CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

Clean Transportation Program

FINAL PROJECT REPORT

BORDER VALLEY TRADING, LLC. LIQUID NATURAL GAS FUELING STATION IN PALM SPRINGS

Prepared for: California Energy Commission

Prepared by: Border Valley Trading, LLC.

March 2023 | CEC-600-2023-014

California Energy Commission

Ulrich Sauerbrey
Primary Author

Border Valley Trading, LLC.
PO Box 2620
Indio, CA 92202
(760) 351-7791

Agreement Number: ARV-10-054

Sarah Williams
Commission Agreement Manager

Elizabeth John
Branch Manager
MEDIUM- AND HEAVY-DUTY ZERO EMISSION TECHNOLOGIES

Hannon Rasool
Director
FUELS AND TRANSPORTATION

Drew Bohan
Executive Director

ACKNOWLEDGEMENTS

The following team members contributed to the data analysis and writing of this report:

- Greg Braun, President, Border Valley Trading, LLC.
- Phil Barroca, Air Quality Specialist, South Coast Air Quality Management District.
- Drue Ann Hargis, Senior Public Information Specialist, South Coast Air Quality Management District.

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-09-006 to provide funding opportunities under the Clean Transportation Program for projects which develop infrastructure necessary to store, distribute, and dispense electricity, E-85, Biomass-based diesel, and natural gas. In response to PON-09-006, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards June 10, 2011 and the agreement was executed as ARV-10-054 on November 8, 2011

ABSTRACT

Liquid natural gas offers many benefits to the world, including cleaner and less expensive fuels. With its increased popularity, one problem is that there are not a lot of facilities to offer these services.

The successful development of this station at this location has closed a tremendous gap in the availability of liquefied natural gas refueling infrastructure in the area. The station will provide a critical halfway point between the nearest 24/7 publicly accessible liquefied natural gas station in the Inland Empire and the California/Arizona border.

This facility also provides a much needed fueling bridge for other long haul trucking operators serving the link between the Imperial Valley and the Ports of Los Angeles and Long Beach. The development of this station also provided a critical link in the availability of liquefied natural gas infrastructure in the east-west direction of Southern California and the South Coast Air Basin.

Keywords: Liquid natural gas, fast fuel dispenser, storage vessel

Sauerbrey, Ulrich, 2023. *Border Valley Trading, LLC. Liquefied Natural Gas Fueling Station in Palm Springs*. California Energy Commission. Publication Number: CEC-600-2023-014

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

In 2011, Border Valley Trading, LLC. was awarded a $251,865 South Coast Air Quality Management District grant to assist with the development of the phase one site improvements and liquefied natural gas fueling infrastructure at the Palm Springs site. This grant was possible because of an award made to South Coast Air Quality Management by the California Energy Commission, namely CEC Agreement ARV-10-054.

Border Valley Trading, LLC. has completed the construction of these improvements, located at 670 West Garner Road, Palm Springs. This site is strategically located adjacent to the I-10 corridor, just north of Palm Springs and is accessible via the Indian Avenue off ramp in both the easterly and westerly directions. The development of this liquefied natural gas fueling station is a key hub and midpoint for not only the Border Valley Trading, LLC. and Hay Day Farms fleets but is also a key location or liquefied natural gas trucks making the Imperial Valley to the LA and Long Beach ports as well as a vital link between the Phoenix to LA haul route.

Scope of work included the acquisition of the site, California Environmental Quality Act compliance, land-use entitlements, engineering and agency approvals, material and labor procurement via subcontracts, construction and operational start up for a 6,000-gallon quick response station portable fueling unit.

Construction improvements included site grading, walls, concrete, drainage, electrical services, paving, gates and operating systems, and the install of the quick response station unit. Operational improvements included the installation of a point-of-sale operating system to allow both Border Valley Trading, LLC. and Hay Day Farms fleets to refuel while auto logging throughput to a central database for billing and reporting. This operating system will also allow other users to purchase fuel with the use of over-the-counter credit cards or company issued fuel cards.

CHAPTER 1:
Project Background and Objectives

Project Background

Border Valley Trading, LLC. (BVT) and Hay Day Farms (HDF) are two large international exporters of high-quality agricultural feed products. In response to local air district directives and the San Pedro Bay Ports Clean Truck Program, both companies began transitioning away from diesel fuel in their fleets and began incorporating liquefied natural gas (LNG) into their operations in 2008.

