

What is RNG? and Why it is Good for Texas & Texans



Freedom CNG[®]
New power for the road ahead



The logo for Lone Star Clean Fuels Alliance, featuring a stylized map of Texas in blue and red, with a yellow sun rising behind the state. The text "LONE STAR CLEAN FUELS ALLIANCE" is written in bold blue letters, and "A DOE Clean Cities Coalition Serving Central Texas" is written in smaller black letters below.

LONE STAR
CLEAN FUELS ALLIANCE
A DOE Clean Cities Coalition Serving Central Texas

August 23rd 2023

Why is RNG Good?

- Helps hit our Clean Cities Goals.
- Health Benefit; Costs, Recycle and Reuse a good idea.
- Need to recycle, reuse; More People, More packages, More Trucks, More Waste
- What is RNG?
- Technology is Cost efficient to diesel and proven technology.
- Texas already has production of RNG and has so much opportunity.
- Close – questions?

Clean Cities Goals



U.S. DEPARTMENT OF
ENERGY



5 Goals:

Evaluate transportation needs and energy choices to determine the most impactful and cost-effective vehicle options, fuels, technologies, and best practices that make sense for specific stakeholder applications.

Shift to efficient and clean energy sources through the use of alternative and renewable fuels such as natural gas, propane, hydrogen, electricity, ethanol, and biodiesel – reduce Oil.

Improve fuel efficiency through state-of-the-art technologies and strategies.

Reduce greenhouse gas emissions through idle reduction and other fuel-saving technologies and practices.

Demonstrate and assess new mobility choices that maximize the return on investment for mobility systems in terms of time, cost, energy, and opportunity.

Reasons for RNG not making the grade.

In Texas we have 13
Counties with an “F.”

Not the List to be on

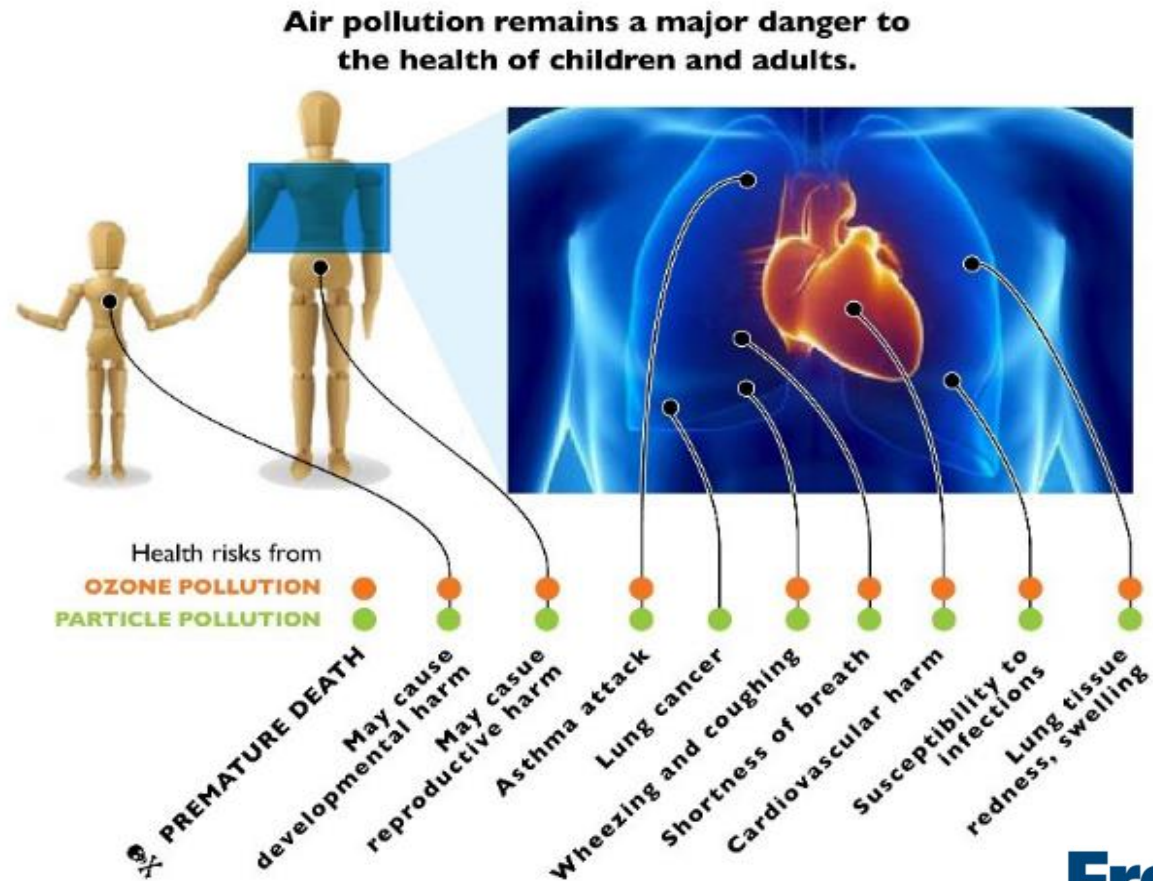
We need to do a lot Right
Now, RNG works!

