



**CALIFORNIA
ENERGY COMMISSION**



**CALIFORNIA
NATURAL
RESOURCES
AGENCY**

Clean Transportation Program

FINAL PROJECT REPORT

North Monterey County Unified School District Compressed Natural Gas School Buses and Infrastructure

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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 that was proposed for funding in the CEC's notice of proposed awards on November 29, 2018, and the agreement was executed as ARV-18-013 on May 5, 2019.

ABSTRACT

North Monterey County Unified School District applied for school bus grant funding through GFO-17-607. North Monterey County Unified School District was awarded funding for the purchase of two compressed natural gas buses and the construction of an on-site compressed natural gas fueling station. North Monterey County Unified School District placed a purchase order for their two compressed natural gas buses and placed them into service on March 10, 2021. North Monterey County Unified School District constructed a new compressed natural gas refueling station and was completed on September 25, 2020.

Keywords: Compressed Natural Gas, North Monterey County Unified School District, school buses.

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EXECUTIVE SUMMARY

North Monterey County Unified School District partnered with ENGIE Services U.S., the company contracted to provide solar services, to apply for GFO-17-607 grant funding provided by the California Energy Commission. North Monterey County Unified School District was awarded funding for two new compressed natural gas buses and fueling infrastructure. These school buses are being used to replace older diesel buses.

The first stage focused on construction of a new natural gas fueling infrastructure at North Monterey County Unified School District transportation yard. The project was intended to add a new compressed natural gas fueling system at the transportation yard located at 17590 Pesante Road, Salinas, CA 93907. The construction was completed, and the station was placed into service on September 25, 2020.

The second stage focused on procurement of the two compressed natural gas buses. North Monterey County Unified School District placed a purchase order with Buswest LLC for the purchase of two Thomasbuilt C2 compressed natural gas buses. The buses were delivered and placed into service on March 10, 2021.

The third stage required North Monterey County Unified School District to scrap the old diesel school buses within 12 months from the delivery of the new compressed natural gas school buses. This disposal is to ensure that the old diesel school buses do not continue to produce emissions. The buses were scrapped on January 17, 2022.

CHAPTER 1:

Introduction

History and Overview

North Monterey County Unified School District (NMCUSD) is located on California's Central Coast and serves approximately 4,600 students and families in the communities of Castroville, Elkhorn, Moss Landing, Prunedale, Royal Oaks, and portions of Salinas. We provide educational programs and services for infants to adults that include early learning programs, four elementary schools, one middle school, one high school, and educational options that include a continuation high school and center for independent studies, homeschooling and distance learning. Additionally, the district offers Career Technical Education pathways for our students and Adult Education programs for our community members and parents.

CHAPTER 2: Project Overview

NMCUSD was awarded an \$830,000 grant from the Clean Transportation Program in May 2019. This grant funding was awarded for the purchase of two Compressed Natural Gas (CNG) school buses as well as for the construction of a new on-site CNG refueling station. The two CNG buses cost a total of \$330,000. The construction of a new CNG fueling system at our existing transportation yard cost \$500,000. The infrastructure construction included electrically driven CNG compressors and a dual-hose, time-fill fueling post to be used as a private CNG-fueling system to service the refueling needs of NMCUSD’s CNG-powered vehicles operating in and around the local area.

In January 2020, the District ordered two CNG Type D buses to replace two older diesel-fueled buses. The buses were delivered in December of that year, when the school district had limited bus service due to COVID-19 restrictions. The buses were officially put into daily, full-service use at the start of the following school year in August 2021. These two buses serve approximately 265 students who attend NMCUSD schools and programs.