Both companies relied on an LNG station at a SunLine Transit facility, located in Thousand Palms, CA, to support the fueling needs of 40 LNG trucks. When Clean Energy suddenly removed the public access to the LNG station in Thousand Palms in November of 2008, BVT and HDF were suddenly presented with an immediate challenge: a large and growing LNG heavy-duty truck fleet and a lack of access to a convenient and reliable public access LNG fueling station. BVT and HDF committed to fund acquisition of a site, entitlement and engineering and construction of a public access LNG fueling station in the region to support their needs as well as the needs of other local and regional natural gas vehicle users.

The partnership set forth to acquire a parcel of land strategically located on the I-10 corridor, in north Palm Springs, with the support of GreenFIX America and Gladstein, Neandross & Associates, obtain California Environmental Quality Act and agency approvals. GreenFIX America then managed procurement and construction of the site as well as development of the phase one LNG fueling station. GreenFIX America is also responsible for providing day-to-day management and operations services as well as throughput data collection and reporting.

The successful development of this station at this location has closed a tremendous gap in the availability of LNG refueling infrastructure in the area. The station will provide a critical halfway point between the nearest 24/7 publicly accessible LNG station in the Inland Empire and the California/Arizona border. This facility also provides a much needed fueling bridge for other long haul trucking operators serving the link between the Imperial Valley and the Ports of Los Angeles and Long Beach. The development of this station also provided a critical link in the availability of LNG infrastructure in the east-west direction of Southern California and the South Coast Air Basin.

Both BVT and HDF have a long-standing and solid business presence in the region. The companies are well known and respected in the Coachella Valley. With a long standing and successful business presence and with a large and growing fleet of heavy-duty LNG trucks consuming over 5,000 gallons of LNG per day, maintenance and continued operation of the LNG station will remain critical for their operations and will provide an additional assurance this station will remain in service for the years to come.

In addition to supporting their own fleets with the development of the Palm Springs site, BVT and HDF have been strong proponents within the agri-business and their supporting operations for the conversion of older diesel burning equipment to cleaner burning LNG and compressed natural gas (CNG) equipment. The development of the Palm Springs site is a direct compliment to those efforts.

CHAPTER 2:
A Summary of Project Partners for the Border Valley Project:

BVT's Palm Springs facility is adjacent to the I-10 and is easily accessible from the west and east bound Indian Avenue (Exit 120) off-ramps. The fueling facility makes LNG fueling available to privately owned heavy- and medium-duty truck fleets as well as nearby agencies whose minimal fleet sizes prevent them from autonomously developing such a station. The development of this LNG infrastructure aimed to achieve the following:

- Reduce air pollution emissions and diesel consumption from heavy-duty motor vehicles traveling throughout Southern California.
- Provide a vital LNG infrastructure link along the Interstate Clean Transportation Corridor.
- Provide an LNG fueling site necessary to initially provide capacity for BVT and HDF to operate its heavy-duty trucks.
- Provide a critical LNG fueling link between the Phoenix and Los Angeles corridors and the Imperial Valley to Los Angeles and Long Beach port corridors.
- Allow for the expanded market penetration of additional clean fuel, natural gas vehicles along the Interstate Clean Transportation Corridor and especially along I-10.

BVT, with the assistance of GreenFIX America, managed all aspects of development and construction. Work was awarded and performed through a series of subcontracts with many trades involved in the successful completion of the station. All work performed at the station met governing agency requirements including International Building Code and National Fire Protection Agency. As lead agency, the City of Palm Springs performed inspections and issued the certificate of occupancy, dated March 20, 2012.

Currently, the station is operating with one 6,000-gallon storage quick response station unit. In addition, the site has been developed to allow for a phase two expansion to include an up to 15,000 storage vessels with additional LNG dispensing and CNG compressor, storage and dispensing.

The station saturates the entire contents of the storage tank immediately upon refill. This automatically occurs when the offload operator changes the selector switch from "offload" to "dispense." Saturation is accomplished by circulating LNG through an ambient vaporizer and back into the tank. The station operator can select variable saturation set points between 25 and 100 psi.

Once the LNG is properly saturated, LNG is dispensed via a suitable cryogenic pump. GreenFIX America continues to monitor the LNG vessel supply with a metering device that will automatically log throughput to a database for billing and reporting purposes.

