DOCKETED	
Docket Number:	21-ALT-01
Project Title:	2021-2022 Investment Plan Update for the Clean Transportation Program
TN #:	239890
Document Title:	SoCalGas Comments - on the 2021-2023 Investment Plan Update for the Clean Transportation Program
Description:	N/A
Filer:	System
Organization:	Southern California Gas Company (SoCalGas)
Submitter Role:	Public
Submission Date:	9/30/2021 2:27:16 PM
Docketed Date:	9/30/2021

Comment Received From: Southern California Gas Company (SoCalGas)
Submitted On: 9/30/2021
Docket Number: 21-ALT-01

Comments on the 2021-2023 Investment Plan Update for the Clean Transportation Program

Additional submitted attachment is included below.

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September 30, 2021

The Honorable Patricia Monahan
Commissioner
California Energy Commission
Docket Unit, MS-4
Docket No. 21-ALT-01
715 P Street
Sacramento, CA 95814-5512

Subject: Comments on the 2021-2023 Investment Plan Update for the Clean Transportation Program

Dear Commissioner Monahan:

Southern California Gas Company (SoCalGas) appreciates the opportunity to comment on the 2021-2023 Investment Plan Update for the Clean Transportation Program. California has made progress decarbonizing the transportation sector in recent years; however, many incentive decisions made today rely on substantial GHG emission reductions occurring five to ten years in the future. It is important to have long-term strategies as well as strategies that emphasize technologies with the greatest GHG and criteria pollutant emission reductions in the near- to mid-term.

SoCalGas' comments thus strongly recommend that the CEC prioritize the most cost-effective technologies to decarbonize the transportation sector today as a glide path to zero-tailpipe emission technologies in the long term. The Clean Transportation Program has an obligation, as established by Section 44271(a)(2) of the Health and Safety Code, to "establish a competitive process for allocation of funds for projects…which considers…the benefit-cost score."[1] Furthermore, Section 44270.3(a) defines the benefit-cost score as "a project's expected or potential greenhouse gas emissions reduction per dollar awarded by the commission to the project from the Alternative and Renewable Fuel and Vehicle Technology Fund."[2] Finally, Section 44272 (d) further explains that "the commission …shall give additional preference to funding those projects with higher benefit-cost scores."[3]

[1] *See* Cal. Health and Safety Code section 44271(a)(2).
[2] *See* Cal. Health and Safety Code section 44270.3(a)
[3] *See* Cal. Health and Safety Code section 44272 (d)

As CEC Commissioner Monahan aptly stated during the opening remarks of the September 16, 2021, Advisory Committee Meeting, "[w]e want to make sure that we are appropriately balancing investments to support the state goals for zero-emission transportation…and that our plan advances equity and provides concrete benefits for low-income and disadvantaged communities."[4] Consistent with this sentiment, SoCalGas believes more funding should be directed to the heavy-duty (HD) vehicle sector, a sector in which clean transportation investments would significantly impact air pollution in environmental and social justice communities on a more immediate time scale. SoCalGas seeks to support and complement statewide efforts to decarbonize the transportation sector.

SoCalGas offers the following comments on the Clean Transportation Investment Plan: **(1)** The Investment Plan Update should recognize that heavy-duty trucks fueled with renewable natural gas (RNG) provide the most benefit-cost decarbonization, public health, and air quality goals by reducing SLCPs (short-lived climate pollutants), greenhouse gas (GHG), diesel, and nitrogen oxide (NOx) emissions; and **(2)** The Clean Transportation Investment Plan Update should continue to encourage incentives and innovative investment programs.

