



California Energy Commission Clean Transportation Program

FINAL PROJECT REPORT

CALEXICO UNIFIED SCHOOL DISTRICT COMPRESSED NATURAL GAS STATION UPGRADE PROJECT

Prepared for: California Energy Commission Prepared by: Calexico Unified School District



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Primary Author(s):

Anisa L. Garcia Melissa Navarro Jeremy Nielsen Mei L. Randle, MBA

Calexico Unified School District 901 Andrade Avenue Calexico, CA 92231 760-768-3888 Calexico Unified School District Website (www.cusdk12.org)

Agreement Number: ARV-12-002

Thanh Lopez Commission Agreement Manager

Elizabeth John Office Manager ADVANCED FUELS AND VEHICLE TECHNOLOGIES OFFICE

John P. Butler II Acting Deputy Director FUELS AND TRANSPORTATION

Drew Bohan Executive Director

DISCLAIMER

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Calexico Unified School District

Anisa L. Garcia Melissa Navarro Jeremy Nielsen Mei L. Randle, MBA

California Energy Commission

Thanh Lopez John Mathias

Greenfix America

All staff who were involved in this project

Other

George Duarte All individuals who were involved in this project

PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program, formerly known as the Alternative and Renewable Fuel and Vehicle Technology 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 PON-11-602 to provide funding to Calexico USD's compressed natural gas station upgrade project. The recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards April 24, 2012 and the agreement was executed as ARV-12-002 on August 13, 2012.

ABSTRACT

The Calexico Unified School District requested grant funding support from the CEC in the amount of \$83,329 to refurbish and upgrade the District's publicly accessible CNG station by replacing the non-functioning compressor with two upgraded models. This station will provide critical fueling access for three (3) existing CNG school buses and other vehicles, in addition to existing CNG school buses from other Imperial County school districts, CNG vehicles owned by other local agencies, and CNG retail fueling for regional users.

Before the completion of this project, there were no functioning CNG stations in the Imperial Valley. Multiple school districts, agencies, and other users were turning away from domestically produced, low-carbon CNG due to the unreliability of the existing fueling network in Imperial County. Calexico Unified School District's CNG station upgrade project enables local school bus fleets to continue using CNG instead of returning to diesel and will support increased commercialization of CNG with the introduction of dependable refueling access.

The upgraded CNG fueling station is located at 1085 Andrade Ave, Calexico, California 92231. It is between the intersection of Highway 98 (East Birch St) and Andrade Avenue. The upgraded CNG station utilized the existing Calexico Unified School District CNG station. Overall, this single station project has significant impact on assisting with the region's transition to an alternative fuel marketplace.

Keywords: California Energy Commission, Calexico Unified School District, GreenFix America, compressed natural gas, natural gas infrastructure.

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EXECUTIVE SUMMARY

Calexico Unified School District sought to upgrade and refurbish its 24-hour public access CNG station in order to support its own CNG vehicle operations, as well as to offer a critical CNG refueling station for other existing natural gas truck users in Imperial County, and retail users from along Highways 88 and 111. At the time of application, there were no operational CNG fueling facilities in Imperial County.

The Calexico Unified School District CNG facility is a small, publicly accessible CNG site owned by the district that provided retail fueling for the public and time-fill fueling for the district's school bus fleet. The district's school bus fleet serves more than a dozen schools, and hundreds of school children, that get to school each day via the District's transportation operations. Calexico Unified School District has three (3) CNG powered buses out of a total fleet of 12 buses. Before this project's completion, the three (3) CNG buses, along with at least five (5) other school buses in Imperial County, were often sitting unused in the bus yards due to problems with the County's CNG regional fueling network, seriously impacting the district's student transportation needs. When the CNG fueling stations were down, the CNG buses travelled 13 miles to the Imperial County El Centro Station to fuel. However, the El Centro station had its own set of problems, meaning that often the local buses could not be operated and were stranded. These issues caused the district's staff to question its use of natural gas and forced the use of diesel.

Due to infrastructure reliability, many fleets were considering a switch from CNG back to diesel, which emits more criteria pollutants and greenhouse gas emissions than CNG. Every day that the school buses and other vehicles were stranded, Imperial County was losing its tremendous potential for the market growth of natural gas in its fleets that would result from the compressor issues being fixed.