GreenFIX America managed the construction and the completion of various civil improvements: underground improvements, foundations, phone equipment, electrical equipment, concrete, masonry, fence, asphalt, and landscape work. GreenFIX America also managed the installation of the quick response station fueling unit and installed the point-of-

sale system. The system has been tested by GreenFIX America and also inspected and accepted by the appropriate permitting agencies. A certificate of occupancy and operation was issued March 20, 2012.

BVT in partnership with HDF purchases its LNG fuel from the Alt Industries Topock, AZ. facility, located just east of Needles, CA. Fuel deliveries are performed by HDF. The Palm Springs facility is managed and maintained by GreenFIX America.

Project Partners

Table 1 shows the funders of this project and the phase they funded.

Table 1: Project Partners

Company Name	Role
South Coast Air Quality Management District#12253/CTP CEC #ARV-10-054	Funder-Phase 1 Improvements (Completed)
CTP CEC #ARV-10-042	Funder-Phase 2 Improvements (In Progress)
Mobile Source Air Pollution Reduction Review Committee #MS11010	Funder-Phase 2 Improvements (In Progress)
South Coast Air Quality Management District #14033 - AB1318 Mitigation Project (Coachella Valley Sentinel Power Plant Fund)	Funder-Phase 2 Improvements (In Progress)
Hay Day Farms	liquefied natural gas Fleet-Operator

Source: Border Valley Trading, LLC.

CHAPTER 3:
Benefits in Terms of Emissions Reductions

This project will significantly reduce diesel consumption and toxic emissions of priority pollutants along the I-10, CA-60 and I-710 corridors. BVT and HDF have achieved the admirable goal of converting 100 percent their heavy-duty truck fleets to operate on clean burning LNG. This is certainly a success story that brings great credit not only to BVT and HDF, but also to South Coast Air Quality Management District (SCAQMD), Mobile Source Air Pollution Reduction Review Committee, CEC, California Air Resources Board, and other project partners. As shown in Table 2 over the life of this project, it is anticipated that it will enable direct emission reductions of oxides of nitrogen (NOx) and particulate matter (PM).

Table 2: Total Direct Emission Reductions

	BVT		**HDF**		**TOTAL**	
Criteria Pollutant Emission Reduction Calculation	**NOx**	**PM**	**NOx**	**PM**	**NOx**	**PM**
Baseline Emission Factor (g/mi) 2003-2006	11.63	0.252	11.63	0.252	24.26	0.50
Reduced Emission factor (g/mi) for 2010 NG	0.58	0.029	0.58	0.029	1.16	0.58
Conversion Factor (bhp-hr/mi)	2.90	2.90	2.90	2.90	5.80	5.80
Energy Consumption Factor (bhp-hr/ga)	18.50	18.50	18.50	18.50	37.0	37.0
Daily LNG Consumption (LNG gallons)	140	140	145	145	285.0	285.0
Operating Days Per Year	286	286	286	286	572.0	572.0
Annual Fuel Consumption (LNG gallons)	40,040	40,040	41,470	41,470	81,470	81,470
Annual Fuel Consumption (dge)	23,553	23,553	24,394	24,394		
Projected Baseline Emissions (tons/year)	**1.93**	**0.042**	**1.995**	**0.043**	**3.88**	**0.085**
Projected Reduced Emissions (tons/year)	0.10	0.005	0.10	0.005	0.20	0.010
Annual Emission Reductions (tons/year)	**1.83**	**0.037**	**1.895**	**0.038**	**3.73**	**0.75**
Project Life	10	10	10	10		
Number of Vehicles	20	20	20	20		

TOTAL ANNUAL EMISSION REDUCTION	**36.6**	**0.74**	**37.9**	**0.76**	**74.5**	**1.5**
TOTAL PROJECT EMISSION REDUCTION	**366**	**7.4**	**379**	**7.6**	**745**	**15**

Source: Border Valley Trading, LLC.

Because of the energy security and air quality gains that can be realized through this project, the importance of BVT's Palm Springs fueling station cannot be overstated. As anticipated, upon witnessing the success of the fueling facility, other heavy-duty fleet operators in the area have expressed an interest in converting their diesel burning truck natural gas trucks; thus, even further increasing the energy and air quality benefits resulting from this project.