1. **The Investment Plan Update should recognize that heavy-duty trucks fueled with renewable natural gas (RNG) provide the most benefit-cost decarbonization, public health, and air quality goals by reducing SLCPs (short-lived climate pollutants), greenhouse gas (GHG), diesel, and nitrogen oxide (NOx) emissions.**

In a recent letter to environmental justice and advocacy groups, Wayne Nastri, Executive Director of the South Coast Air Quality Management District (SCAQMD), stated that actions to make progress toward climate goals and reduce air pollution "can and must go hand-in-hand."[5] The letter further stated that heavy-duty trucks fueled with RNG are commercially available today, can "provide substantial GHG emission reductions," and are "at least 90 percent cleaner than new diesel trucks on [the air pollutant nitrogen oxide] NOx and 100 percent cleaner on cancer-causing diesel particulate matter."[6] In addition, a peer-reviewed study recently published by the University of California, Riverside in the journal "Transportation Research Part D" reinforces this point by stating heavy-duty trucks fueled with RNG should be rapidly deployed in the 2020-2040 timeframe to achieve GHG and NOx emission reduction targets, and "accelerating [the diesel trucks] fleet turnover is a more important NOx control strategy than dividing up vehicle replacements…between near-zero-emissions and zero-emissions vehicles."[7]

Today, natural gas and RNG trucks meet or exceed CARB's optional low NOx standard of 0.02 grams of NOx per brake horsepower-hour (low NOx trucks). The Clean Truck rule does not require all diesel trucks to meet the standard of 0.02 grams of NOx per brake horsepower-hour until 2027

[4] *See* The California Energy Commission (Producer). (2021, September 16). 2nd Advisory Committee Meeting on the Clean Transportation Program Investment Plan [Zoom Video File], Available at: https://www.energy.ca.gov/event/meeting/2021-09/clean-transportation-program-investment-plan-advisory-committee-meeting

[5] Nastri, Wayne. "Letter to Partners in Environmental Justice and Environmental Health" August 3, 2021.

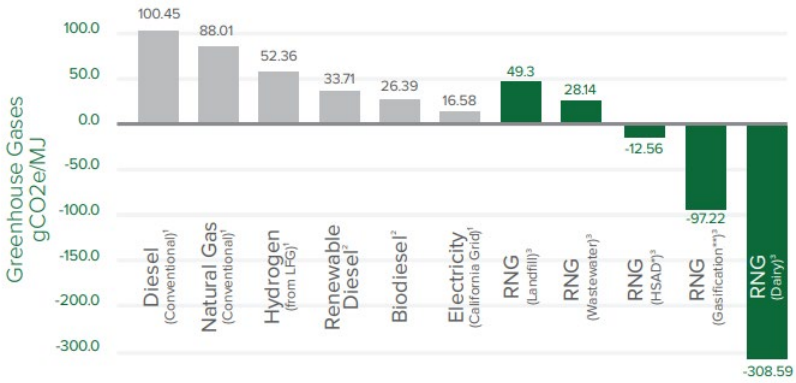
[6] *Ibid*.

[7] *See* Achieving NOx and Greenhouse gas emissions goals in California's Heavy-Duty transportation sector, Transportation Research Part D: Transport and Environment, Volume 97, 2021, August 2021, Available at: https://www.sciencedirect.com/science/article/pii/S1361920921001826.

– deferring emission reductions from what can be achieved today by RNG trucks.[8] Notably, the CEC's Natural Gas Research and Development Program funded the low NOx Cummins engine. Since April 2019, SoCalGas has supported the RNG market by dispensing 100 percent renewable natural gas at all utility-owned refueling stations. CARB Low Carbon Fuel Standard (LCFS) reporting showed that by year-end 2019, 98 percent of all the natural gas used in motor vehicles was RNG.

Furthermore, since September 2020, the RNG procured and dispensed at utility-owned refueling stations has a carbon intensity (CI) of -5.845 gCO_2e/MJ.[9, 10] This is compared to a CI of 82.92 gCO_2e/MJ for plug-in battery-electric trucks fueled by grid electricity today.[11] Comparing the carbon intensities of key clean transportation fuels by CARB demonstrates that RNG produced from three sources, high solid anaerobic digestion (HSAD), gasification, and dairy, have a lower CI than electricity, as shown in Figure 2 below.