	Grade	Weighted	Orange Days	Red Days	Purple Days
Bell	C	1.7	5	0	0
Bexar	F	8	24	0	0
Brazoria	F	7.8	19	3	0
Collin	F	6.8	16	3	0
Culberson	F	4.3	13	0	0
Dallas	F	7.2	20	1	0
Denton	F	13.8	37	3	0
El Paso	F	13.5	39	1	0
Ellis	B	0.3	1	0	0
Galveston	F	4	12	0	0
Gregg	B	0.3	1	0	0
Harris	F	23.2	51	11	1
Hidalgo	B	0.3	1	0	0
Hood	B	0.7	2	0	0
Jefferson	F	3.3	10	0	0
Johnson	F	5	15	0	0
Montgomery	F	4.8	13	1	0
Nueces	B	0.3	1	0	0
Orange	B	0.3	1	0	0
Parker	B	0.7	2	0	0
Randall	C	1.7	5	0	0
Rockwall	C	1	3	0	0
Smith	B	0.3	1	0	0
Tarrant	F	15	37	4	1
Travis	B	0.7	2	0	0

Reasons for RNG Health.

“Health Benefit” when we don’t fix it, we have increased health costs.

So what are ozone and particle pollution?



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Reasons for RNG population growth.

“Major City Population Growth”



Austin is now the 10th largest city in US. Austin and the surrounding suburbs growth together is over 3%. Georgetown leads the area with 14%

NET GAINS/LOSSES, MOST POPULOUS U.S. METROS

Rank	Metro	Population as of 7/1/22	Change, '21 - '22	
			#	%
1	New York	19,617,869	-156,517	-0.8
2	Los Angeles	12,872,322	-100,525	-0.8
3	Chicago	9,441,957	-77,581	-0.8
4	Dallas-Fort Worth	7,943,685	170,396	2.2
5	Houston	7,340,118	124,281	1.7
6	Washington	6,373,756	8,849	0.1
7	Philadelphia	6,241,164	-12,156	-0.2
8	Atlanta	6,222,106	78,968	1.3
9	Miami	6,139,340	29,967	0.5
10	Phoenix	5,015,678	72,841	1.5
11	Boston	4,900,550	-3,158	-0.1
12	Riverside	4,667,558	21,498	0.5
13	San Francisco	4,579,599	-37,011	-0.8
14	Detroit	4,345,761	-20,935	-0.5
15	Seattle	4,034,248	17,974	0.4
16	Minneapolis	3,693,729	2,742	0.1
17	Tampa	3,290,730	61,653	1.9
18	San Diego	3,276,208	1,254	0.0
19	Denver	2,985,871	8,038	0.3
20	Baltimore	2,835,672	-7,682	-0.3

Source: Partnership calculations based in U.S. Census Bureau data

Some Facts about trucking and shipping?

July 5, 1994 (29yrs.)

amazon



1.6 Million packages daily
608 Million annually

June 29, 2007 (16yrs.)

Apple iPhone



2.2 billion sold
1.5 Million in use
Ordering from phones

Some Facts about trucking and shipping?

