



**CALIFORNIA
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California Energy Commission
Clean Transportation Program

FINAL PROJECT REPORT

Bulk Biomass Diesel Dispenser Adjacent to San Jose Pipeline Terminal

Prepared for: California Energy Commission

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Gavin Newsom, Governor

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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-09-006 to upgrade public and private infrastructure investments, expand the network of public-access and fleet fueling stations and charging sites based on the population of existing and anticipated vehicles, and put in place infrastructure that will ultimately be needed to accommodate transportation fuels with very low greenhouse gas emissions. In response to PON-09-006, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards May 6, 2011, and the agreement was executed as ARV-10-019 on May 17, 2010.

ABSTRACT

As California increases its use of low-carbon biofuel, additional transportation fuels storage will become a necessity. Since biodiesel is hydrophilic it cannot be shipped in many pipelines. This is a logistical challenge to fuel suppliers attempting to market blends (B-20, etc.), and so creates additional costs in a low-margin, competitive marketplace. Trucks carrying bulk loads must typically on-load 6,600 gallons of diesel at a refinery or pipeline terminal and then stop at a bulk storage facility to top-off with 1,400 gallons of biodiesel to achieve a B-20 blend. The proposed facility will virtually be co-located with a pipeline terminal, essentially eliminating a step required of bulk biodiesel: diesel blend transporters.

Western States Oil operates a commercial truck stop on a parcel immediately adjacent to the San Jose Kinder-Morgan pipeline terminal. Western State's facility can easily be used to top-off partially loaded transfer trucks departing the Kinder Morgan terminal with biodiesel (fatty acid methyl esters). This pipeline terminal services the southern region of the San Francisco Bay Area such as San Jose, Sunnyvale, Palo Alto, Fremont, and Hayward, and will be instrumental in the achievement of those communities' climate action plans and the State of California's Low Carbon Fuel Standard.

The project will facilitate the introduction of 5.25 million gallons per year of B-99, 21 million gallons per year of B-20, or 105 million gallons per year of R-20 (5 percent diesel component) into California's diesel supply chain, at a cost of \$69,223.

Keywords: California Energy Commission, biodiesel, biofuels, Western States Oil, fuel storage

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EXECUTIVE SUMMARY

Biodiesel's hydrophilicity (its tendency to mix with or dissolve in water) means it cannot be transported through many pipelines. This represents a substantial cost barrier to its proliferation, as suppliers of biodiesel blends are typically subject to excess costs: trucks already carrying diesel fuel—loaded at a refinery or pipeline terminal—must make an additional trip to a separate biodiesel storage facility.

This project's goal was to eliminate that additional trip. It proposed converting an existing, above-ground, permitted, and operational 8,000 gallon tank used for retail gasoline dispensing into one used for wholesale biodiesel dispensing. Located at a Western States Oil-operated truck stop immediately adjacent to the San Jose Kinder-Morgan pipeline terminal, a retrofitted tank essentially eliminated the transport cost usually associated with biodiesel blends.

The tank was re-plumbed, given a high-speed pump, and fitted with the appropriate dispenser. Operation for its new purpose began in October 2012, and will facilitate the introduction of 5.25 million gallons per year of B-99, 21 million gallons per year of B-20, or 105 million gallons per year of R-20 (5 percent diesel component) into California's diesel supply chain, at a cost of \$69,223.

CHAPTER 1: Project Introduction

Since biodiesel is hydrophilic it cannot be shipped in many pipelines. This is a logistical challenge to fuel suppliers attempting to market blends (B-20, etc.), and so creates additional costs in a low-margin, competitive marketplace. Trucks carrying bulk loads must typically on-load 6,600 gallons diesel at a refinery or pipeline terminal and then stop at a bulk storage facility to top-off with 1,400 gallons of biodiesel to achieve a B-20 blend. The proposed facility will virtually be co-located with a pipeline terminal, essentially eliminating a step required of bulk biodiesel: diesel blend transporters.

Figure 1: Western States Oil Pacific Pride Fueling Site



Photo credit: Andre Freeman, CEC

The project's goal was to convert an existing, above-ground, permitted, and operational 8,000 gallon tank from dispensing gasoline in a retail mode to dispensing biodiesel in a wholesale mode. The tank is located at a Western States Oil-operated commercial truck stop, adjacent to the San Jose Kinder-Morgan pipeline terminal, which services the southern region of the San Francisco Bay Area: San Jose, Sunnyvale, Palo Alto, Fremont, and Hayward. Existing pumps and piping were to be removed. The tank was to be fitted with a high-speed pump and re-plumbed and fitted with the appropriate dispenser. This simple conversion would enable transfer trucks or truck and trailers to immediately access biodiesel as those vehicles leave the pipeline terminal. The tank being proposed for conversion is 8,000 gallons. The anticipated throughput can be supported by three truck and trailers per day, which will supply the

biodiesel as part of a back-haul; i.e., three trailers bringing B-99 and bringing out B-20. No increase in truck traffic is anticipated.