Figure 2: Carbon Intensity of Key Transportation Fuels[12]



RNG can be produced from landfills, animal manure, and solid waste – it is derived from waste produced by modern activities; through these characteristics, RNG production can capture and allow the productive use of methane that would otherwise escape into the atmosphere.[13] RNG is currently helping California reduce SLCPs and criteria air pollutant emissions as a transportation fuel in near-zero-emission heavy-duty trucks. Forty-five percent of the methane emissions in

[8] *See* CARB Formally Adopts Low-NOx Omnibus Rule, Transport Topics, August 28, 2020, Available at: https://www.ttnews.com/articles/carb-formally-adopts-low-nox-omnibus-rule.
[9] *See* LCFS Pathway Certified Carbon Intensities, Available at: https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities.
[10] *See* California's renewable natural gas vehicles turn carbon negative in 2020, Reuters, Available at: https://www.reuters.com/business/autos-transportation/californias-renewable-natural-gas-vehicles-turn-carbon-negative-2020-2021-06-02/.
[11] *See* Low Carbon Fuel Standard Annual Updates to Lookup Table Pathways, CARB, p.2. Available at: https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/fuelpathways/comments/tier2/elec_update.pdf
[12] *See* California Air Resources Board Low Carbon Fuel Standard Program Q2 2020 Data, CARB, Available at: https://cngvp-7f8e.kxcdn.com/pdf/Understanding-Carbon-Intensity-Why-It-Is-Important.pdf.
[13] *See* American Geoscience Institute, What Is Renewable Natural Gas? Available at: https://www.americangeosciences.org/critical-issues/faq/what-renewable-natural-gas

California are fugitive emissions from landfills and dairy manure. [14] Currently, RNG use in the heavy-duty transportation sector **is achieving greater GHG emission reductions than electric vehicles** and is available to be deployed today. Last year, RNG used as a transportation fuel lowered GHG emissions equivalent to taking approximately 760,000 passenger vehicles off the road or reducing CO_2 emissions from approximately 394 million gallons of gasoline consumed.[15] Switching to Optional Low NO_x RNG HHD trucks is the most cost-effective and technologically feasible pathway to obtain appreciable GHG reductions over the next decade, starting today.

The following comparative analyses of a Class 8 HHD truck powered by Diesel, RNG, and electricity shows that a Class 8 Optional Low NO_X HHD RNG truck can generate more significant reductions in the lifecycle (well-to-wheel) GHG emissions than a battery-electric (BE) truck when replacing a diesel truck. Further, clean fuels like RNG would largely eliminate tailpipe CO_2 emissions since these fuels are plant/biogenically based.

Table 1 (below) shows that one Model Year (MY) 2024 Class 8 Optional Low NO_X RNG HHD truck can reduce lifecycle (well-to-wheel) GHG emissions by approximately 760 metric tons of carbon dioxide equivalent (MT CO_2e) over its ten-year lifetime as compared to its diesel counterpart, which is equivalent to taking almost 17 passenger vehicles off the road, annually.[16] These GHG reductions are more significant than those achieved by replacing the diesel truck with a BE truck.

[14] *See* CARB 2022 Scoping Plan Update – Short-Lived Climate Pollutants Workshop Presentation on September 8. Available at: https://ww2.arb.ca.gov/sites/default/files/2021-09/carb_presentation_sp_slcp_september2021_0.pdf.
[15] *See* Decarbonize Transportation with Renewable Natural Gas," RNG Coalition and NGV America, Available at: https://ngvamerica.org/wp-content/uploads/2021/04/Decarbonize-Transportation-with-RNG-Updated-April-16-2021.pdf.
[16] *See* Greenhouse Gas Equivalencies Calculator, US EPA, March 2021, Available at: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

