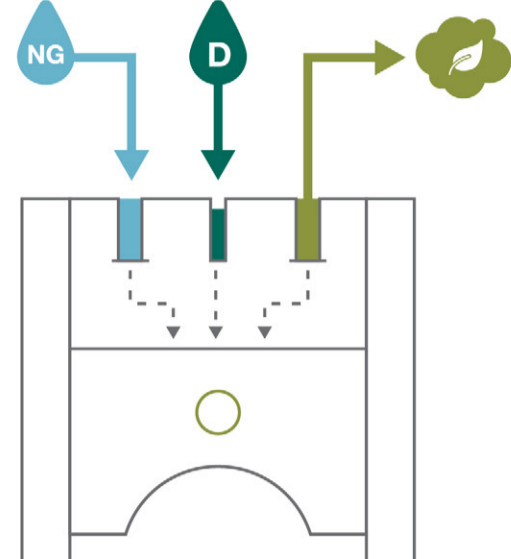


NATURAL GAS ENGINES:

YOUR QUESTIONS ANSWERED

Can a diesel engine run on natural gas?

In short, no. Natural gas combustion requires spark plugs, while diesel engines cause fuel to ignite through compression



■ There are some engines modified to run on diesel or natural gas, known as bi-fuel or dual fuel engines

Can a natural gas engine run on renewable natural gas (RNG)?

Yes! RNG is a big reason fleets switch to natural gas vehicles



■ Environmental benefits really shine when using RNG made with biogas



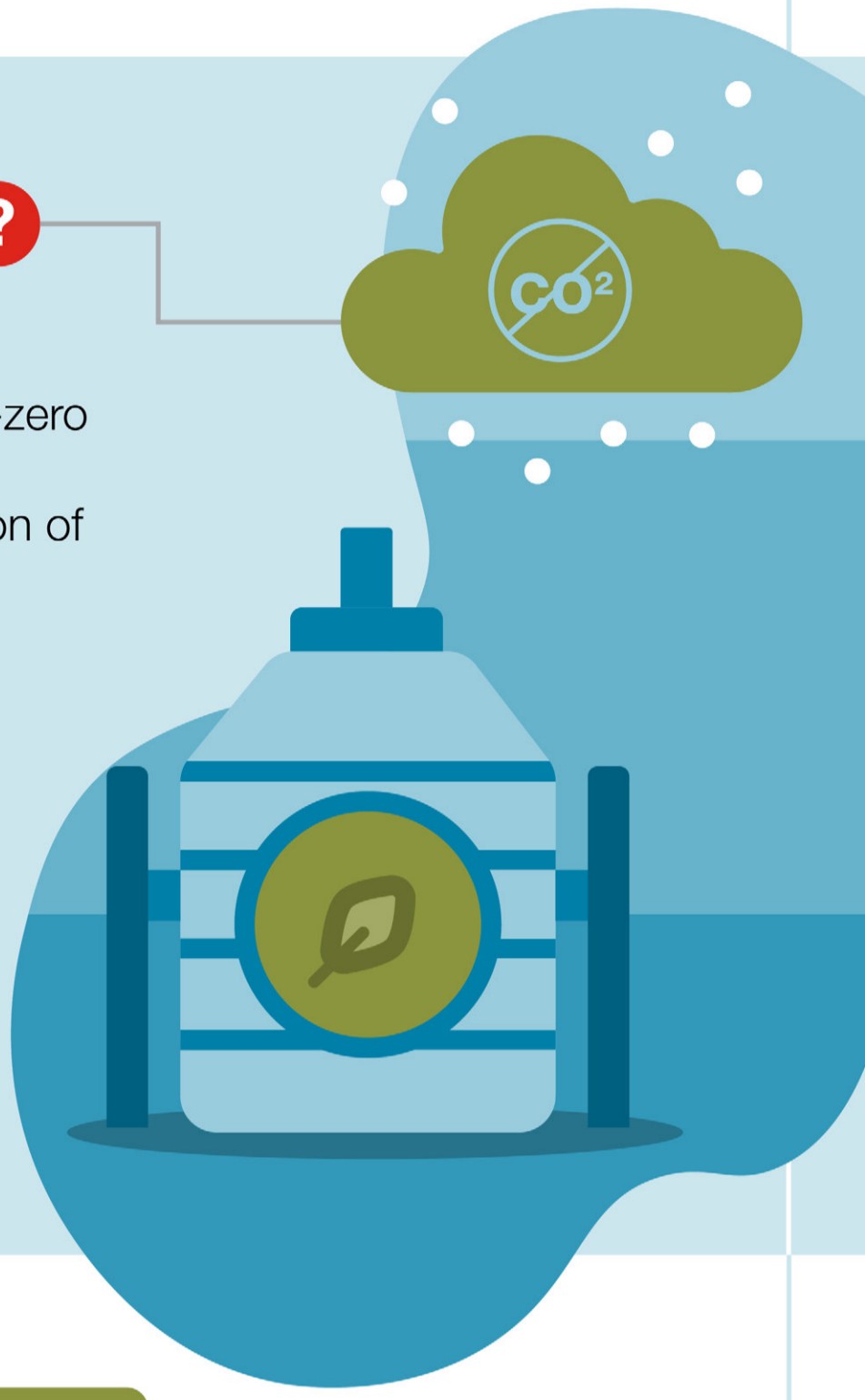
What are the environmental benefits of RNG?