In order to achieve a natural gas fueling source that was consistently available and reliable, Calexico Unified School District sought funding from the CEC to help offset the entire cost of critical upgrades to the existing CNG refueling station. Replacing the Fuel Maker units with CNG Coltri¹ units, to be installed and maintained by GreenFix, would buttress a regional fueling network that would not only serve local fleets, but also support cross-border truck drivers who drive from Mexico and other retail users. The districts facility is located within two miles of Mexico, directly on Highway 98, which is a commercial truck connection point with entry to Highway 111. This area is full of logistic yards that experience regular truck traffic. Thus, CNG station issues in Imperial County also meant hindering commercialization of natural gas beyond just the fleets that exist within the County.

To accomplish this project, the Calexico Unified School District electricians started evaluating the existing electrical supply to the refueling stations and began upgrading the power source for the new retrofit compressor units. Once all the electrical power supply was ready for connection to the new equipment, GreenFix America furnished and commissioned two (2) GreenFix CNG 6.9 Natural Gas Compressors with Programable Logic Controllers. Next, these

¹ <u>Coltri</u> www.coltri.com

same electricians completed the installation and wiring which were previously set by GreenFix America.

In conclusion, in May of 2013, GreenFix America connected all necessary gas lines, connected all control wiring, and started up these new compressor units. Each unit was then individually tested for proper operation. Both compressor units are now operational and pumping CNG fuel into three (3) of our buses.

Calexico Unified School District has met the goals of this project to upgrade and refurbish its 24-hour public access CNG station in Calexico, California, to support the districts CNG vehicle operations and has provided a critical CNG refueling station for other existing natural gas users in Calexico area, as well as Imperial County's retail users along highways 88 and 111. The upgraded CNG station will displace over 44,000 gallons of imported diesel fuel per year, reduce greenhouse gas emissions from transportation by over 159 metric tons per year in California, and school district has demonstrated the feasibility of constructing, owning, and operating a 24-hour public access station to supply an ultra-low carbon fuel for school fleet transportation. Thus, concludes that this districts CNG Station upgrade project had successfully serve the public and significantly contributes to a greener and more sustainable environment.

CHAPTER 1: Project Background and Objectives

Background

The Calexico USD had requested grant funding support from the CEC to refurbish and upgrade the publicly accessible CNG station located at 1085 Andrade Avenue, Calexico, California, 92231. This station will provide critical fueling access for three (3) existing CNG school buses, in addition to providing retail fueling for existing CNG school buses from other Imperial County school districts, CNG vehicles owned by other local agencies, and other regional users. At this time, there are no regularly functioning CNG stations in the Imperial Valley and therefore, multiple school districts, agencies, and other users are turning away from domestically produced low-carbon CNG due to the unreliability of the existing local fueling network. Existing fleets that own CNG vehicles, including Calexico USD, have turned back from CNG buses to older, high polluting diesel school buses and vehicles because they can't obtain CNG fuel. Calexico's existing CNG station has been inoperable for the majority of the last 18 months and intermittently for the last 2.5 years. Although there is technically a CNG fueling station in El Centro that provides regional redundancy, this station is also regularly shut down and will be fully decommissioned in June 2012 due to expense of ongoing problems, leaving the region with just one CNG fueling station; Calexico USD. Therefore, this station refurbishment project will enable local school bus fleets and others to continue using CNG instead of returning to diesel and will support increased commercialization of CNG with the introduction of dependable refueling access.

Current Situation

At least eight (8) natural gas school buses are currently stranded in Imperial County due to serious problems that currently affect the County's CNG regional fueling network. These problems are regularly causing local fleets to question their commitment to the operation of clean-burning natural gas vehicles, threatening the implementation of any further alternative use in an economically depressed part of California that needs access to low cost fuel, and perhaps most distressingly, reducing the availability of low-emission transportation for local school children and sensitive lungs. In addition to the eight (8) buses, there are four (4) additional light- and medium-duty CNG vehicles that are currently stranded because of dire issues with six (6) CNG Fuel Maker stations located in four (4) locations from Brawley to Calexico USD. These Fuel Makers are essentially non-operational, leaving regional vehicles without any refueling options or redundancy.