Table 1. Class 8 HHD Trucks Well-to-Wheel GHG Emission Estimates for MY 2024

Greenhouse Gas	Units	Diesel Truck	Optional Low NO_x Natural Gas Truck	Battery Electric Truck
Tailpipe Emissions[17,18]				
CO_2 Emissions	MT/truck	614	0	0
CH_4 Emissions	MT/truck	0.00108	0.704	0
N_2O Emissions	MT/truck	0.0967	0.112	0
BC Emissions	MT/truck	0.00211	0.00026	0
Tailpipe CO_2e Emissions	MT/truck	645	51	0
Upstream Emissions				
Upstream CO_2e Emissions	MT/truck	225	54	175
Total CO_2e Emissions	**MT/truck**	**869**	**105**	**175**
Reduction of CO_2e Emissions Compared to Diesel	MT/truck	--	764	694
Percent Reduction of CO_2e Emissions Compared to Diesel	**-**	**--**	**87%**	**80%**

Please view footnotes to determine the basis for Table 1 Calculations.[19]

Further, Table 2 (below) shows that the total cost of ownership for an Optional Low NO_X RNG truck is approximately 50 percent lower ($480,000 versus $1,019,000) than a BE truck[20] needed to replace an MY 2024 diesel Class 8 HHD truck. Transitioning diesel Class 8 HHD trucks to Optional Low NO_X RNG trucks is more cost-effective in reducing GHG emissions than a transition to an equivalent number of BE trucks. An RNG pathway for HHD trucks is estimated to cost -$107/MT CO_2e compared to a battery-electric pathway estimated to cost $658/MT CO_2e. These cost numbers do not account for the additional dollars necessary to upgrade the electric grid to support a zero-emission vehicle transition in the transportation sector.

[17] *See* Direct Global Warming Potentials: CO_2, CH_4, and N_2O GWP values, IPCC, 2007, Available at: https://archive.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html.

[18] *See* California's Black Carbon Emission Inventory, CARB, 2015 Edition, Available at: https://ww3.arb.ca.gov/cc/inventory/slcp/doc/bc_inventory_tsd_20160411.pdf.

[19] The tailpipe emissions of CO_2, methane, and black carbon were obtained from EMFAC2021 for a T7 Tractor Class 8 in California for Calendar Years 2024-2033. Lifetime emissions were integrated over an assumed vehicle lifespan of 10 years and activity level of 43,500 miles per year, based on the US EPA's definition of HHDT useful life[19] and CARB's Low-NOx Omnibus Regulation.[19] Upstream emission factors were calculated using the CA-GREET3.0 model for diesel and electricity generation. The electricity grid mix inputs to the model were adjusted based on California Energy Commission data for the current year and projections, with renewables comprising 47 percent in 2023 and growing to 81 percent in 2037. RNG upstream carbon intensities were obtained from the LCFS program pathway lookup tables for the following RNG feedstocks: landfill gas, food wastes, and animal waste/dairy digester gas. A weighted average of the carbon intensities is calculated based on the LCFS sales volumes in 2019-2020 before being used in these calculations.

[20] *See* Developing Markets for Zero Emission Vehicles in Short Haul Goods Movement: A Research Report from the National Center for Sustainable Transportation, 2020, Available at: https://escholarship.org/uc/item/0nw4q530. Note 1.4 BE trucks are needed to replace a diesel truck in calendar year 2024.

Table 2. Lifetime Ownership Costs and Incremental Cost-Effectiveness

Description	Units	Diesel Truck	Optional Low NO_x Natural Gas Truck	Battery-Electric Truck
Total Cost of Ownership for Single Truck[21]	$	$562,149	$480,576	$823,411
Additional Capital Cost for Battery Electric Truck[22]	$	--	--	$195,779
Total Cost of Ownership	$	$562,149	$480,576	$1,019,190
Incremental Cost of Ownership	$	--	-$81,573	$457,041
	%	--	-15%	81%
Reduction in Lifecycle GHG Emissions Compared to Diesel	MT CO_2e	--	764	694
Reduction in Tailpipe NO_x Emissions Compared to Diesel	tons	--	0.97	1.18
Cost Effectiveness for GHG Reductions	**$/MT CO_2e**	**--**	**-$107**	**$658**
Cost Effectiveness for Tailpipe NO_x Reductions	**$/ton**	**--**	**-$83,935**	**$387,983**

Table 3 (below) shows that Optional Low NO_X RNG trucks can achieve nearly the same reductions in tailpipe NO_X emissions as a BE truck when replacing a Class 8 HHD truck.

