



**CALIFORNIA
ENERGY COMMISSION**



**CALIFORNIA
NATURAL
RESOURCES
AGENCY**

Clean Transportation Program

FINAL PROJECT REPORT

Lake Elsinore Unified School District Compressed Natural Gas Fueling Facility Expansion

Prepared for: California Energy Commission

Prepared by: Lake Elsinore Unified School District

MARCH 2024 | CEC-600-2024-020

California Energy Commission

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PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program. The statute authorizes the California Energy Commission (CEC) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC allocate up to \$20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of about \$100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and nonroad vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued GFO-17-607 to replace the state's oldest, dirtiest school buses and install supporting infrastructure. In response to GFO-17-607, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards on November 29, 2018, and the agreement was executed as ARV-18-012 on March 13, 2019.

ABSTRACT

Using previously published data on fuel and greenhouse gas reduction, internal billing documentation and input from design engineers and bus vendors, this paper examines the Lake Elsinore Unified School District Compressed Natural Gas infrastructure expansion project and benefits of converting from diesel powered school buses to compressed natural gas school buses.

Keywords: Compressed Natural Gas, Lake Elsinore Unified School District, greenhouse gas, diesel, school buses.

Please use the following citation for this report:

Gray, Myron. 2022. *Lake Elsinore Unified School District Compressed Natural Gas Fueling Facility Expansion*. California Energy Commission. Publication Number: CEC-600-2024-020

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EXECUTIVE SUMMARY

Since 2005, Lake Elsinore Unified School District has gradually been converting its school bus fleet from diesel powered school buses to Compressed Natural Gas school buses. To continue its expansion and to update its Compressed Natural Gas technology, Lake Elsinore Unified School District partnered with Tomco Compressed Natural Gas, Inc. to design and install a new compressor and expand the capacity for the Compressed Natural Gas operation.

In tandem with the project, Lake Elsinore Unified School District applied for and was awarded grants through the California Energy Commission for six Type D Compressed Natural Gas school buses in 2019. Seven additional Type D Compressed Natural Gas school buses from the South Coast Air Quality Management District have also been ordered and are scheduled to be delivered in July 2022. These school buses are being used to replace older diesel buses , reducing the cost per mile for the overall fleet.

Compressed Natural Gas fuel costs compared to diesel are still cheaper; however, added fees associated with using Compressed Natural Gas have increased over the years, no longer making overall fuel costs cheaper for Compressed Natural Gas than using diesel. The benefit, however, is the contribution and commitment by Lake Elsinore Unified School District to help clean the environment.

Updating the infrastructure and adding newer Compressed Natural Gas buses to Lake Elsinore Unified School District's fleet will help the district continue to reduce greenhouse gases and other particulates in the air, and allow for a safer and less toxic ride for the students the district serves.

CHAPTER 1: Lake Elsinore Fueling Expansion

History and Overview

The Lake Elsinore Unified School District (LEUSD) is one of oldest public-school systems in Southern California. Covering more than 140 square miles in Southwest Riverside County, the district serves the cities of Lake Elsinore, Canyon Lake and Wildomar and several unincorporated communities, including Lakeland Village and Horsethief Canyon.

With a significantly aging diesel school bus fleet, the district has been transitioning to Compressed Natural Gas (CNG)-fueled buses through its school bus replacement program since 2005. In 2019, six CNG Type D buses were ordered replacing six older diesel buses. The buses were delivered on March 3, 2020. However, due to COVID-19, buses were not officially put into service until April 2021 when in-school instruction started up again. In December 2021, an additional seven Type D CNG buses were awarded by South Coast Air Quality Management District’s Lower Emission School Bus Program to LEUSD and are scheduled to arrive in late summer of 2022. These 13 buses will service approximately 600 students who attend LEUSD schools and programs. In order to continue the district’s ongoing bus replacement program, expansion of the CNG infrastructure was necessary.

LEUSD was awarded a \$1,490,000 grant through the Clean Transportation Program in the Spring of 2019. Tomco CNG Inc. was awarded the contract to install the district’s new ANGI Model NG 300 E 125 horsepower compressor at a total cost to LEUSD of \$448,023, replacing the older model currently in place. A brief summary of the compressor specifications is shown in Table 1.

Table 1: Lake Elsinore Unified School District CNG Compressor Specifications

Fuel Type	Inlet	Outlet	Maximum Capacity	Brake Horsepower	Number of Stages
Compressed Natural Gas	42 Pounds per Square Inch Gauge	3600-4200 Pounds per Square Inch Gauge	270 Standard Cubic Feet per Meter or 2.14 Gallon Gas Equivalent per Minute	50	4

Source: California Energy Commission staff

Construction was completed for the upgrade in February of 2021, and the system was operational on April 13, 2021, after the inspection and sign-off by the Riverside County Fire Marshall. Drivers began using the new system to fuel in May 2021. California Energy Commission (CEC) infrastructure funding provided several temporary positions for the duration of the construction of fueling infrastructure.

