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ENERGY COMMISSION**



**CALIFORNIA
NATURAL
RESOURCES
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California Energy Commission
Clean Transportation Program

FINAL PROJECT REPORT

Rialto Compressed Natural Gas Fueling 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.
- 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 PON-14-608 to fund projects that establish or expand infrastructure necessary to store, distribute and dispense compressed natural gas for use in natural gas vehicles. In response to PON-14-608, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards August 12, 2015 and the agreement was executed as ARV-15-010 on December 4, 2015.

ABSTRACT

Natural gas is used in new school buses as an alternative to other fuels. Compressed natural gas is an energy source that is cheaper and cleaner burning than that of diesel engines. Since compressed natural gas is a cleaner burning fuel, Rialto Unified School District invested in purchasing newer buses to provide a near zero emissions school buses for students. At the time of the grant solicitation, the Rialto Unified School District maintained a fleet of 28 school buses, which traveled up to 12 miles each time a bus, needed fueling. To continue to reduce the carbon footprint a natural gas fueling station was necessary in the Rialto, California area.

Keywords: Natural gas, CNG, compressed natural gas, carbon footprint

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EXECUTIVE SUMMARY

Introduction

The South Coast Air Quality Management District required all new school buses to use alternative fueled engines and those buses that were not retrofitted with an approved control device to reduce particulate matter to be replaced with an alternative fueled school bus. The numbers of alternative fueled buses increased at a rapid rate while compressed natural gas fueling stations were remaining stagnant. The City of Rialto had no publicly accessible compressed natural gas fueling stations to serve the needs of The Rialto Unified School District existing and planned compressed natural gas bus fleet, Colton Joint Unified School District and Fontana Unified School District's compressed natural gas school bus fleets, public or commercial compressed natural gas vehicles. To improve air quality in the area, it was sought-after to build an additional compressed natural gas fueling stations.

Project Description

The Rialto Unified School District proposed to build a compressed natural gas fueling station and transportation yard in two phases. Phase I of the project will construct and operate a compressed natural gas fueling station, which provided infrastructure for two "fast-fill" pumps to serve the refueling needs of the existing 28 buses, which are currently maintained approximately 0.25 mile away from the Project site at the Rialto Unified School District existing transportation facility located at 625 West Rialto Avenue. Phase I infrastructure is open to the public and other school districts for refueling. Phase II of the Project, which is not the subject of this grant but is part of the long-term transportation plan, includes construction and operation of a new transportation yard. The transportation yard will provide for a total of 94 "time-fill" fueling stalls to fuel approximately 94 regular education and special needs school buses upon project completion. The Rialto Unified School District current compressed natural gas bus fleet will be relocated to the new Yard along with additional compressed natural gas buses as the existing 28 diesel and 2 gasoline buses are replaced and new compressed natural gas buses are acquired.

Project Goals

The goal is an economically viable and environmentally cleaner transportation system within the region through the displacement of petroleum use.

The objectives are as follows:

- Provide fast-fill fueling for 28 existing compressed natural gas school buses.
- Provide fast-fill fueling open to the public and other school districts in the City of Rialto, which currently has no publicly accessible compressed natural gas fueling facilities.
- Save money on fueling costs and generate revenue from non-Rialto Unified School District use of the station, which can be re-invested into additional compressed natural gas vehicles and infrastructure.

Project Results

The initial infrastructure timeline was to complete the construction Phase I by December 2016, however due to several change orders and issues with utilities the project was completed in June 2018. In June 2018 the Rialto Unified School District opened the compressed natural gas

Fueling Station with two "fast fill" pumps. This is open to the public and serves the Rialto Unified School District 28 compressed natural gas buses.

CHAPTER 1:

Project Goals and Objectives

For this project the Rialto Unified School District (RUSD) used previously owned property, which was not being used, located within the school district boundaries (Figure 1) to build a Compressed Natural Gas (CNG) fueling station (Figure 2) with two fast-fill fueling pumps to fuel the existing 28 CNG school buses and the additional 29 CNG school buses acquired from 2016 through 2018. A California Environmental Quality Act report was prepared for RUSD on January 2015 prepared by VCS Environmental.

