



**CALIFORNIA
ENERGY COMMISSION**



California Energy Commission
Clean Transportation Program

FINAL PROJECT REPORT

Washington Unified School District Compressed Natural Gas School Bus Replacement

Prepared for: California Energy Commission

Prepared by: Southwest Transportation Agency

December 2021 | CEC-600-2021-052

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 oldest, dirtiest school buses in California. In response to GFO-17-607, the recipient submitted an application, which was proposed for funding in the CEC's notice of proposed awards November 29, 2018, and the agreement was executed as ARV-18-016 on June 7, 2019.

ABSTRACT

Washington Unified School District submitted an application to receive grant funding under the California Energy Commission Solicitation GFO-17-607 to replace four old, diesel-powered school buses. Washington Unified School District was awarded funding for two replacement compressed natural gas buses as well as partial funding for a third compressed natural gas bus. Washington Unified School District purchased three compressed natural gas buses with the grant funding through the California Energy Commission and placed these buses into service in June 2020. The old, diesel-powered buses were dismantled and removed from service.

Keywords: Washington Unified School District, grant funding, compressed natural gas, GFO-17-607, California Energy Commission

Please use the following citation for this report:

Ordoñez, Maricela (Washington Unified School District). 2021. *Washington Unified School District Compressed Natural Gas School Bus Replacement*. California Energy Commission. Publication Number: CEC-600-2021-XXX.

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EXECUTIVE SUMMARY

Washington Unified School District is a school district that provides 2,686 kindergarten through twelfth grade students the support they need to be successful. The Washington Unified School District is in Fresno County within the San Joaquin Valley. Washington Unified School District consists of two elementary schools, one middle school, one high school, and one alternative education school.

The pollution levels in the San Joaquin Valley are among the highest in the nation. Washington Unified School District strives to help reduce the emissions in the state. Washington Unified School District's priority has always been the students' well-being as well as their educational success. Washington Unified School District embraces continuous improvements to their transportation department and fleet to help keep students safe and healthy.

The Washington Unified School District features a school bus fleet of 18 buses. Of those 18 school buses, 5 are compressed natural gas school buses. The compressed natural gas fueling infrastructure is located and maintained at the Southwest Education Support Center in Caruthers, California.

CHAPTER 1:

Introduction

Background

Washington Unified School District, shown in Figure 1, serves 2,686 students, grades kindergarten through twelfth grade. The district's boundaries encompass a diverse area ranging from agricultural farmland in the community of Easton, which lies just south of Fresno, and extends to a more urban section of Southwest Fresno that has been found to have the third-highest level of concentrated poverty in the United States.¹ Ninety percent of the students in the district are considered socioeconomically disadvantaged. Basic student demographics indicate that 77.8 percent are of Hispanic descent, 7.6 percent are Asian, 6.8 percent are Caucasian, 6.3 percent are African American, 40.2 percent are English learners, shown in Tables 1 and 2, and 219 of the district's students come from migrant families.

Washington Unified School District is composed of American Union Elementary, West Fresno Elementary, West Fresno Middle School, and Washington Union High School, along with two preschools and three alternative education schools. Four nonunified K-8 schools also feed into the high school. Washington Unified School District schools exist to engage, educate, and empower students to achieve their college and career goals. From positive relationships with students, parents, and community to the ability of their teachers to deliver the best instruction for their students each and every day, the district is dedicated to preparing students for the challenge of college and careers.

Washington Unified School District is unique and provides students with a diverse set of experiences that include the traditions of a 126-year-old district blended with modern technology and a variety of rigorous and relevant programs such as the Health Institute, Law and Justice Institute and the Agriculture Institute, which is a partnership with the Wonderful Corporation and Reedley College. The district has also partnered with the Fresno County Superintendent of Schools to receive differentiated assistance to address the performance gaps among struggling student groups. It is the district's hope that this process will further contribute to the success of all students. As its vision statement declares, Washington Unified is a district of academic excellence committed to ensuring that all students graduate college or are career ready or both.