Project Objective

The primary objective of this project is to establish the natural gas fueling infrastructure to support Calexico USD's current fleet and others operating in Imperial County, by replacing Calexico USD's two (2) existing Fuel Maker Quad compressor units with CNG Coltri Units. Maintenance of the Coltri units would be handled by GreenFix, a local business leader with experience deploying and managing CNG Coltri stations, instead of relying on costly and multimonth repairs originating out of Italy for the current, problematic, Fuel Maker units. This project will make natural gas fuel accessible to multiple confirmed fleets, including Calexico USD, El Centro Elementary School District, the City of Holtville, Imperial County Air Pollution

Control District, commercial fleets such as Kraft Foods, and retail users such as cross-border truck drivers who arrive from Mexico. The Calexico USD's facility is located within two miles of Mexico directly on Highway 98, which is a commercial truck connection point with entry to Highway 111. This is not a remote area – it is full of logistics yards that experience regular truck traffic – thus, repairing CNG issues in Imperial also means supporting commercialization of natural gas beyond just the fleets that existing with the County.

This station will serve an important economic function for a region that has been extremely negatively impacted by the recession by injecting immediate cost savings by providing a more economical fueling option for local school fleets and others. This station will also support greenhouse gas and criteria pollutant emission reductions in an area that is heavily impacted by emissions, geography and weather patterns. Lastly, this station will support businesses located in hard-hit communities, helping them to save money, displace petroleum, and use entirely low carbon fueling operations.

Calexico USD already owns the land and the existing station, and a contract with GreenFix to manage the project implementation and ongoing maintenance. Permitting, site design, and California Environmental Quality Act approvals are unnecessary for this station upgrade project that will simply exchange the old Fuel Maker compressors for new Coltri units, and so the project is shovel-ready and available for rapid implementation.

Goals and Objectives

The goal of this project is to upgrade and refurbish Calexico USD's 24-hour publicly accessible CNG station in Calexico, in order to support Calexico's CNG vehicle operations, as well as to offer a critical CNG refueling station for other existing natural gas users in Imperial County and retail users along Highways 88 and 111.

The objectives of this project are to:

- Support fuel requirements of the existing and planned expansion of Calexico USD's CNG vehicle fleet and other fleets in the region.
- Strengthen the network of natural gas fueling infrastructure along the main transportation corridor on Highways 88 and 111.
- Displace over 44,000 gallons of imported diesel fuel per year.
- Reduce greenhouse gas emissions from transportation by over 159 metric tons per year in California.
- Demonstrate the feasibility of constructing, owning, and operating a 24-hour public access station to supply an ultra-low carbon fuel for school fleet transportation.

System Design and Specifications

Existing Station

The Calexico CNG facility is a small, publicly accessible CNG site owned by Calexico USD. The station was developed in 2004. The existing station consists of:

- One (1) Gas Boy card reader
- One (1) dual hose FTI CNG dispenser
- One (1) Fuel Maker Cascade Storage Cabinet
- One (1) 88-gallon storage sphere
- Two (2) Fuel Maker FMQ8-42 units.

The FTI dispenser has a maximum flow rate of approximately 25 gasoline gallon equivalents (GGE) per minute. However, this flow rate is limited by station storage volume, with the storage capacity maximized at 117 GGE and 3,600 pounds per square inch. The station also supports time-fill fueling for Calexico USD's three school buses with a two-hose dedicated time-fill station.

Although the original station was built to effectively support the Calexico USD fleet, the Fuel Maker compressor units have posed operational problems from the start. The mandatory service interval is 4,000 hours; however, the fuel maker's control boards often fail, leading the compressors to not time off, leaving them continually running and then burning out at 4000 hours of use. The maintenance problems with the Fuel Makers are compounded by a complete lack of local support to repair the units. Although Calexico USD had a local service contract with the original installation contractor, Gas Equipment Services, our experience was unsatisfactory, and the service agreement was not renewed. It is very difficult to obtain parts to service the units; the entire unit must be sent back to Italy, where Fuel Maker originates, to be repaired. This takes a great deal of time to complete repairs (at least three months), and the problem typically resurfaces a few months later. Based on GreenFix's experience and others in Imperial County with the Fuel Maker units, these units typically run for only three (3) years before they must be replaced entirely or begin to have near-constant operational issues. After their 4,000-hour run time is complete, the units shut down and must be rebuilt and reset.