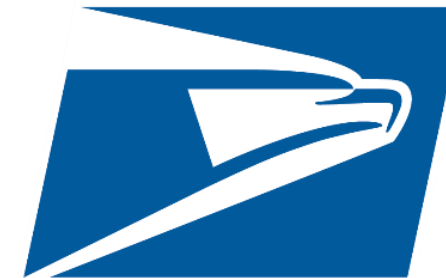
How many Packages does
UPS Deliver daily?

15.8 Million per day



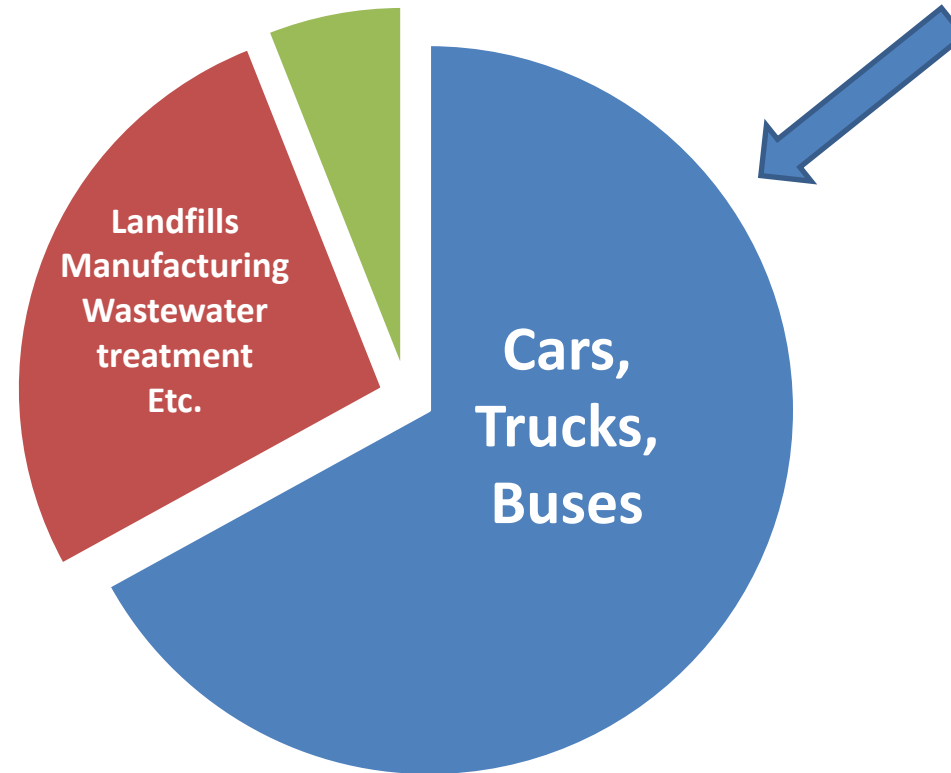
How many Envelopes/Packages
does USPS Deliver daily?

421 Million per day



**UNITED STATES
POSTAL SERVICE®**

What source do our emissions come from?



■ Mobile ■ Manufacturing ■ Heavy Duty & Stationary

Fastest way to achieve Air Quality goals – NOW

**Focus on 60-64% of the Smog!
Trucks and buses are 33%**

Focus: Heavy Duty Trucks, Waste & Transit

Fact:

Heavy Duty Trucks Class 7-8, Waste Trucks and Transit Buses cause the most smog, etc. Focus on Truck and bus population in Texas.