Figure 1: North Monterey County Unified School District’s CNG School Buses



Source: North Monterey County Unified School District

The compressed natural gas fueling station was installed as part of a larger construction project so that the underground infrastructure necessary for both projects could be installed at the same time. This was done in an effort to minimize impact to the daily operations of the transportation department as well as reduce overall costs for both projects. A location was identified at the transportation site that allowed for future expansion of the CNG fueling station system. The station currently services two buses but has the capacity to include an additional six CNG buses. In order to feed the fueling station with enough volume of natural gas, the pressure needed to be increased at the point of entry to the site. Due to the increased pressure to the natural gas system, the system needed to be split so that existing

gas fixtures were not affected. The splitting of the system meant that an entire new gas line was required to run from the point of entry to the CNG fueling station. Once the natural gas infrastructure was complete, the concrete foundation (pad) was constructed and the fueling station was set. The installation was a seamless installation and was completed in less than two weeks. As the project wrapped up the CNG fueling station was commissioned and has been in operation ever since.

Figure 2: North Monterey County Unified School District's CNG Compressor



Source: North Monterey County Unified School District

CHAPTER 3:

Data Collection

Bus Life, Fuel Efficiency and Costs

The duty cycle of the new CNG buses is 20 years, at least as long as the duty cycle for the district's current diesel fleet, which is 15-20 years. Due to distance-learning and COVID-19 restrictions, the two new CNG buses were not used to transport students until the 2021-2022 school year, which began in August 2021. Since then, the buses have been driven 29,858 miles.

Over a twelve-month period, the two CNG buses traveled a total of 29,858 miles. The two replaced diesel buses had a miles per gallon average of five miles. This equates to a reduction in diesel usage of 5,971 gallons. This reduction in usage of diesel fuel and transition to CNG usage results in an annual reduction of 0.585 short tons Oxides of Nitrogen, 0.034 short tons of Particulate Matter 2.5, and .175 short tons of greenhouse gas emissions. The total cost for fueling the two replaced diesel buses was \$33,347. The total cost to fuel the two new CNG buses was \$8,061. The total cost savings for fueling the two CNG buses totaled \$25,375. Over a twelve-month period, the cost of maintenance for the two old diesel buses was \$13,142. The cost of maintenance for the two new CNG buses was \$7,669. The maintenance savings between the old and new buses equaled \$5,473. Over a twelve-month period, the total savings for the district from switching to the new CNG buses was \$31,118.

CHAPTER 4:

Conclusion

As a school district, North Monterey County Unified currently doesn't have the funding for an ongoing bus replacement program. We rely on grant awards to replace our current fleet. In the future, we hope to replace more diesel-fueled buses with CNG-powered buses or electric buses.

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 CEC's seven major areas of responsibilities are:

1. Planning and Policy Development
2. Renewable Energy Growth
3. Energy Efficiency
4. Energy Innovation
5. Cleaner Transportation
6. Responsible Electricity Infrastructure
7. Emergency Response

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.

LOW CARBON FUEL STANDARD (LCFS)—A set of standards designed to encourage the use of cleaner low-carbon fuels in California, encourage the production of those fuels, and therefore reduce greenhouse gas emissions. The LCFS standards are expressed in terms of the carbon intensity of gasoline and diesel fuel and their respective substitutes. The LCFS is a key part of a comprehensive set of programs in California that aim cut greenhouse gas emissions and other smog-forming and toxic air pollutants by improving vehicle technology, reducing fuel consumption, and increasing transportation mobility options.

NITROGEN OXIDES (OXIDES OF NITROGEN, NO_x)—A general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO₂), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes and are major contributors to smog formation and acid deposition. NO₂ is a criteria air pollutant and may result in numerous adverse health effects.

NORTH MONTEREY COUNTY UNIFIED SCHOOL DISTRICT (NMCUSD)—North Monterey County Unified School District is a public school district located in Northern Monterey County on California's Central Coast. The district serves approximately 4,600 students and families in the communities of Castroville, Elkhorn, Moss Landing, Prunedale, Royal Oaks, and portions of Salinas.

PARTICULATE MATTER (PM)—Unburned fuel particles that form smoke or soot and stick to lung tissue when inhaled. A chief component of exhaust emissions from heavy-duty diesel engines.

SHORT TON—An imperial unit of mass equal to 2,000 pounds.