¹ [United States Census Bureau](https://data.census.gov/cedsci/table?q=concentrated%20poverty&tid=ACST1Y2019.S1701&hidePreview=true) is available at <https://data.census.gov/cedsci/table?q=concentrated%20poverty&tid=ACST1Y2019.S1701&hidePreview=true>

Figure 1: District Office at Washington Unified School District



Table 1: Washington Unified School District Ethnicity Demographics

Ethnicity	Percentage
Hispanic	77.80%
White	6.80%
Asian	7.60%

Source: Washington Unified School District

Table 2: Washington Unified School District Language Demographics

Language Fluency	Percentage
English Only	59.80%
English Learners	40.20%

Source: Washington Unified School District

The pollution in the San Joaquin Valley is evident as it features some of the worst air quality in the nation. One of the goals of the district is to help reduce greenhouse gas emissions. Its priority is the students, and the district embraces continuous improvements to help keep them safe and healthy, including reducing emissions emitted into our environment.

Current Fleet

Washington Unified School District contracts with South County Support Services Agency, located 9.3 miles away, for all home-to-school transportation services. South County Support Services Agency runs and manages the entire school bus fleet. The school bus fleet is owned

by Washington Unified School District, of which five school buses are operated with compressed natural gas (CNG). Figure 2 shows one of the fleet's new compressed natural gas buses, funded by the California Energy Commission. Washington Unified School District entire school bus fleet is stored and maintained by South County Support Services Agency.

Figure 2: Washington Unified School District CNG Bus



Source: Washington Unified School District

The Southwest Education Support Center is home to Southwest Transportation Agency and South County Support Services Agency. These agencies provide the same services to its member and associate member districts. Services provided by these two agencies include:

Transportation

- Complete home to school contracts
- Field trips statewide
- Global Positioning System-equipped buses
- Buses with DVD players and high back seats
- Bus lease
- Substitute driver coverage

- School bus driver classroom training
- Original/renewal
- School bus driver behind-the-wheel training
- In-service training

Maintenance

- Bus maintenance
- Preventive maintenance inspections
- Engine overhaul
- Transmission replacement
- Automotive Service Excellence school bus certified mechanics

Other services

- Installation of cameras, radios, and Global Positioning Systems
- CNG fueling station
- Street sweeper services

The Southwest Transportation Agency is a public joint powers authority that serves 10 school districts in southwest Fresno County. The agency was formed by five school districts in 1988 and added five associate member districts as part of South County Support Services Agency over the years. These transportation joint powers authorities provide the safest, most cost-effective home-to-school transportation possible for rural school districts in a geographically isolated part of Fresno County. Current school districts served by the agencies include original members Alvina Charter School, Monroe School District, Caruthers Unified School District, Laton Unified School District, and Riverdale Joint Unified School District. Associate members that are part of South County Support Services Agency include Kingsburg Elementary Charter School District, Pacific Union School District, Raisin City Elementary School District, and Washington Unified School District.

When Southwest Transportation Agency opened in July 1988, it operated 27 routes transporting 2,000 students (one-way) per day. Today, both agencies operate 55 home-to-school routes, transporting an excess of 10,000 students per day while traveling more than 1.3 million miles per school year. The agencies also provide more than 1,959 extracurricular trips annually.

The agencies opened the Southwest Education Support Center, a 17-acre state-of-the-art facility in 2004, shown in Figures 3 and 4. The facility consists of a 16,000-square-foot operations and maintenance center, parking for 100 school buses, and a public-access park and ride parking area with more than 208 stalls. The agencies have been a pioneer in the advancement of CNG school buses in California. The cornerstone of the center is a 15,000-gallon state-of-the-art public access CNG fueling station. The construction of this station has allowed the agencies to expand its CNG school bus fleet from the original 10 CNG school buses received through the Katz Safe School Bus Program in 1991 to the operation of 51 CNG school buses today. The agencies are committed to operating a 100-bus natural gas fleet.

Figure 3: Southwest Education Support Center



Source: Southwest Education Support Center

Figure 4: Aerial View of Southwest Education Support Center



Source: Southwest Education Support Center

CHAPTER 2:

The Project

Project Background

The School Bus Replacement Program through the California Energy Commission seeks to replace old diesel school buses with new electric school buses. However, there may be eligible applicants with bus route profiles not suited for an electric school bus. To be considered for a new CNG school bus, eligible applicants must (1) complete a series of questions and (2) provide a route profile evaluation completed by an independent third party. The applicant's answers to the CNG application questions and the route profile evaluation must meet at least 2 of the CNG bus selection criteria.