Station Upgrade

The refurbishment and replacement project would eliminate the expensive, frequent, and lengthy breakdowns by replacing the Fuel Maker units with GreenFix compressor and control system packages and a local maintenance contract with local parts service. This scope is to furnish two (2) GreenFix Coltri CNG 6.8 natural gas vehicle re-fueling units. The units are configured to be a direct replacement for the two (2) existing Fuel Maker FMQ8 units. The 117 GGE storage unit and the rest of the equipment will remain and be reused. The new units each have a minimum capacity of 6.8 GGE per hour and a minimum discharge rate 14 standard

cubic foot per minute (SCFM). They have a minimum fill rate of 28 SCFM or 14 GGE per hour combined, improving fueling capacity over the original, actual 8 GG per hour full Fuel Maker capacity. The faulty Fuel Maker control panel will also be replaced with built-in PLC for the GreenFix units.

The upgraded site will be available to the public on a 24-hour operation through an existing point of sale card-reading data management system. The facility will service light- to heavy-duty vehicles, including school buses, sedans, pick-up trucks, dump trucks, refuse collection vehicles, street sweepers, and other vehicles as requested. The upgraded fueling station will directly support the ongoing annual reduction of 45,425 gallons of diesel and 441 gallons of gasoline by 2015, replacing it with 51,938 plus GGE of clean-burning natural gas in the form of CNG.

Bid/Contractor Selection Process

Calexico USD will own and operate the 24 hours per day, seven days per week public access fueling station with full retail and time-fill capabilities. GreenFix was selected as the contractor for the installation and maintenance of the fueling station. All service kits are stocked locally by GreenFix.

GreenFix America is in the process of implementing large-scale, medium-scale and small-scale sustainability projects across all aspects of its customers' operations, including alternative fuel vehicles, stations, energy production, resource recovery, and water conservation projects. GreenFix's CNG experience was earned via a collaboration of Imperial County businesses that implemented liquefied natural gas truck and infrastructure projects. GreenFix is now a distributor of Coltri CNG units and has managed local maintenance of El Centro's CNG station (for all non-Fuel Maker parts) and Calexico USD since 2010. The Calexico USD CNG station upgrade project is GreenFix's tenth Coltri installation initiative to specifically support CNG station projects in the Imperial and Coachella regions of Southern California.

Equipment Selection/Site Preparation

The project will furnish two (2) GreenFix Coltri CNG 6.8 natural gas vehicle re-fueling units. The units are configured to be a direct replacement for the two (2) existing Fuel Maker FMQ8 units. The 117 GGE storage unit and the rest of the equipment will remain and be reused. The new units each have a minimum capacity of 6.8 GGE per hour and a minimum discharge rate 14 SCFM. They also have a minimum fill rate of 28 SCFM or 14 GGE per hour combined, improving fueling capacity over the original, actual 8 GGE per hour full Fuel Maker capacity. The faulty Fuel Maker control panel will also be replaced with built-in PLC for the GreenFix units.

The Coltri units are available at GreenFix's local Brawley headquarters, and have no long order lead time. Because this is a simple remove and replace application with local equipment, the Coltri installations can be finalized within days. No infrastructure is being disturbed or added.

Construction and Installation

GreenFix will disconnect the electrical and regulated natural gas supply, after which the two Fuel Maker quads shall be removed and properly discarded. Reinstallation of the new selfcontained GreenFix CNG 6.8 units will require reconnecting to the existing regulated gas line. The electrical connection will require a three-phase source of power which is being supplied from the existing school district warehouse building. Upon completion of the gas and electrical supply connections the installation will be complete.

The project team has confirmed, in advance, that no electrical or code compliance modifications to the original installation are needed; thus, there will be no permit process triggering nor California Environmental Quality Act approvals necessary for project commencement. Research has been completed regarding the appropriate replacement units, confirmed that no site work or civil improvement is needed, confirmed with local planning agencies that no new permitting is necessary.





Source: Calexico USD

Commissioning

GreenFix America performed upgrade services and maintenance for Calexico USD CNG station upgrade project. In January 2013, GreenFix install and remove the old units. In March 2013, GreenFix commission both units, 6.8 Two Coltri equipment. In April 2013, for project completion, GreenFix furnish and commission two GreenFix CNG 6.8 Natural Gas Compressors with Programmable Logic Controller. After the CNG fueling station installation completed, GreenFix installed card readers and FTI dispensers. In May 2013, CNG fueling station upgrade project is completed.