CHAPTER 4:
Detailed Description of the Scope of Work

Task 1: Construction & Installation of Phase One Fueling Station

All aspect for the development and construction of the Palm Springs phase one LNG station were either managed or performed by GreenFIX America and procured via subcontracts to BVT.

The following work performed through subcontracts:

- Site Clearing and Grubbing (Nuevo, Inc.)-removal of vegetation and debris
- Site Grading (Nuevo, Inc.)-site pre-water, PM10 (dust) and storm water pollution prevention plan compliance controls, earthwork cut and fills and finish grade
- Site Wall Construction (JGinger Masonry)-installation of site perimeter walls including footing excavation, footing pours and masonry block installation
- Gate and Gate Operating Access Controls (Palm Springs Welding/EES Control Systems)-installation of ingress and egress wrought iron gates, wireless transponder transmitter and receiver and access keypad kiosk
- Site Electrical (Johnson Electric)-installation of master control panel and site electrical in support of phases one and two fueling units, gate operating systems and site security lighting
- Site Paving (AAA Paving)-installation of site driveways and access roads
- Site Concrete (Nuevo, Inc.)- fuel bays and equipment foundations
- LNG Fueling (GreenFIX America)-installation of quick response station fueling unit, fire and gas detection equipment and controls, point of sale operating systems development of fire department and driver training manuals

Task 2: Operation and Maintenance of the Palm Springs Station

Proper functioning of the phase one quick response station LNG fueling station is critical to the BVT and HDF export operations. Routine preventative maintenance of the quick response station fueling equipment, gate operators, site and electrical is performed by trained personnel employed by GreenFIX America. All throughput and usage data are collected by GreenFIX America and distributed to BVT and HDF for billing purposes and to CEC, SCAQMD and Mobile Source Air Pollution Reduction Review Committee for reporting purposes.

CHAPTER 5:
Annual Fuel Throughput and Usage Data

Table 3 is a monthly summary of the fuel throughput and usage data for the BVT Palm Springs facility for a one-year period from August 21, 2013 through August 20, 2014.

Table 3: LNG Throughput

Actual LNG Throughput			
Period	**LNG Dispensed in DGE**	**Fueling Events**	**No. of Vehicles Fueling**
08/21/13-09/20/13	48,424.50	807	29
09/21/13-10/20/13	51,434.70	866	31
10/21/13-11/20/13	53,663.20	954	32
11/21/13-12/20/13	48,353.50	847	30
12/21/13-01/20/14	30,705.10	603	31
01/21/14-02/20/14	49,082.20	857	29
02/21/14-03/20/14	42,601.50	750	29
03/21/14-04/20/14	48,075.50	799	28
04/21/14-05/20/14	43,342.80	727	30
05/21/14-06/20/14	23,289.90	433	28
06/21/14-07/20/14	42,966.80	723	27
07/21/14-08/20/14	35,688.80	610	25
12 Month Period	**517,628.50**	**8,976**	**349**

Source: Border Valley Trading, LLC.