CNG Bus Selection Criteria

To be eligible for a CNG school bus, an applicant must demonstrate that an electric bus would not be sufficient to meet the needs of the applicant's regular school bus routes. To demonstrate this, the applicant's route profile evaluation and the applicant's answers to the CNG application questions must establish at least two of the following criteria for the school district total bus fleet:

- Average route distance traveled daily exceeds 90 miles.
- More than 20 percent of service days have temperatures above 80 degrees Fahrenheit or below 32 degrees Fahrenheit during the hours the bus is operated.
- Forty percent of routes are on roads with speed limits of 45 mph or higher.
- Fifty percent of routes include a 15 percent grade.

Washington Unified School District was able to successfully demonstrate meeting the criteria set forth by the California Energy Commission and thus was awarded a \$390,592 grant to fully fund two replacement CNG buses as well as partially fund a third bus.

Washington Unified School District has owned the three diesel buses replaced since 1990, and they were in service for more than 16 years. Unfortunately, these buses became inoperable recently. Washington Unified School District had to rely on another district's bus fleet to continue providing home-to-school transportation to its district's students. Washington Unified School District's association with South County Support Services Agency allowed the district to be able to continue providing home-to-school transportation to its students with minimal interruption. Since Washington Unified School District is in a disadvantaged, low-income rural community, the district had not been able to acquire the funding necessary to replace the inoperable buses. The district had applied to various grants through the California Air Resources Board Rural School Bus program and ranked 384, 385, and 479, respectively, on the Year 2 ranking list of 2017. When Washington Unified School District received notification of the School Bus Replacement program through the California Energy Commission, it sought Southwest Transportation Agency's help in applying for the grant to replace the old diesel school buses with new CNG school buses.

Obstacles/Delays

The acquisition of and placement into service of the new CNG school buses faced several issues that contributed to the delay of project completion. In normal times, the physical delivery of purchased school buses takes a few months from the date the order is placed to the actual delivery of the school buses. The COVID-19 pandemic played an enormous factor in not only the delivery of the new school buses, but the placement into service. There were numerous delays from the manufacturer, Blue Bird, in obtaining the parts to build the buses to the specifications requested by Washington Unified School District.

Since the purchase and acquisition was made through a piggyback bid in place with South County Support Services Agency, there was no need to go through a bidding process in purchasing the new school bus. The piggyback allowed the quick ordering of the bus from the date Washington Unified School District received notification of being awarded the California Energy Commission School Bus Replacement grant.

It did, however, take more than nine months to receive the new school buses. The school buses were delivered in May 2020, and upon the successful inspection by the California Highway Patrol, the new CNG school buses were placed in service in June 2020.

Data Collection

One of the requirements of the school bus replacement grant was to collect data and metrics on the usage of the new buses. These data points would be used to determine the financial, environmental, and health benefits of replacement school buses funded by CEC. Listed below are the specific data points for the three CNG buses funded by the School Bus Replacement Program.

Washington Unified Bus #30

When placed into service, over a six-month period, Washington Unified Bus #30, shown in Figure 5, traveled 11,124 miles. The replaced diesel fuel bus had a miles-per-diesel-gallon average of 5 miles as well as a total diesel fueling capacity of 100 gallons. The average and capacity equate to 2,225 gallons of diesel fuel used over a six-month operating period. The total CNG used for the six-month period was 2,590 gallons. The conversion of CNG gallons to diesel gallon equivalent (DGE) is 643 DGE. This equates to a reduction of 1,582 gallons of diesel over six months. The health benefits from this displacement of diesel are significant. Over six months, this results in a reduction of 143.24 pounds of oxides of nitrogen, 7.79 pounds of particulate matter 2.5 (PM_{2.5}), and 5.35 tons of greenhouse gas emissions. Over the 20-year life of the replacement CNG school bus, the total reductions of emissions would equate to 4,340.72 pounds of oxides of nitrogen, 236.12 pounds of PM_{2.5}, and 162.22 tons of greenhouse gas emissions. The operating and maintenance cost to power the CNG bus was equal to \$0.32 cents per mile. The total operating cost for the six-month reporting period was \$3,559.68. The previous operating cost for the replaced diesel bus was \$0.68, which would represent a six-month total cost of \$7,564.32. This represents a six-month operating cost savings for the district of \$4,004.64.