= 7% of vehicle population

= 10% of miles driven

= 27% of Road Transportation Fuel

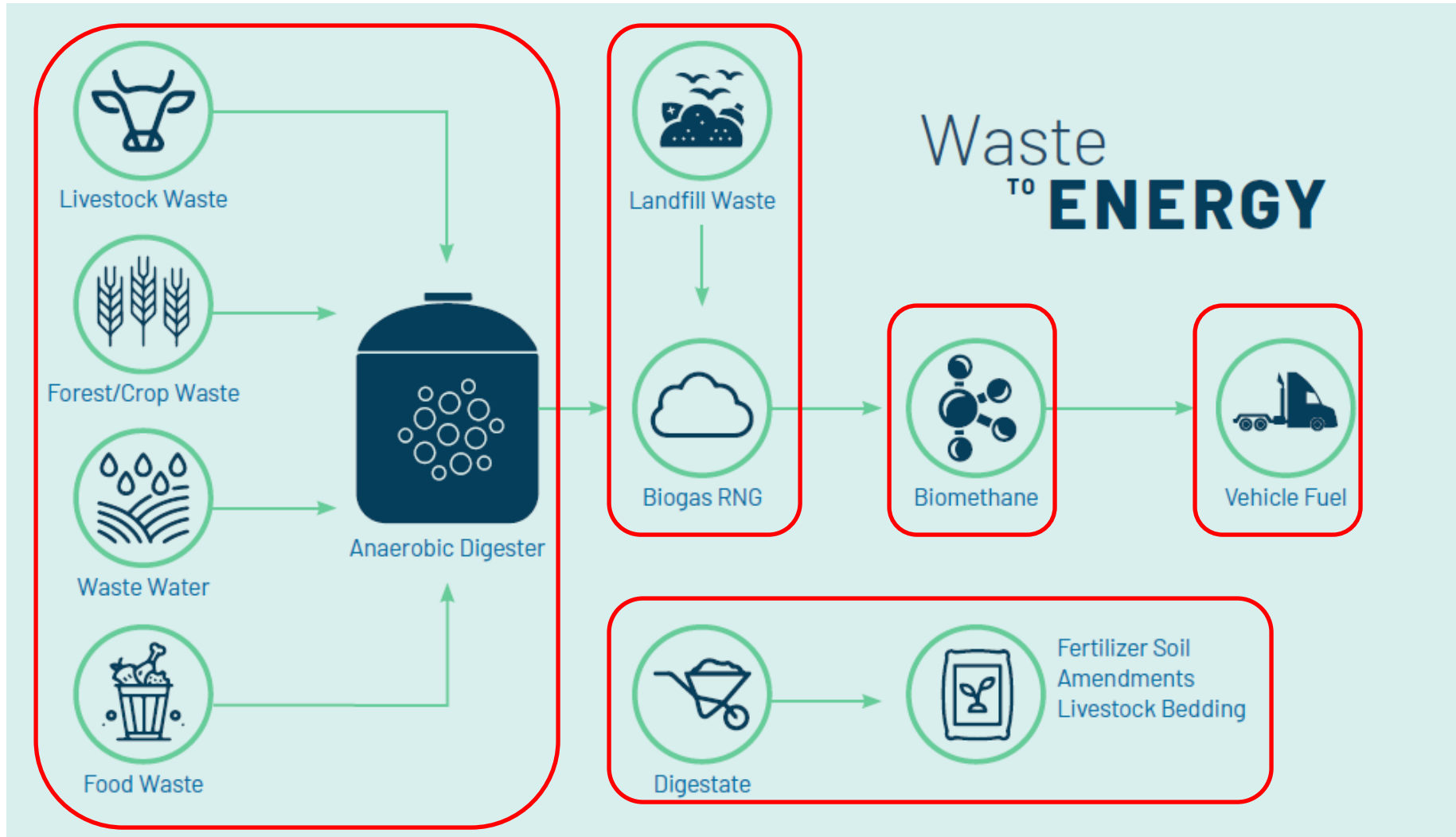
= 33+% of the emissions

What is RNG?

“Because Renewable Natural Gas is...”

- American, Local
- Sustainable, Clean
- Ensures Energy Independence.
- Safe.
- Supply is made by recycling waste.
- And RNG price is the same as CNG. \$1.00-\$2.00 less than Diesel across the US.

