



**CALIFORNIA  
ENERGY COMMISSION**



Clean Transportation Program

## **FINAL PROJECT REPORT**

# **Bear Valley Unified School District's Compressed Natural Gas Fueling Station Installation Project**

**Prepared for: California Energy Commission**

**Prepared by: Bear Valley Unified School District**

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# 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 PON-11-602 to provide funding opportunities under the Clean Transportation Program for projects which develop infrastructure necessary to store, distribute, and dispense electricity, E-85, propane, diesel substitutes, and natural gas. In response to PON-11-602, Bear Valley Unified School District submitted application #156, which was proposed for funding in the Energy Commission's Notice of Proposed Awards April 24, 2012, and the agreement was executed as ARV-11-023 on August 29, 2012.

# ABSTRACT

The Bear Valley Unified School District's bus fleet was travelling 34 miles each way to fuel their natural gas bus fleet, which was not cost effective. Grants from the California Energy Commission and other agencies allowed Bear Valley Unified School District to construct a compressed natural gas fueling station at its transportation facility. The construction of the fueling station was completed in October 2013. Construction was completed through a single source contract with Siemens Industries and engineered by Allsup Corporation. The station was built with eight fueling posts, which allows the school district to fuel their five compressed natural gas school buses and anticipate the growth of their compressed natural gas bus fleet. Growth of the compressed natural gas fleet will be dependent on available grants.

Since the completion of this compressed natural gas fueling station, Bear Valley Unified School District has seen a substantial reduction in the use of diesel fuel. It has also enabled the district to use compressed natural gas school buses on field trips, furthering the reduction of the use of diesel fuel. Students and parents of the school district are pleased with the grants received from the California Energy Commission, which enables the school district to move forward with a cleaner, safer school bus fleet.

Bear Valley Unified School District would like to move forward in replacing their remaining 14 diesel school buses with compressed natural gas buses and becoming a public compressed natural gas fueling station. Due to the isolated area in which the school district is located, users of compressed natural gas and the entire mountain community would benefit from a public station.

**Keywords:** Bear Valley Unified School District, compressed natural gas, CNG fueling station, natural gas infrastructure, natural gas bus fleets

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## **EXECUTIVE SUMMARY**

The objective of the Bear Valley Unified School District compressed natural gas fueling station installation project is to install a new compressed natural gas fueling station that can meet the current and future compressed natural gas fueling needs of the school district.

Bear Valley Unified School District has been successful in receiving South Coast Air Quality Management District grant funding for a new compressed natural gas bus. The school district was successful in procuring an additional four compressed natural gas buses and intends to expand its fleet to a total of 18 compressed natural gas buses replacing its diesel fleet. Until Bear Valley Unified School District could build its own compressed natural gas fueling station, fueling the current bus fleet at the Rim of the World School District 34 miles away would not be cost effective in terms of time (and fuel) spent travelling to the fueling station. Traveling 34 miles each way to the nearest fueling station twice a week would add nearly 7,000 vehicle miles travelled per compressed natural gas bus per year.

Bear Valley Unified School District had already received \$175,000 in infrastructure funding from the Mobile Source Air Pollution Reduction Review Committee, established under state law Assembly Bill 2766 (Gray, Statutes of 2020) whose sole mission is to fund projects that reduce air pollution from motor vehicles within the South Coast Air District in Southern California, and had an additional \$14,000 in remaining infrastructure funding with the South Coast Air Quality Management District.

The California Energy Commission issued solicitation PON-11-602 for "Alternative Fuels Infrastructure Deployment: Electricity, Natural Gas, Propane, E85 and Diesel Substitutes" to provide funding opportunities under the Clean Transportation Program for projects.

With CEC funding, Bear Valley Unified School District was able to move forward immediately with the construction of a new compressed natural gas fueling station project immediately.

Siemens Industries was contracted by Bear Valley Unified School District to be the lead agent for the design, construction and commissioning of the compressed natural gas fueling station. The design and construction process started on April 26, 2013 and was completed within six months.

The construction of the fueling station was completed in October 2013. Construction was completed through a single source contract with Siemens Industries and engineered by Allsup Corporation. The compressed natural gas fueling station was built with eight fueling posts, allowing the school district to fuel their five compressed natural gas school buses, and anticipate the growth of their compressed natural gas bus fleet. Growth of the compressed natural gas fleet will be dependent on available grants.

Since the completion of this compressed natural gas fueling station, Bear Valley Unified School District has seen a substantial reduction in the use of diesel fuel. It has also enabled the district to use compressed natural gas school buses on field trips, furthering the reduction of the use of diesel fuel. Students and parents of our district are pleased with the grants received

from the CEC, which enables the school district to move forward with a cleaner, safer school bus fleet.