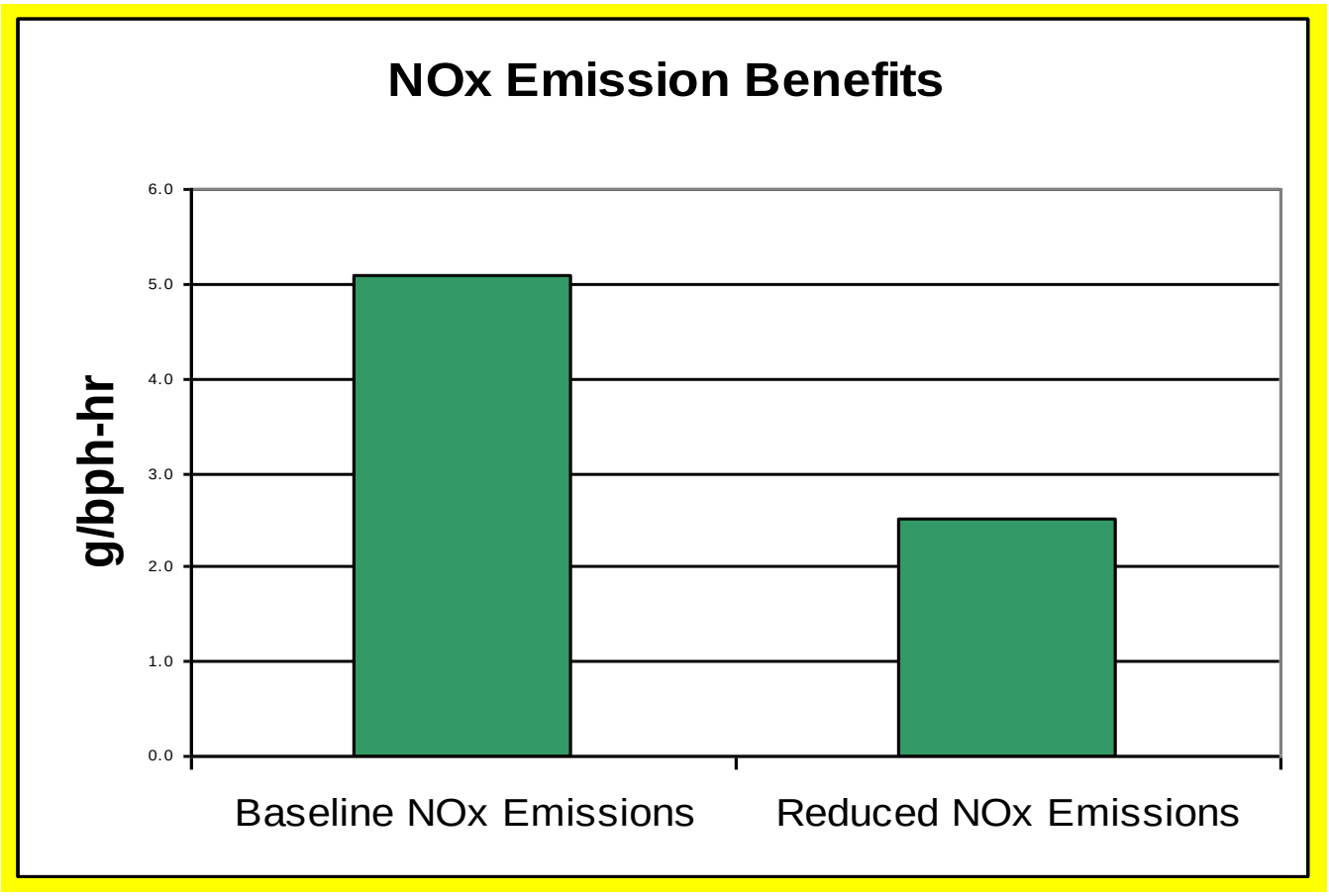
CHAPTER 6:
Results

BVT's, in conjunction with HDF's, successful LNG truck deployment and phase one fueling station construction project has been an incredible achievement and would have been difficult to implement without the support of the project's partners. BVT has worked diligently with engine and truck manufacturers to commit to and provide valuable operational feedback, which has resulted in improved equipment durability and reliability. This commitment has been further memorialized with the commitment to build the phase one LNG station in Palm Springs, not only support its own operations, but to also provide a much-needed natural gas fueling hub on the Los Angeles to Phoenix and Imperial and Los Angeles and Long Beach Ports corridors.

In terms of emission benefits, the phase one Palm Springs station is supporting the operation of 40 Class eight Kenworth T800 tractors equipped with the 15-liter Westport engines.

These engines achieve 50 percent nitrogen oxide emission reductions and use a combination of approximately 85percent natural gas and 15 percent diesel fuel to achieve California Air Resources Board optional low nitrogen oxide certification. As shown in Figure 1 below the projected emission reductions and diesel displacement for the 40 trucks is meeting the performance goals.

Figure 1: NOx Emission Benefits



Source: Border Valley Trading, LLC.

The Kenworth T800s are equipped with the Westport Innovations LNG fuel system and Westport 15-liter GX engine. A typical LNG Class eight truck may reduce nitrogen oxide and greenhouse gas emissions by up to an estimated 21-27 percent respectively, compared to a diesel-fueled truck. (Source: Westport Innovations). Table 4 shows the nitrous oxide levels of each engine.

Table 4: Summary of NOx Emission Benefits

Summary of NOx Emission Benefits for Heavy-Heavy-Duty		
	NOx Certification	**NOx NTE Level**
Cummins Westport ISL G Natural Gas Engine	0.2	0.3
Navistar 10.4 Liter Diesel Engine	1.2	1.8
Natural Gas Benefits	83%	83%

Source: Border Valley Trading, LLC.