Figure 5: Washington Unified CNG Replacement Bus #30



Source: Washington Unified School District

Washington Unified Bus #31

When placed into service, over a six-month period, Washington Unified Bus #30, shown in Figure 6, traveled 9,852 miles. The replaced diesel fuel bus had a miles-per-diesel-gallon average of 5 miles as well as a total diesel fueling capacity of 100 gallons. The average and capacity equates to 1,970 gallons of diesel fuel used over a six-month operating period. The total CNG used for the six-month period was 2,066 gallons. The conversion of CNG gallons to diesel gallon equivalent (DGE) is 513.5 DGE. This equates to a reduction of 1,456.5 gallons of diesel over six months. The health benefits from this displacement of diesel are significant. Over a six-month period, these benefits result in a reduction of 147.12 pounds of oxides of nitrogen, 8.10 pounds of PM_{2.5}, and 6 tons of greenhouse gas emissions. Over the 20-year life of the replacement CNG school bus, the total reductions of emissions would equate to 4458.64 pounds of oxides of nitrogen, 245.65 pounds of PM_{2.5}, and 181.8 tons of greenhouse gas emissions. The operating and maintenance cost to power the CNG bus was equal to \$0.30 cents per mile. The total operating cost for the six-month reporting period was \$2,955.60. The previous operating cost for the replaced diesel bus was \$0.72, which would represent a six-month total cost of \$7,093.44. The difference equals a six-month operating cost savings for the district of \$4,137.84.

Figure 6: Washington Unified CNG Replacement Bus #31



Source: Washington Unified School District

Washington Unified Bus #32

When placed into service, over a six-month period, the CNG replacement bus traveled 9,720 miles. The replaced diesel fuel bus had a miles-per-diesel-gallon average of 5 miles as well as a total diesel fueling capacity of 100 gallons. The average and capacity equate to 1,944 gallons of diesel fuel used over a six-month operating period. The total CNG used for the six-month period was 2,126 gallons. The conversion of CNG gallons to diesel gallon equivalent (DGE) is 528 DGE. This equates to a reduction of 1,416 gallons of diesel over six months. The health benefits from this displacement of diesel are significant. Over the six-month period, these benefits result in a reduction of 82.1 pounds of oxides of nitrogen, 4.15 pounds of PM_{2.5}, and 1.55 tons of greenhouse gas emissions. Over the 20-year life of the replacement CNG school bus, the total reductions of emissions would equate to 2487.62 pounds of oxides of nitrogen, 125.88 pounds of PM_{2.5}, and 47 tons of greenhouse gas emissions. The operating and maintenance cost to power the CNG bus was equal to \$0.17 cents per mile. The total operating cost for the six-month reporting period was \$1,652.40. The previous operating cost for the replaced diesel bus was \$0.68, which would represent a six-month total cost of \$6,609.60. The difference represents a six-month operating cost savings for the district of \$4,957.20.

CHAPTER 3:

Conclusion

The acquisition of the new CNG school buses was vital to the long-term success and continued home-to-school transportation for Washington Unified School District students. Not only is it saving the district time and money, but it is helping reduce the total emissions placed into our environment. Washington Unified School District is striving to contribute to California's overall goals of decreasing greenhouse gas emissions. The district's next goal is to continue applying for funding that would allow the district to replace the remaining old diesel school buses with new CNG school buses. Washington Unified School District is dedicated to doing its part to help California achieve cleaner air.

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.

WASHINGTON UNIFIED SCHOOL DISTRICT — Washington Unified School District is a public school district located in Fresno, Ca. It has 2,686 students in grades K-12 with a student-teacher ratio of 23 to 1. According to state test scores, 26 percent of students are at least proficient in math and 37 percent in reading.