Table 3. Class 8 HHD Trucks NOx Emission Estimates for MY2024

	Units	Diesel Truck	Optional Low NO_x Natural Gas Truck	Battery Electric Truck
Tailpipe NOx Emissions[23]	tons	1.18	0.21	0
Incremental Reduction of NO_x Emissions Compared to Diesel	tons	--	0.97	1.18
Percent Reduction of NO_x Emissions Compared to Diesel	-	--	83%	100%

Table 4 (below) considers investing a billion dollars in either Optional Low NO_X RNG trucks or BE trucks and then calculates the emissions reductions compared to an equivalent number of diesel trucks, respectively. Because a BE truck cannot haul the same amount as a diesel truck (weight

[21] *See* Ramboll Multi-Technology Pathways Study, WSPA, Available at https://www.wspa.org/resource/ramboll-multi-technology-pathways-study/.
Note total costs of ownership for a single truck are taken from the study.

[22] Additional capital costs for Battery Electric Truck occur due to anticipated growth in the fleet when BEVs are used to replace conventional diesel trucks, per Giuliano et al. (2020). A factor 1.4 is applied to the BEV capital costs to reflect added costs due to fleet growth.

[23] Tailpipe emissions are obtained from EMFAC2021 for a T7 Tractor Class 8 in California for Calendar Years 2024 2033. Lifetime emissions are integrated over an assumed vehicle lifespan of 10 years and activity level of 43,500 miles per year, based on the US EPA's definition of HHDT useful life, and CARB Low-NOx Omnibus Regulation, Available at: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-86/subpart-A/section-86.004-2, and at: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hdomnibuslownox/res20-23.pdf.

and range limitations), the calculations in Table 4 (below) assume that a single BE truck replaces only approximately 0.7 diesel trucks. In addition, as previously noted, the capital costs of BE trucks are greater than diesel trucks. Thus, a $1B investment in BE trucks will result in avoided diesel emissions from approximately 1,500 diesel trucks; approximately 2,000 BEVs would need to be purchased to replace 1,500 diesel trucks, in contrast to Optional low NOx RNG trucks that can replace diesel trucks on a one-to-one basis. An investment of a billion dollars in Optional low NO_X RNG trucks in 2024 would deliver about **three** times more black carbon reductions (a health harmful carcinogen), almost **three** times more lifecycle GHG reductions, and almost **three** times more tailpipe NO_X reductions (needed to meet the Federal Clean Air Act Requirements) as compared to BE trucks. This still does not account for the cost and implementation time of expanded electricity generation, transmission, and distribution infrastructure. Even greater reductions can be achieved if the investment is made for incremental vehicle costs only.

Table 4. Potential Emission Reductions in Investing $1 Billion in MY2024 Class 8 HHD Trucks

Truck Technology		**Optional Low NO_x RNG Truck**	**Battery Electric Truck**
Capital Cost for Single Truck[24]	**$/truck**	**$192,719**	**$489,448**
Number of Trucks Purchased	--	5,188 (replaces 5,188 diesel trucks)	2,043 (replaces about 1,500 diesel trucks)
Reduction of BC Tailpipe Emissions Compared to Diesel[25,26]	MT	9.61	3.08
Reduction of Lifecycle GHG Emissions Compared to Diesel	MT CO_2e	3,963,507	1,419,337
Reduction of NO_x Emissions Compared to Diesel	tons	5,042	1,719

[24] *See* Ramboll Multi-Technology Pathways Study, WSPA, July 2, 2021, Available at: https://www.wspa.org/resource/ramboll-multi-technology-pathways-study/. Note the total capital cost for a single truck is taken from this study.
[25] GHG emissions here include those contributed by black carbon. Values for black carbon and GHG reductions per truck are referenced from Table 1.
[26] *See* California's Black Carbon Emission Inventory, CARB, 2015 Edition, Available at: https://ww3.arb.ca.gov/cc/inventory/slcp/doc/bc_inventory_tsd_20160411.pdf.