The carbon intensity of RNG can be neutral or even sub-zero

RNG's main elements come from biogas, the fermentation of organic waste



Biogas (like methane) is captured during treatment, preventing it from being emitted into the atmosphere



Is it more affordable to run natural gas engines?

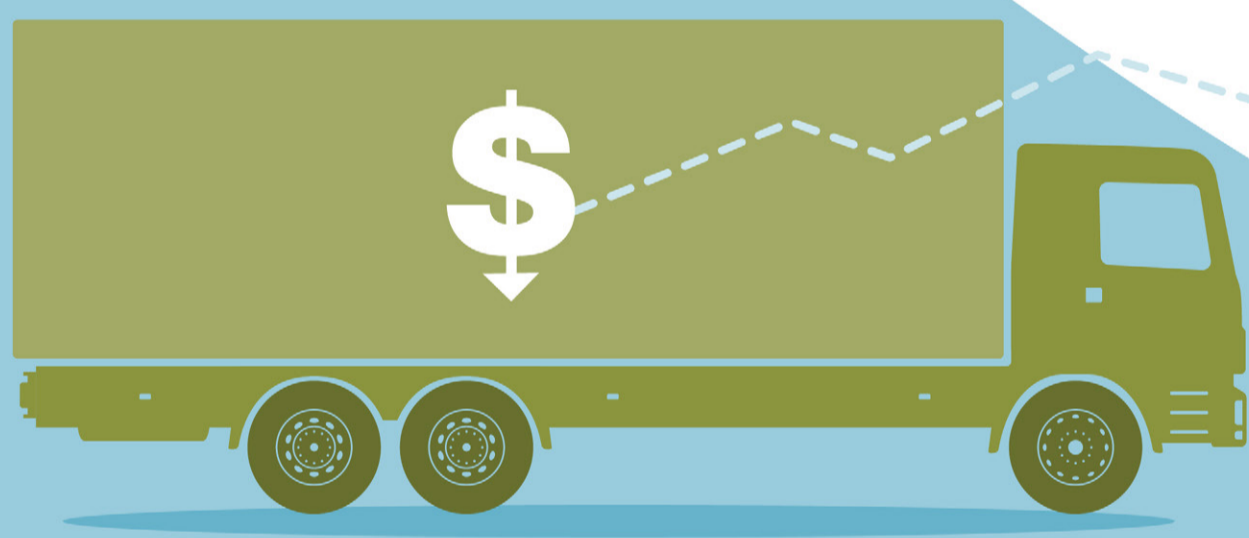
In most cases, yes, as NG engines have significantly lower fuel costs... Additionally, diesel engines require a complicated exhaust treatment system. The clean combustion of natural gas doesn't require diesel particulate filters, making maintenance simpler and less expensive



NG

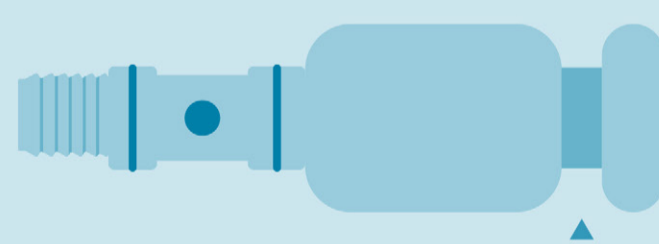


■ The average retail fuel price of NG has been lower than the average retail price of both gasoline and diesel for more than 20 years; NG prices are more stable than other fossil fuels



Do natural gas engines start better than diesel engines in cold weather?

No engine is completely immune to cold weather. Sometimes, NG engines lose battery power. Other times, the O-rings in the fueling receptacle can become frozen, preventing the fuel nozzle from coupling correctly



However, there are two cold weather difficulties diesel drivers face, which NG drivers never will:

1. NG does not turn to gel when it is cold like diesel does
2. The diesel exhaust fluid (DEF) largely consists of water and can easily freeze. NG burns cleanly, with minimal NO_x formation, meaning there is no need for heavy-duty DEF-consuming NO_x scrubbers