Figure 1: Lake Elsinore Unified School District CNG Compressor



Source: Lake Elsinore Unified School District

Benefits Outlook

By converting to CNG-powered buses, LEUSD is expected to reduce the particulate matter in the air by 40 to 86 percent compared to diesel buses.¹ The Los Angeles Unified School District is the second largest school district in the nation and is 70 miles north of Lake Elsinore. At the height of their conversion from diesel to compressed natural gas, they estimated that the amount of greenhouse gas emissions by its 475 CNG bus fleet was reduced by 2,595 metric tons of Green House Gas emissions from 2007 to 2013.² Using a similar time frame and bus for bus comparison, Lake Elsinore estimates that for the six new buses acquired from CEC, greenhouse gas emissions will be reduced by approximately 104 tons of GHG reduction along with a 187 pounds of particulate matter 2.5 and 7,300 pounds of Nitrogen Oxide reduction over the twenty-year estimated useful life of the buses.³

1 [Utah Alternative Fuels and the Impact of COVID-19](https://utahcleancities.org/utah). Utah Clean Cities, available at <https://utahcleancities.org/utah>

2 [Los Angeles Unified School District: So-Cal Gas](https://www.socalgas.com/for-your-business/natural-gas-vehicles/LAUSD). SoCalGas, A Sempra Energy Utility. (2013, May). Retrieved January 12, 2022, available at <https://www.socalgas.com/for-your-business/natural-gas-vehicles/LAUSD>

3 [Clean Energy Calculator](https://www.cleanenergyfuels.com/calculator), available at <https://www.cleanenergyfuels.com/calculator>

Bus Life, Fuel Efficiency and Costs

The duty cycle of Lake Elsinore’s current fleet is 20 years, the same as the new buses coming online by July 2022. New CNG buses were not used to transport students until April 2021 when COVID-19 restrictions were lifted, and in-class learning was reinstated. Since then, LEUSD’s new buses have been driven 39,822 miles.

During the six-month period from June 2021 to November 2021, LEUSD used approximately 47,300 diesel gallons equivalent at a total cost of \$51,000, averaging \$8,500 per month in fueling costs for each of the 6 CNG buses.

During the past year, fuel prices have increased considerably. The average fuel cost currently is about \$3.75 per gallon for diesel. In comparison, the diesel gallon equivalent cost of CNG fuel is \$1.98, or \$1.77 less than a comparable gallon of fuel. However, despite the lower diesel gallon equivalent cost for CNG over diesel fuel, the overall cost of CNG fuel is higher than diesel due to a commodity charge incurred for CNG use.

Figure 2: Lake Elsinore Unified School District CNG School Bus



Source: Lake Elsinore Unified School District

Conclusion

LEUSD’s completion of the CNG infrastructure expansion has allowed the district to maximize its capacity for their CNG fleet with the newest and most current technology. The district will continue to replace older, less fuel-efficient buses for cleaner ones that will reduce greenhouse

gases and will produce a much lower percentage of other pollutants compared to diesel counterparts.

The district is in the planning phase to bring electric vehicles into its fleet of vans and other district owned vehicles. With additional funding for CNG and electric buses on the horizon, Lake Elsinore will continue to lower its carbon footprint by taking advantage of new funding opportunities and seek alternative fuel options for its school bus and white fleet operation. The new CNG buses that were funded by the CEC's School Bus Replacement Program are helping schools throughout the state reduce school children's exposure to harmful emissions and are helping the state reach its climate and air quality goals.

GLOSSARY

CALIFORNIA ENERGY COMMISSION (CEC)—The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's five major areas of responsibilities are:

1. Forecasting future statewide energy needs
2. Licensing power plants sufficient to meet those needs
3. Promoting energy conservation and efficiency measures
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels
5. Planning for and directing state response to energy emergencies.

COMPRESSED NATURAL GAS (CNG)—Natural gas that has been compressed under high pressure, typically between 2,000 and 3,600 pounds per square inch, held in a container. The gas expands when released for use as a fuel.

LAKE ELSINORE UNIFIED SCHOOL DISTRICT (LEUSD)—Lake Elsinore Unified School District is a public school district located in Lake Elsinore, California. It was formed on July 1, 1989, when the Elsinore Union High School District merged with the Lake Elsinore School District