Figure 2: Trucks Fueling at Site



Photo credit: Andre Freeman, CEC

The California Air Resources Board (ARB) is developing regulations that will support the Low Carbon Fuel Standard (LCFS). A blend of 15—16 percent renewable diesel (hydrotreated fats) and 4—5 percent biodiesel (fatty acid methyl esters) with 80 percent ultra-low sulfur diesel is being reviewed by ARB staff and is postulated to be nitrogen oxide neutral. Biodiesel (fatty acid methyl esters) should be very useful as a lubricity additive as well as a particulate mitigation strategy. To support the LCFS, the project will facilitate the introduction of 5.25 million gallons per year of B-99, 21 million gallons per year of B-20, or 105 million gallons per year of R-20 (5 percent biocomponent) into California's diesel supply chain, at a cost of \$69,223. The blended fuel type will be determined by market conditions.

CHAPTER 2: Conclusion

The facility was successfully built and began operation in October 2012. The following volumes of B-99 biodiesel were dispensed during the initial six months of startup:

Table 1: B-99 Dispensed

Year	Month	Volume of B-99 (Gallons)
2012	October	7,272
	November	5,329
	December	6,340
2013	January	6,827
	February	15,679
	March	13,873

Source: Western States Oil

Figure 3: Biodiesel-Diesel Split Storage Tank



Photo credit: Andre Freeman, CEC

During the course of the project, changes in the California biodiesel industry and permitting process proved to be setbacks. However, these occurrences provided useful information that can be utilized for future facilities.

The feedstocks utilized for biodiesel are very important to market acceptance. The biggest issue with feedstocks in California is counter intuitive cold flow. Biodiesel derived from animal fats will have difficulties throughout the year because of the low temperatures throughout the coastal region of the state, as well as the close proximity of high elevations. Animal fat-derived biodiesel will literally jell in vehicle fuel tanks. With the growing maturity of the industry and industry-led efforts such as the BQ 9000 quality control system, the industry is quickly establishing standards that will provide fuel providers more confidence in a finished biodiesel product. Additional problems regarding biodiesel quality have centered on shipping and handling. Careful attention must be paid to both in-house and third party logistics providers to eliminate problems such as product contamination, exposure of product to extreme temperatures, and inappropriate blending. There is also a significant problem in the treatment of biodiesel in storage systems. Nearly all problems with biodiesel in storage systems stem from hydrocarbon utilizing microbes. These problems can be eliminated through three measures: employment of desiccating filters on any opening to the atmosphere, such as overflow tubes; routine annual tank cleaning; and employment of a biocide.

There were two major hurdles in the construction of this facility. The regulatory oversight of the facility was transferred during the course of the project to the local fire department, which required product compatibility data for all of the components in the system, despite the system being an above-ground tank. This turned out to be a useful exercise, although it also delayed the project and added additional costs. There were also some issues with the switches that were installed in the data system. It took an additional three months to achieve a consistent operation of the site.

After having built and operated the facility for over six months, this project has set an example for future fueling sites to be based off of. As the LCFS promotes increasing amounts of biofuels into the conventional fuel stream, biodiesel blending facilities will become increasingly important. This facility will likely experience increased throughput volumes and show to be a valuable investment by the State of California.

GLOSSARY

B-20—A mixture of 20 percent biodiesel and 80 percent petroleum diesel based on volume.¹

B-99—Biofuel blend using up to 99.9 percent biodiesel.²

CALIFORNIA AIR RESOURCES BOARD (ARB)—The “clean air agency” in the government of California whose main goals include attaining and maintaining healthy air quality, protecting the public from exposure to toxic air contaminants, and providing innovative approaches for complying with air pollution rules and regulations.

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.

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 to cut greenhouse gas emissions and other smog-forming and toxic air pollutants by improving vehicle technology, reducing fuel consumption, and increasing transportation mobility options.

HYDROPHILIC—Of, relating to, or having a strong affinity for water.³

R-20—Diesel fuel blended with 20 volume percent renewable diesel.⁴

1 [California Air Resources Board Glossary](https://www.energy.gov/eere/bioenergy/full-text-glossary#B) (https://www.energy.gov/eere/bioenergy/full-text-glossary#B)

2 [U.S. DOE Biodiesel Handling and Use Guide](https://afdc.energy.gov/files/u/publication/biodiesel_handling_use_guide.pdf) (https://afdc.energy.gov/files/u/publication/biodiesel_handling_use_guide.pdf)

3 [Merriam-Webster](https://www.merriam-webster.com/dictionary/hydrophilic) (https://www.merriam-webster.com/dictionary/hydrophilic)

4 [California EPA Multimedia Evaluation of Renewable Diesel](https://ww2.arb.ca.gov/sites/default/files/2018-08/Renewable_Diesel_Multimedia_Evaluation_5-21-15.pdf) (https://ww2.arb.ca.gov/sites/default/files/2018-08/Renewable_Diesel_Multimedia_Evaluation_5-21-15.pdf)