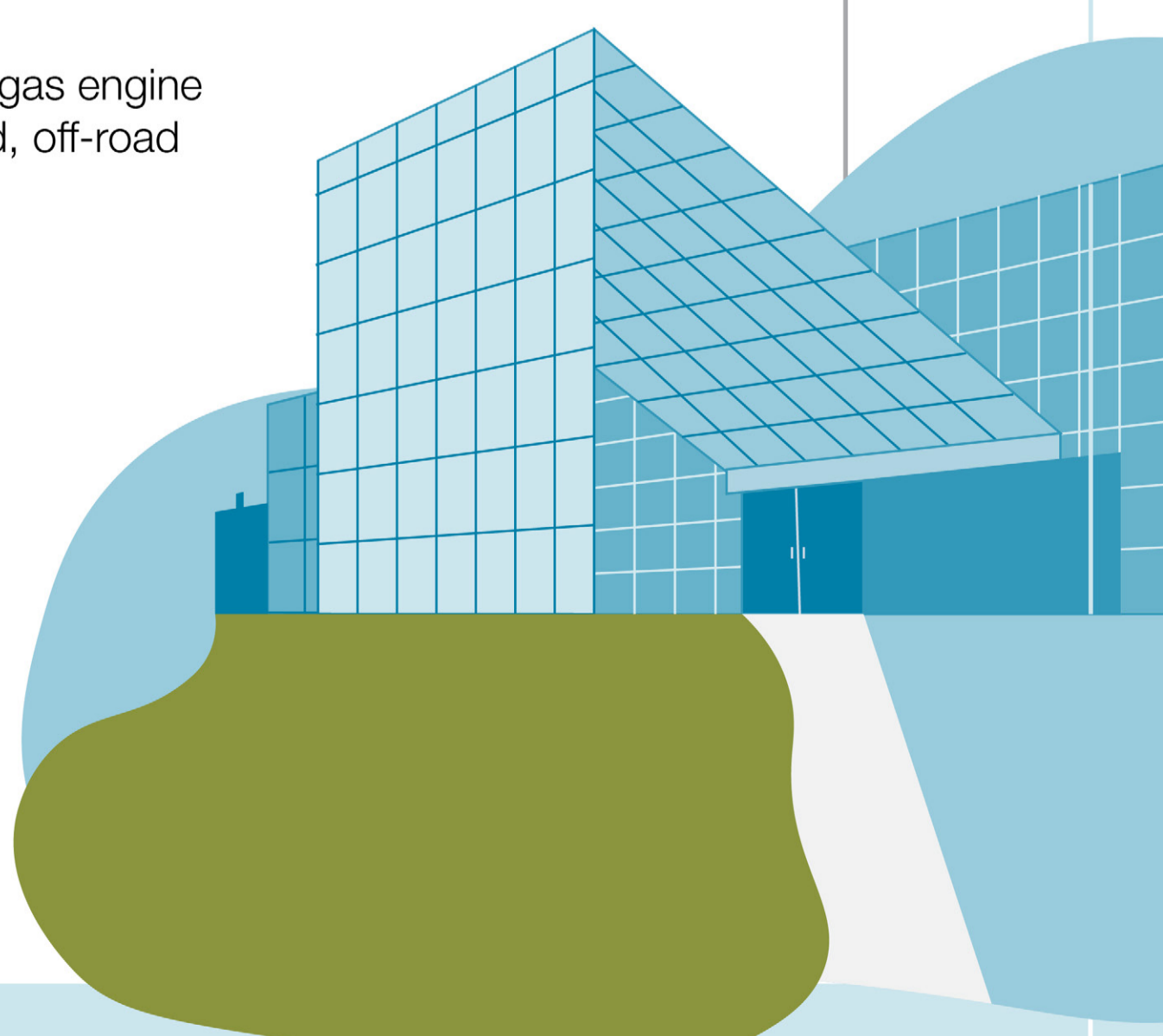
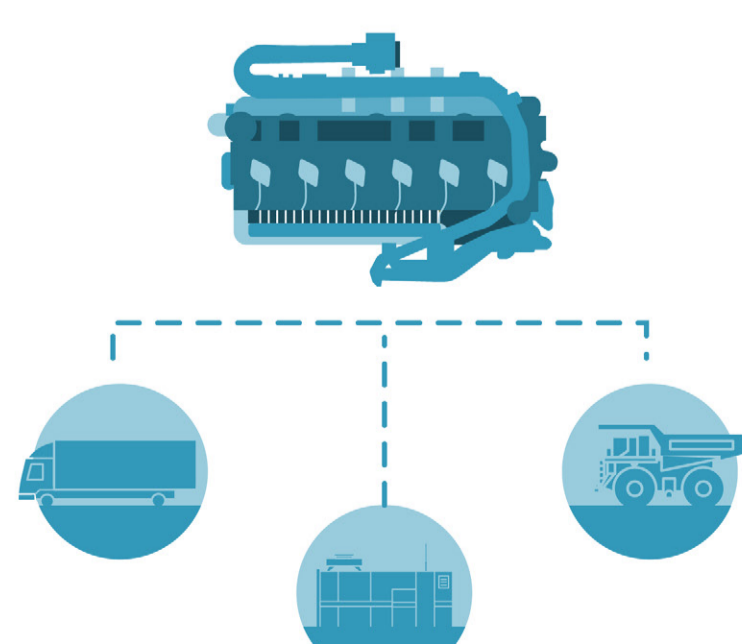


NO_x



Who makes natural gas engines?

Cummins Inc. has an extensive natural gas engine portfolio suitable for a variety of on-road, off-road and stationary applications



SCAN THIS QR CODE FOR MORE INFORMATION ON FREQUENTLY ASKED QUESTIONS ABOUT NATURAL GAS ENGINES

If this information is relevant to your needs, don't forget to check out our natural gas engines on <https://www.cummins.com/engines/natural-gas>