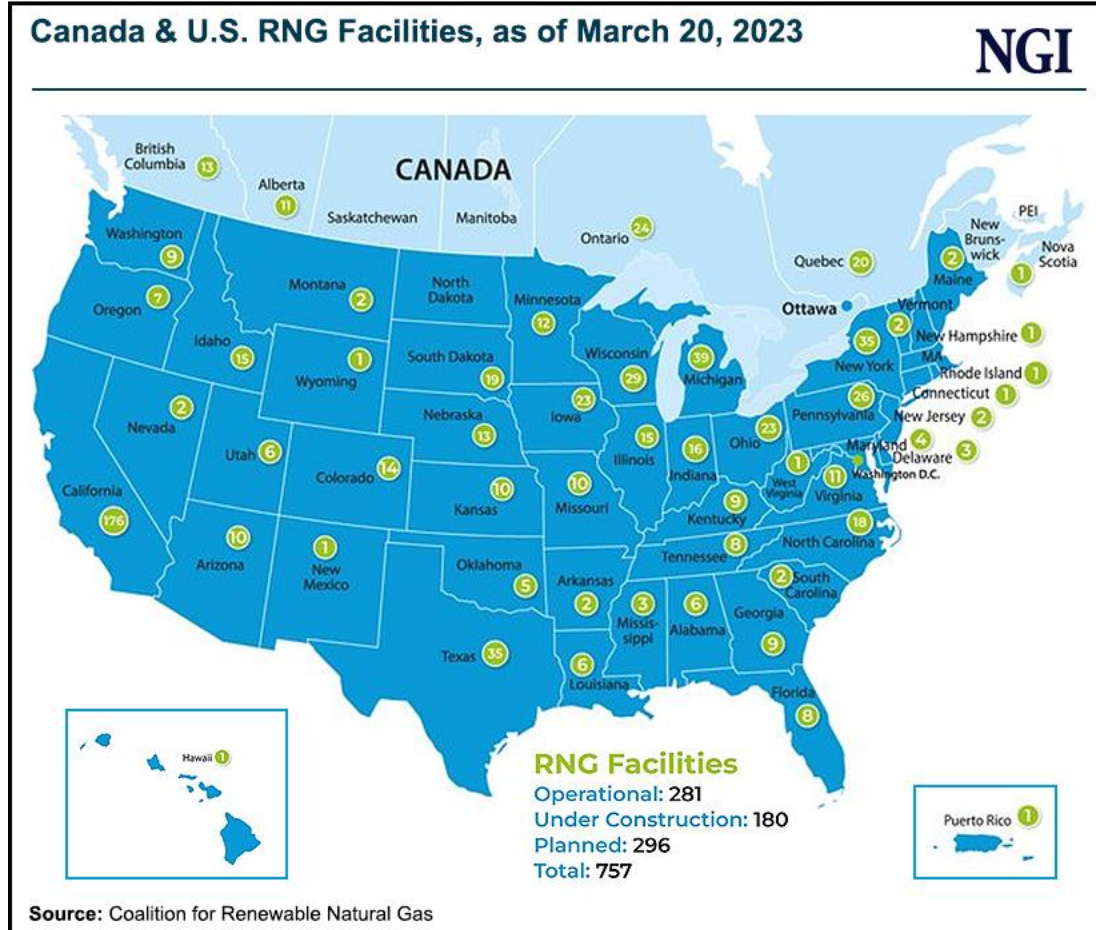
What is RNG?



RNG an excellent option



RNG an excellent option



Guess What - Texas Already has 35 RNG plants operating, with more coming. 300 plants operating in the US with 180 under construction coming on line.

RNG an excellent option



McCarty



Humble



Houston Ship Channel



Texas Waste for fuel; Collect, Recycle, Reuse and Refuel. RNG.



Galveston



Alvin



Ft. Bend



Angleton



RNG an excellent option

In Texas we put 38.23 Million tons of waste into 199 Landfills each year.