Figure 1: Location for CNG Fuel Infrastructure



Photo Credit: Nereida Camacho; October, 2015

In 2019, Rialto Unified School District will receive seven additional CNG buses, resulting in a total of 64 CNG school buses. The CNG station is open to the public on a "24-hour/7-day" basis. Local school districts were informed of the opportunity for emergency backup fueling. This reduces RUSD's fueling costs and generate revenue from non-RUSD use of the station.

Figure 2: Location for CNG Fuel Infrastructure As-Build



Photo Credit: Iris Chu; April 2018

Phase I

Phase I of this project included the construction and operation of the station, including a vehicle entry/exit access way along South Lilac Avenue; Two fast-fill vehicle fueling positions (dispensers) and roof structure; CNG equipment enclosure to house three CNG storage tanks, three CNG compressors, and one backup generator; Storm water facilities; Utility upgrades to support operations; and Hardscape/landscape improvements.

During Phase I it was decided to only install two of the CNG compressors instead of three CNG compressors due to Phase II being postponed. All other station equipment and materials were purchased and installed. Phase II was not part of the grant funding requested but is part of the District's long-term goals. The proposed Up to 9,100 square-foot of office building; 9,900 square-foot service building with six service bays, storage area and office space; Parking stalls for 94 buses with time-fill CNG fuel pumps; Four bus wash stations; Parking stalls for 96 staff, 33 visitors, and six accessible stalls; Water quality treatment facilities; various utility upgrades, including a stub-out gas line for future City connection; and Various hardscape/landscape improvements.

CHAPTER 2:

Activities Performed

Building of CNG infrastructure

During the first few months of the CNG project, there were several delays that were unavoidable and unforeseen at the time of the planning process. The activities performed from the award bid to the final commissioning took approximately two years and one month. After the commissioning, it was determined that the County of San Bernardino Department of Agriculture, Weights and Measurements is required to complete a weight and measures tests prior to selling to any type of fuel to the public which took place on May 7, 2018.

Summary of unforeseen activities which resulted in delaying the project

In March of 2016, it was discovered that the building design did not include a data room. A revision to our plan design was required, as the original plan did not include plans for a separate structure to house the equipment servers, phone lines and electrical panel. This was discovered because of the need for the fuel management software and network requirements to support the software. The revision was approved by the city on June 21, 2016.

In October of 2016 and during the early stages of construction, the school district was awarded an electrical grant from the Federal Department of Energy, to receive eight electric school buses. Due to the increase of the additional buses, the electricity supply had to increase from one 4,000-amp service to include an additional 4,000-amp service. The construction timeline was extended for two additional months because of the interactions with Southern California Edison, and the need to upgrade our electrical system to accommodate the addition of the electrically powered school buses. It was determined that it would be cost effective to do the upgrading now at this phase to avoid the cost of having to re-open the underground after the high-pressure gas lines were installed. By April 2017 all changes were approved by Southern California Edison and upgrades were installed.

The original electrical vaults were not acceptable to the field inspector, so they had to be removed and we had to order new ones. This caused the project to be delayed for three weeks. However, new vaults arrived on Friday, May 12, 2017 and were installed and approved by the inspector.

Figure 3: Original Electric Vaults



Photo Credit: David Walthall; April, 2017

Figure 4: New Electric Vaults



Photo Credit: David Walthall; July, 2017

CHAPTER 3:

Data Collection and Analysis

The data collection test plan will be monitored by two systems. The first system will track CNG gallons used for six-months through the FuelMaster Management System. The second monitoring system will manually track miles driven from July 1, 2018 through December 31, 2018 through monthly reporting by our school bus driver’s inspections reports.

Six months of data collection and analysis resulted in 218,249 miles driven by CNG school buses displacing about 23,600 gallons of diesel fuel.

Diesel buses averaged 9.2478 mpg (Table 1).