Bear Valley Unified School District would like to move forward in replacing their remaining 14 diesel school buses with compressed natural gas buses and becoming a public station. Due to the isolated area in which the school district is located, along with the entire mountain community, users of compressed natural gas would benefit from a public station.

# **CHAPTER 1:**

## **Introduction**

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### **Background**

Bear Valley Unified School District (BVUSD) was established as a unified school district in 1958. The BVUSD encompasses 241 square miles, serving kindergarten through twelfth grade students living in the mountain city of Big Bear Lake and the unincorporated areas adjacent to Big Bear Lake. Nearly 54 percent of the BVUSD is comprised of unincorporated areas.

The BVUSD currently operates four elementary schools, one middle school, one comprehensive high school, one continuation high school, and an alternative independent study program. One elementary school is in Forest Falls, with the remaining schools in Big Bear Valley. Average daily attendance in the BVUSD for the 2010-2011 school year was 2,604 students.

The BVUSD employs 153 full-time certified employees and approximately 88 part-time employees. Approximately 125 classified employees provide support services such as transportation, maintenance, nutrition, purchasing, secretarial, and instructional assistance.

### **Initial Situation**

For two years prior to this grant, BVUSD was able to participate in a special South Coast Air Quality Management District program which provided two compressed natural gas (CNG) buses and a temporary fueling station.

The program took two years due to fueling problems the first year; the second year was a complete success. The BVUSD currently has a total fleet of 21 school buses, 18 of which are full-size Thomas or Bluebird school buses. The model year range for the diesel fleet is 1986 to 1999. As a result of its positive experience with the CNG buses, Bear Valley became committed to moving forward with the replacement of 18 full size diesel school buses with CNG school buses.

BVUSD succeeded in receiving South Coast Air Quality Management District grant funding for a new CNG bus. Prior to the CEC's grant, the BVUSD was in the process of procuring an additional four CNG buses, with the intent to expand its fleet to a total of 18 CNG buses replacing its diesel fleet. However, without its own CNG fueling station, fueling the current bus fleet at the Rim of the World School District 34 miles away was not cost effective in terms of time (and fuel) spent travelling to the fueling station. Traveling 34 miles each way to the nearest fueling station twice a week would have added nearly 7,000 vehicle miles travelled per CNG bus per year.

BVUSD had already received \$175,000 in infrastructure funding from the Mobile Source Air Pollution Reduction Review Committee, established under state law, AB 2766, whose sole mission is to fund projects that reduce air pollution from motor vehicles within the South Coast Air District in Southern California, and has an additional \$14,000 in remaining infrastructure funding with South Coast Air Quality Management District. With CEC funding, BVUSD was able

to move forward immediately with the construction of a new CNG fueling station project immediately.

## **Project Objective**

The objective of the project was to install a new CNG fueling station that could meet the current and future CNG fueling needs of the BVUSD.

Upon completion of this project, the new fueling station would enable the BVUSD to fill their current CNG bus fleet and allow for expansion once the full bus fleet is converted. The BVUSD also planned to open the station for public use in the future.

## **Goals of the Project**

The goals of the project were:

1. Provide capacity for up to nine CNG buses.
2. Reduce the time and money spent travelling to the other nearest fueling station, which is 34 miles away at Rim of the World School District
3. Provide opportunities for other school buses in Bear Valley to use the modified fast-fill capability of the new CNG fueling station.

# CHAPTER 2: Project Approach

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## System Design and Specifications

### Develop Specifications and Bid Documents

BVUSD contracted Siemens Industries under Government Code 4217.11 (Energy Conservation Measures) as a single source provider for alternative energy projects which included the CNG fueling station, solar panels at all seven school sites in the BVUSD, as well as energy reduction projects. Siemens Industries is experienced in CNG construction and has subcontracted with Allsup Corporation on numerous occasions to design and construct CNG fueling stations, including this project.

The design for the CNG station was submitted in June 2013 to the San Bernardino County Fire Department for approval and was approved in July 2013.

### Equipment

Allsup Corporation designed and installed the CNG station at BVUSD consisting of two natural gas compressors, dryer unit, eight time-fill posts and k-rail. The following table (Table 1) shows the equipment used for the project.

**Table 1: Equipment List**

Quantity	Equipment	Specifications
2	CNG Compressors	Duplex ANGI Model NG50E compressor
1	Electric Time-Fill Panel	ANGI XLe Control
1	Gas Dryer	Xebec STV18NGX single tower dryer
8	Time-Fill Posts	Swagelok Fill Valve Model SS-L83XKF4
8	K-Rail	Six Sections at 24"W x 34"H x 20"D

Source: Bear Valley Unified School District, Allsup Corporation

## Construction and Commissioning

### Site Preparation and Installation

The new CNG fueling station is located on the north side of the bus parking area at the transportation facility. An area approximately 50-foot by 30-foot was graded to accommodate the natural gas compressor and dryer pad.