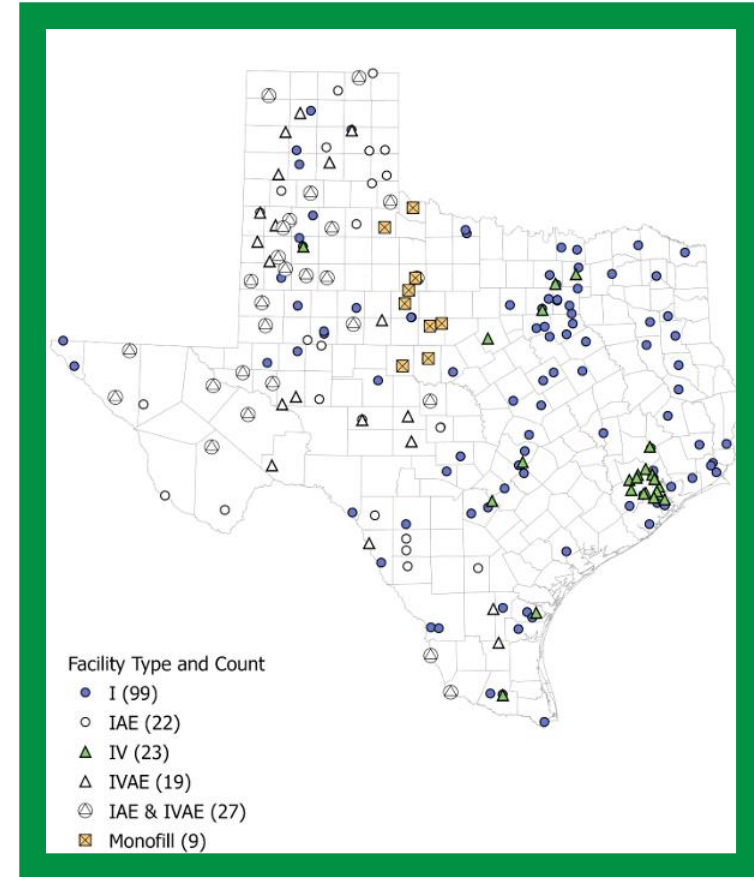
625,000 dairy cows in TX each generates 120 lbs. of waste per day
13.7B tons per year.

3M Hog, Pig, Swine in TX
3M tons per year

13M Cattle Cows, Calves in TX
23.7M tons of waste.

Add these 4 buckets up and we have 80M tons of waste methane to capture and reuse.

2583 waste water treatment plants in TX



RNG an excellent option

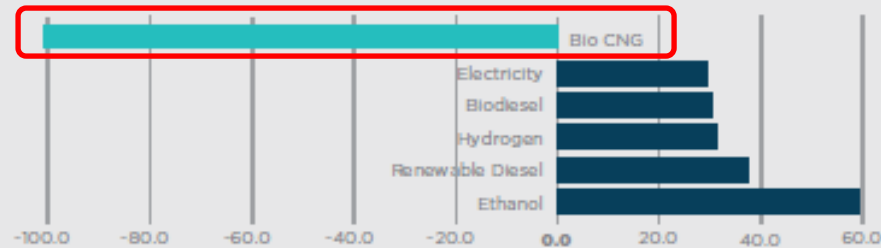
Achieving Carbon Negative Transportation **Today with RNG**



RNG: The Only Carbon-Negative Transportation Outcome Available

- Q3 2022 data confirms the energy weighted carbon intensity (CI) values of California's RNG vehicle fuel portfolio (bio-CNG) is below zero at **-111.7 gCO₂e/MJ**
- California fleets fueling with bio-CNG have achieved carbon negativity since 2020

CA LCFS Renewable Fuels Average CI Score



Note: bio-LNG not listed as it accounts for less than 2% of all RNG used in on-road vehicles. Data from CARB's LCFS Quarterly Data Summary dated 1/31/23.



-111.7 IS LESS THAN ZERO

Freedom CNG

New power for the road ahead

RNG an excellent option

✓ Ready-Right-Now

- Road-tested, proven, commercially-available, & scalable fleet technology
- Established refueling infrastructure of over 1,600 stations
- Mature network of manufacturers, servicers, & suppliers coast-to-coast
- Unmatched system resiliency & redundancy in times of storms & disasters

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

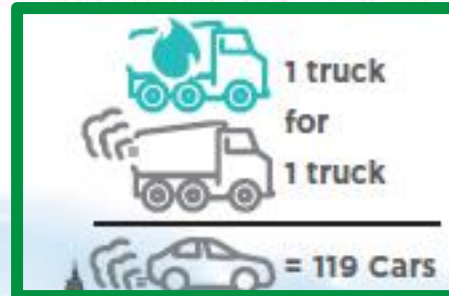
- **90% cleaner** than EPA's current NOx emissions requirement.
- **90% cleaner** than the cleanest diesel engine.
- **Surpasses** EPA's stricter Clean Trucks rule, effective Model Year 2027

✓ 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.