2. The Investment Plan Update should continue to encourage incentives and innovative investment programs.

First, we encourage the Clean Transportation Program (CTP) to continue to support innovative investment strategies. A peer-reviewed study recently published by the University of California, Riverside, in the Journal "Transportation Research Part D" suggested that "current incentive programs need to be re-evaluated to ensure NZE (net-zero emission) technologies are being encouraged and not delayed."[27] Further, the study recommends "replacement of as many higher emitting diesel engines as soon as possible with 0.02g/bhp-hr. engines and ZE engines/vehicles at the earliest feasible date should be of the highest priority."[28]

The Legislature envisioned support of these kinds of technologies in the Clean Transportation Program. The California Health and Safety Code states "programs and projects that accelerate the commercialization of vehicles and alternative and renewable fuels including buy-down programs through near-market and market-path deployments…."[29] One recommendation that follows the pathway of section 44272 (e) (7) is a fuel card program. Such a program could help offset the upfront costs of owning and operating an NG/RNG HD truck to complement existing incentive programs that CARB and the air quality management districts manage. This is similar to how Toyota offers free fuel to customers who purchase a Mirai to help incentivize purchases of new hydrogen fuel cell electric light-duty vehicles. Customers who purchase a new HD class 8 natural gas NZE truck or hydrogen fuel cell electric truck can be provided with a fuel card pre-loaded with a balance at an amount designed to improve economics and encourage adoption. For example, for an HD Class, 8 NZE truck with a $60,000 incremental cost (compared to Diesel) and traveling 72,000 miles per year, a fuel card of $10,000 could improve the payback period from about 4.4 years to 2.5 years.[30, 31] This is akin to the Natural Gas Vehicle Incentive Program funded out of the Clean Transportation Program, which provided incentives up to $25,000 per vehicle purchased.[32] The difference here would be encouraging the natural gas trucks to utilize RNG to reduce their GHG emissions greatly. Such a program can also lay the foundation for offsetting the cost of owning a fuel cell heavy-duty truck as that technology is commercialized and feasible. The SCAQMD and the San Joaquin Valley Air Pollution Control District (SJVAPCD) have indicated general support for a fuel card program. Such programs have the potential to help further public health and clean air goals, especially in disadvantaged communities located near major trucking corridors.

[27] *See* Achieving NOx and Greenhouse gas emissions goals in California's Heavy-Duty transportation sector, Transportation Research Part D: Transport and Environment, Volume 97, 2021, August 2021, Available at: https://www.sciencedirect.com/science/article/pii/S1361920921001826.
[28] *Ibid*.
[29] *See* Cal. Health & Safety Code section 44272(e)(7).
[30] *See* Advanced Clean Fleets – Cost Workshop Cost Data and Methodology Discussion Draft, CARB, p. 3, Available at: https://ww2.arb.ca.gov/sites/default/files/2020-12/201207costdisc_ADA.pdf
[31] *See* Average Annual Vehicle Miles Traveled by Major Vehicle Category, Available at: https://afdc.energy.gov/data/10309.
[32] *See* The Natural Gas Vehicle Incentive Program, Available at: https://afdc.energy.gov/laws/11647

In closing, we appreciate the opportunity to comment in support of CEC's continued efforts to advance clean transportation goals across the State. Advancing statewide decarbonization goals by deploying technologies that are available today, like low NOx heavy-duty trucks fueled by RNG, is critical. We recommend that incentives and innovative investment programs continue to be encouraged within the investment plan update. SoCalGas offers these comments in the spirit of collaboration. We look forward to working with CEC Commissioners and Staff to determine funding allocations that positively benefit the State by the greatest magnitude.

Respectfully,

Matt Gregori
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