A 10-foot by 30-foot by 4-foot concrete slab (shown in Figure 1) was poured to accommodate the dual compressors and natural gas dryer. Approximately 100 feet of trenching was completed to install pipe and supply line from the existing gas meter connection at the south end of the transportation facility.

**Figure 1: Installation of Concrete Equipment Pad**



Source: Bear Valley Unified School District

Bear Valley Electric, the local utility provider, reviewed and approved the transformer replacement plan and the new load/distribution panel plan submitted in June 2013.

The electrical was upgraded to a 1,200-amp service panel and 1,234-kilowatt transformer. In addition, approximately 300 feet of conduit was installed to provide electrical power to the new CNG fueling station. The electrical upgrades and the concrete pad installation were completed in September 2013.

Figure 2 shows the electrical upgrade in process for the CNG station.

**Figure 2: Electrical Upgrades for CNG Station**



Source: Bear Valley Unified School District

To complete the new CNG fueling station, the natural gas compressors, natural gas dryer, time-fill posts, electronic time-fill panel, and K-Rail were installed. Figure 3 shows the natural gas compressor and control panel pad under construction.

**Figure 3: Compressor Installation**



Source: Bear Valley Unified School District

Figure 4 shows the completed CNG fueling station that was operational as of October 21, 2013. The new CNG fueling station has eight time-fill posts and capability of one post for fast-fill.

**Figure 4: Completed CNG Station, Operational October 21, 2013**



Source: Bear Valley Unified School District

## **Commissioning**

The pre-commissioning check list included:

- Ensuring the equipment was anchored properly.
- All electrical connections and earth grounds were made to the equipment and control panel.
- Gas supply to compressors was connected and tested for leaks.
- Dispenser lines anchored, connected, and tested (4500 psi- one hour).
- Clearing entire site of construction materials and ensuring all construction work was completed.

The commissioning process included:

- Fueling buses to test compressor and dispenser operations.
- Training BVUSD staff on fueling, safety and maintenance procedures.

## **Training**



Allsup Corporation trained the personnel from BVUSD in the areas of station safety, fueling, and equipment maintenance. A yearly contract with Allsup Corporation for station maintenance and continued training is in place to ensure equipment is properly maintained and BVUSD staff is current with training.

## **Outreach**

The contractors held a public ribbon cutting ceremony at Baldwin Lane Elementary School on October 29, 2013, shown in Figure 5.

**Figure 5: Ribbon Cutting Ceremony, October 29, 2013**



Source: Bear Valley Unified School District

# CHAPTER 3:

## Data Collection and Analysis

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### Results

BVUSD met all goals set. They increased the capacity of buses that can be fueled on time or fast-fill. Funds are now being saved by not having to travel 34 miles to fuel each CNG school bus. BVUSD bus fleets are now traveling off the mountain for trips because of being able to fuel at the current transportation facility, decreasing diesel use.

As grant opportunities become available, BVUSD plans to apply, and if awarded, will phase in the replacement of additional CNG buses and adding additional fueling posts to meet future demands. Figure 6 shows the fueling of one of five new CNG school buses.

**Figure 6: Buses Being Fueled Daily Operation**



Source: Bear Valley Unified School District

Bear Valley Unified School District has procured an additional four CNG school buses through grants by the South Coast Air Quality Management District during this project, bringing the total to five CNG school buses. BVUSD intends to continue the transition of its remaining diesel school bus fleet to lower-emission natural gas school buses.

## Data Collection

Tables 2 – 7 summarize the data collected for the project. Over the six-month span from October 2013 to March 2014, the station displaced a total of 4,015 diesel gallons equivalent of CNG across 15,839 miles of service.

**Table 2: Data for October 2013**

<b>Bus #</b>	<b>Mileage Beginning</b>	<b>Mileage End</b>	<b>Mileage Total</b>	<b>Days Schools in Session</b>	<b>Days in Use</b>	<b>Days not in Service</b>	<b>Days Fueled</b>
15	6,426	6,674	48	9	5	8	5
16	2,503	2,591	91	9	5	8	5
17	2,541	2,850	309	9	3	10	3
18	2,457	2,955	498	9	7	6	7
26	2,486	2,550	64	9	0	Not CHP Approved	0
<b>Diesel Fuel Gallons Displaced by CNG</b>							202

Source: Bear Valley Unified School District.