Training

Calexico USD provided training to all the maintenance and operations department's staff and all the drivers who fuels the buses.

Public Outreach

Calexico USD CNG upgraded fueling station was ready on June 2013 and is up and running on July 2013. Calexico USD CNG upgraded fueling station can be located on United States Department of Energy website under Alternative Fueling Station Locator. The Internet address is <u>U.S. Department of Energy Alternative Fuels Data Center Web Page</u> (www.afdc.energy.gov).

Results of the Project

Calexico USD CNG station was successfully upgraded in 2013. Currently, the new CNG stations is up and running. The upgraded station is now serving Calexico USD District CNG buses along with other school districts, local schools, and municipalities.



Figure 2: CNG Upgrade Fueling Station (completed installation)

Source: Calexico USD

Data Collection

Table 1 below shows the six months of data collected for the project.

				-		
	Jan	Dec	Nov	Oct	Sep	Aug
	2015	2014	2014	2014	2014	2014
Therms as Documented by Utilities Bills	3792	4411	2527	3191	3198	2494
Average Number of Non-District Vehicles Fueled per Month	3	3	3	3	3	3
Average Number of Type 1 Bus Fueled per Month	4	4	4	4	4	4
Average Number of Type 2 Bus Fueled per Month	2	2	2	2	2	2
Number of Days per Month Vehicles Were Fueled	31	31	30	31	30	31
Maximum Capacity of the New Fueling System (SCFM)	111	111	111	111	111	111
Miles Traveled per Bus by Odometer Reading	1409	1403	2683	3667	3395	829
Gallons of Gasoline and/or Diesel Fuel Displaced by Using Natural Gas (with Associated Mileage Information)	3033.60	3528.80	2021.60	2552.80	2558.40	1995.20

Table 1: 6 Months Data Collection

Source: Calexico USD

Public Assessment

In May 2013, Calexico USD has a new upgraded CNG fueling station and are currently serving CUSD and other public vehicles around Calexico and Imperial County. Local schools, municipalities, businesses, as well as other traffic travelling along Highways 88 and 111 or general retail users benefit from this project. Several fleets in Imperial County are suffering from inoperable and failing CNG stations and need a consistent reliable station for fueling. Similar to its past operations, the Calexico USD CNG Fueling Station will function as a public-access station; the station will utilize a card reader and will be open to retail use for vehicles based in or travelling through the area and seeking fueling redundancy. This station refurbishment project will enable local school bus fleets and others to continue using CNG instead of returning to diesel and will support increased commercialization of CNG with the introduction of dependable refueling access.

Calexico USD had achieved the goal to provide a clean, reliable, cost-efficient and domestically produced source of fuel for transportation and encourage market development for natural gas vehicle. Overall, the CNG station upgrade project have a significant impact on assisting with the region's transition to an alternative fuel marketplace.

Recommendations

Calexico USD support CEC to achieve the goal of developing innovative technology that transform California's fuel and vehicle types toward a sustainable greener environment. Calexico USD provision to strengthen the necessary web of CNG fueling station coverage in California by being an active supporter for renewable energy, and more efficient classrooms, and energy efficient operations.

Fleet Expansion

Calexico USD fleet expansion vision includes: 32 new CNG vans and pickups for maintenance vehicles to replace the current gasoline vehicles and 6 CNG Type 1 buses to replace 6 pre 1998 diesel Type 1 buses.

GLOSSARY

<u>CALEXICO UNIFIED SCHOOL DISTRICT</u> (Calexico USD)- Is a school district located at 901 Andrade Avenue, Calexico, CA. 92231. www.cudk12.org.

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 are sufficient enough 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.

GASOLINE GALLON EQAUIVALENT (GGE)- GGE is the amount of alternative fuel it takes to equal the energy content of one liquid gallon of gasoline. One GGE of natural gas is 126.67 cubic feet at standard conditions, and this has the same energy content as one US gallon of gasoline. When compressed to 3,600 psi, one GGE requires .51 cubic feet of space in a CNG tank.

STANDARD CUBIC FEET PER MINUTE (SCFM)-is a volumetric flowrate corrected to a set of "standardized" conditions of pressure, temperature, and relative humidity