Table 1: Displacement of Diesel Fuel for six months

Time Frame	CNG Miles Driven	CNG GGE Gallons Fueled	Miles Per Gallon
07-01-18 – 12-31-18	218,249	23,600	9.2478

Source RUSD staff

The Duty cycle of the District’s current fleet of school buses is based on a 16-hour day, with peak time in the morning, midday and afternoon for transporting students during school hours. Additionally we have trips that require transporting students to study trips. The District currently, owns 80 school buses; 51 CNG; 25 diesels; 4 gasoline. Two diesel buses are equipped with diesel particulate filters. The District applied for South Coast Air Quality Management grant in January 2017 and was awarded thirteen replacement buses in May 2018. As a condition of the grant award, the District is required to and will crush eight Crown 2-cycle Detroit Diesel Engine, without diesel particulate filter buses and five Thomas Caterpillar diesel engine buses pre-1994 diesel buses once the thirteen new CNG school buses are delivered in December and February 2019. The District applied for the CEC school bus replacement grant in September 2018 to replace ten diesel buses. The awardees of the CEC grant were announced in late May 2019.

Six months of data collection and analysis (Table 2) demonstrates a savings of \$44,700.

Table 2: Savings in Labor for six months

Time Frame	Drivers Wages	Time to Outside Source Vendor	Total Savings in Labor
07-01-18 – 12-31-18	\$22,353	\$67,058	\$44,700

Source RUSD staff

When calculating the labor saving we reviewed the drivers wages and compared to outside vendor in doing so we found bus driver hourly wages were about \$24 for the half hour it takes to fuel at the Rialto CNG Station and totals \$22,352 compared to the average time of one and a half hours of drive time it takes to fuel at an outside vendor located 11.8 miles round trip to our district yard total of \$67,060 for a total savings in labor cost of \$44,700.

Six months of data collection and analysis (Table 3) demonstrates a savings of \$28,010.

Table 3: Savings in Fuel for six months

Time Frame	RUSD CNG Station	Gallons Consumption at Vendor Cost	Total Savings in Fuel
07-01-18 – 12-31-18	\$115,380	\$143,390	\$28,010

Source RUSD staff

Rialto USD fuel consumption compared to fueling at outside vendor. Six months of data collection and analysis has resulted in a savings for Fuel and Labor of \$72,720 for Rialto USD. These savings are a huge win because they will be ongoing.

CHAPTER 4:

Impact to District

There is a favorable financial impact to the District's general fund, due to the reduced costs of fuel and labor. Having our own CNG station eliminates the need for our bus drivers to travel to neighboring cities to obtain CNG fuel. Our drivers are now able to fuel and return to the transportation yard within 30 minutes.

Additionally we can purchase fuel at a cost that is significantly below retail cost. The savings from fuel and labor are now able to be reinvested in the District's educational programs.

Building a CNG station also helps boost our District's commitment to educating our students on how to take care of our planet. Our District has recently been recognized by the California Department of Education 2019 Green Ribbon Awards. Our STEM CARES environmental education program utilizes local relevant phenomena to strengthen the scientific and environmental literacy of all students, by teaching them about their environment. Our students grow their own produce and utilize it in our Child Nutrition Program. We use solar energy in 80 percent of our buildings. The entire District uses energy-efficient lightbulbs. Lastly, we are one of the few school Districts to operate a CNG station that is also open to the public, to encourage more companies to purchase environment friendly vehicles.

Our Lead Academic Agent, Dr. Edward D'Souza, said it best, "Stressing the importance of collaboration and partnership within the District, with local industry and regional government, RUSD has successfully leveraged support for school gardens and groves at every elementary school, wellness gardens, environmentally responsible transportation and energy acquisition for all schools."

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.

RIALTO UNIFIED SCHOOL DISTRICT (RUSD)—Rialto Unified School District is a school district in San Bernardino County, California, serving most of Rialto, sections of Colton, Fontana and San Bernardino and the unincorporated community of Lytle Creek.