Freedom CNG

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RNG an affordable equipment option



Refuse Trucks



Achieve Carbon-Free Collection and Eliminate More Emissions Now with RNG





Refuse collection using ultra-low-NOx natural gas trucks fueled with renewable natural gas (RNG) reduces more criteria pollutant (NOx) and greenhouse gas (GHG) emissions than collection using a battery electric alternative:



CNG: The Most Cost-Effective and Immediate Solution



	 CNG Refuse Truck	 Battery Electric Refuse Truck
Total Cost	\$335,000	\$650,000*
Payload	10 tons, Comparable to Diesel	Up to 5 tons, 50% less than Diesel
Cost per ton of NOx reduced	\$24,842 LFG**	\$360,575
Cost per ton of GHGs reduced	\$33 LFG**	\$381

	 Renewable Natural GAS	 Battery Electric
 Criteria Pollutants	14,000 tons of NOx reduced	9,700 tons of NOx reduced
 Greenhouse Gases	10.6 million tons of GHG reduced	9.2 million tons of GHG reduced

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RNG an affordable equipment option



Transit Bus Costs

MB 40 foot Built	2017	2018	2019
CNG	\$530,909	\$538,394	\$551,055
Diesel	\$470,384	\$495,435	\$498,971
EB 40 foot	\$836,333	\$869,451	\$919,289
EB 41 foot	\$800,000		
EB 42 foot	\$789,000	\$836,100	\$794,500

Today
 → \$750,000
 → \$700,000
 → \$1,000,000

Hydrogen
 \$1,200,000

It's Proven Technology

Heavy Duty CNG Available today, any range, any configuration.

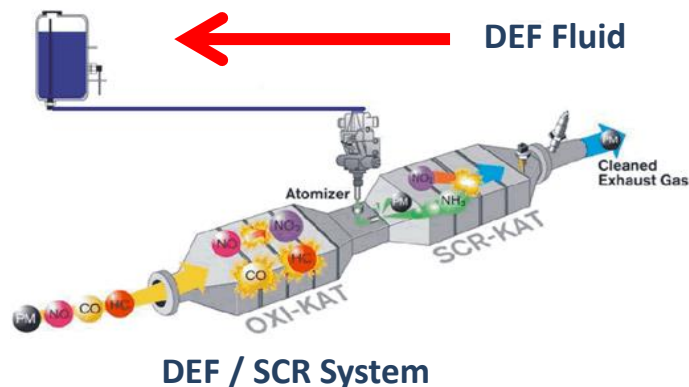


Don't need DEF, just a Band-Aid, short term

“There is no product named clean Diesel”

- **DEF Fluid cost** - 1 DEF gallon per 50 gallons of diesel fuel
 - 4-5 cents additional per diesel gallon
- **Filter replacement cost** - @ 160,000+ miles typically 28,000 - 30,000 gallons of diesel fuel used, depending on the driving style.
 - 8-16 cents additional per diesel gallon
- **Regeneration Time** – depending on driving style, regen needs to be performed at each 100 - 200 gallons of diesel.
 - 6-12 cents additional per diesel gallon

DEF / SCR adds **\$.20 - \$.35** cents additional per diesel gallon
so if diesel is **\$4.00** per gallon add **\$.25** to cover DEF/SCR costs
or in this example **\$4.00 + \$.25 = \$4.25**



**More sensors ,
more issues, more
maintenance**

RNG Strategic partners

All major enterprises are reducing GHG.



Sustainability in Action



Look Who is Producing RNG...



Shell
ENERGY

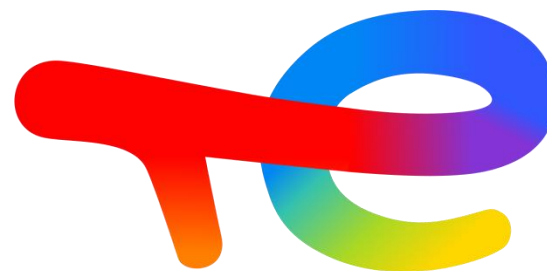


bp
NEXT *Renewable Fuels, Inc.*

Chevron



Renewable Energy Group



TotalEnergies

Freedom CNG

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RNG Works.

“Supports Sustainability Programs”



Drive Clean Across Texas



RNG is Cleaner...

Freedom CNG
New power for the road ahead

Thanks for your time today!

Freedom CNG



RNG a Pollution Solution NOW in Texas!