**Table 3: Data for November 2013**

<b>Bus #</b>	<b>Mileage Beginning</b>	<b>Mileage End</b>	<b>Mileage Total</b>	<b>Days Schools in Session</b>	<b>Days in Use</b>	<b>Days not in Service</b>	<b>Days Fueled</b>
15	6,674	7,464	790	18	15	3	15
16	2,594	3,756	1,162	18	16	2	16
17	2,850	4,077	1,227	18	16	2	16
18	2,955	3,131	176	18	2	16	2
26	2,550	3,587	1,037	18	17	1	17
<b>Diesel Fuel Gallons Displaced by CNG</b>							878.4

Source: Bear Valley Unified School District.

**Table 4: Data for December 2013**

<b>Bus #</b>	<b>Mileage Beginning</b>	<b>Mileage End</b>	<b>Mileage Total</b>	<b>Days Schools in Session</b>	<b>Days in Use</b>	<b>Days not in Service</b>	<b>Days Fueled</b>
15	7,464	7,789	325	14	2.5	11.5	2.5
16	3,756	4,059	303	14	1	13	1
17	4,077	5,232	1,155	14	13	1	13
18	3,496	3,496	0	14	0	14	0
26	3,587	4,582	995	14	14	0	14
<b>Diesel Fuel Gallons Displaced by CNG</b>							555.6

Source: Bear Valley Unified School District.

**Table 5: Data for January 2014**

<b>Bus #</b>	<b>Mileage Beginning</b>	<b>Mileage End</b>	<b>Mileage Total</b>	<b>Days Schools in Session</b>	<b>Days in Use</b>	<b>Days not in Service</b>	<b>Days Fueled</b>
15	7,619	8,486	867	14	14	0	14
16	4,059	4,059	0	14	0	14	0
17	5,105	6,299	1,194	14	14	0	14
18	3,496	3,496	0	14	0	14	0
26	4,448	5,467	1,019	14	14	0	14
<b>Diesel Fuel Gallons Displaced by CNG</b>							616

Source: Bear Valley Unified School District.

**Table 6: Data for February 2014**

<b>Bus #</b>	<b>Mileage Beginning</b>	<b>Mileage End</b>	<b>Mileage Total</b>	<b>Days Schools in Session</b>	<b>Days in Use</b>	<b>Days not in Service</b>	<b>Days Fueled</b>
15	8,486	9,270	784	18	18	0	18
16	4,059	4,059	0	18	0	18	0
17	6,299	7,556	1,257	18	18	18	18
18	3,496	4,986	1,490	18	19	0	18
26	5,467	6,515	1,048	18	17	1	17
<b>Diesel Fuel Gallons Displaced by CNG</b>							915.8

Source: Bear Valley Unified School District.

**Table 7: Data for March 2014**

<b>Bus #</b>	<b>Mileage Beginning</b>	<b>Mileage End</b>	<b>Mileage Total</b>	<b>Days Schools in Session</b>	<b>Days in Use</b>	<b>Days not in Service</b>	<b>Days Fueled</b>
15	9,270	9,975	705	15	15	0	15
16	4,059	4,204	145	15	0	15	0
17	7,556	8,642	1,086	15	15	0	15
18	4,986	6,243	1,257	15	15	0	15
26	6,515	7,559	1,044	15	15	0	15
<b>Diesel Fuel Gallons Displaced by CNG</b>							847

Source: Bear Valley Unified School District.

## **Conclusion**

Since the completion of this compressed natural gas fueling station, BVUSD has seen a substantial reduction in the use of diesel fuel. The new fueling station has also enabled the BVUSD to use compressed natural gas school buses on field trips, furthering the reduction of the use of diesel fuel. Students and parents of our BVUSD are pleased with the grants received from the CEC, which enables the school district to move forward with a cleaner, safer school bus fleet.

BVUSD would like to move forward in replacing their remaining 14 diesel school buses with compressed natural gas buses and becoming a public station. Due to the isolated area in which the school district is located, the entire mountain community, users of compressed natural gas would benefit from a public station.

# GLOSSARY

BEAR VALEY UNIFIED SCHOOL DISTRICT (BVUSD) – Bear Valley Unified School District is a school district in San Bernardino County, California, supporting the towns of the Big Bear area such as Boulder Bay, Fawnskin, Big Bear City, Big Bear Lake, Sargarloaf, etc<sup>1</sup>

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.

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 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.

Funding for the CEC's activities comes from the Energy Resources Program Account, Federal Petroleum Violation Escrow Account, and other sources.

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<sup>1</sup> [BVUSD Wikipedia page](https://en.wikipedia.org/wiki/Bear_Valley_Unified_School_District) (https://en.wikipedia.org/wiki/Bear\_Valley\_Unified\_School\_District)