CHAPTER 7:
Costs

BVT and its partner HDF have made a significant business investment in developing the Palm Springs LNG fueling facility. Phase one costs have included the following major categories:

- Land Acquisition $281,132
- Site Improvements & Equipment $445,427
- Site Electrical $73,386
- Permits & Planning $340,760
- Consulting, Engineering, Project Management & Entitlements $177,421
- Total Cost-Phase one $1,318,126

This investment was made both as a commitment to a cleaner burning fuel and benefit to the environment, but also as an opportunity to reduce long term operational costs through fuel savings. The work completed to date (phase 1) has been completed with expansion and growth in mind. Phase 2, which includes increased storage and fueling capabilities, will benefit from capital commitment and phase one work performed to date. It is anticipated that phase two will be completed in spring 2015.

The support of SCAQMD with their grant of $251,865 has been critical to help reduce the initial investment burden sustained by BVT and HDF.

These grant dollars, as well as the initial private investment, have not only provided LNG fueling at a key location on the I-10, but they have also provided the infrastructure and opportunity for an expanded facility as market demand dictates. This ideal location will provide a cost-effective LNG fueling option for other heavy-duty long-haul operators, within the SCAQMD, travelling on the I-10 corridor from the east and south to the LA marketplace.

A summary of project costs for phases one & two and funding partners:

- BVT-Phase one $533,131
- HDF-Phase one $533,130
- SCAQMD-Phase one $251,865
- Total-Phase one $1,318,126
- CEC-Phase two $500,000
- Mobile Source Air Pollution Reduction Review Committee /AB 2766 Discretionary Fund-Phase two $150,000
- SCAQMD-Phase two 1318 Mitigation Project $900,000
- Total-Phase two $1,550,000
- Total Costs $2,868,126

The actual costs for phase one were nearly 20 percent higher than estimated costs. These costs included fire and gas detection as well as integrating a point-of-sale system with the data collector on the quick response station fueling unit.

CHAPTER 8:
Barriers and Solutions

The work performed in phase one has primarily been to develop a site, which will provide:

- A strategic location to provide LNG fueling capabilities to their respective truck fleets (phase one).
- A strategic location for other natural gas vehicle operators doing commerce along the I-10 to access LNG fuel.
- A site which has been developed to provide for storage and fueling expansion while helping to reduce upfront business investment costs.
- Provide fuel into the marketplace at a competitive price. Current pricing in the marketplace is based on the cost of diesel (diesel less 15-20 percent) and not on the cost of providing fuel into that same marketplace.

Challenges for business (BVT and HDF) operators to enter the LNG marketplace have been:

- Cost of land at key locations accessible to the major transportation corridors.
- Limited understanding of LNG infrastructure at the staff, planning commission and council levels which result in lengthy review and approval processes.

BVT and HDF, with the support of GreenFIX America, made the commitment to spend the time and money necessary to enter the marketplace as well as take the time to work closely with City staff and leadership to educate on the values and benefits of natural gas vehicle fuels. This commitment was rewarded with project approvals and operational occupancy in March of 2012.

A critical challenge needing to be overcome will be to demonstrate that private business investment will be rewarded with a savings or return. Not only will continued public support remain essential in bringing natural gas vehicle fueling infrastructure to the marketplace, but lesser cost fuel alternatives will also be the primary driver for continued and expanded growth of LNG, CNG and other clean energy fuel alternatives.

The cost of the fuel will also continue to be a barrier to growth. If operators of long and local fleets can achieve returns on their investments, then commitments will be made to purchase cleaner burning vehicles and the infrastructure to support them. State and local grant dollars will certainly help reduce the gap between investment and return. However, if LNG fuel offered in the marketplace remains near the cost of diesel, entry for private business into the natural gas vehicle marketplace will continue to be inhibited.

CHAPTER 9: Recommendations

BVT and HDF remain strong advocates for low emission, alternative fuel vehicles. SCAQMD's financial support of the phase one work has provided an additional partner and incentive to help to bring the Palm Springs fueling facility to fruition. Continued SCAQMD support for these types of projects will be essential to help bring competitive alternative fuels to the marketplace. Recommendations include:

- Continued financial support of private fleet operators to develop infrastructure in support of their, other local and regional businesses desiring to operate natural gas vehicle vehicles.
- Continued financial support to develop LNG fuel sources. Limited access to bulk LNG fuel has resulted in a couple of large companies controlling the fuel available and being sold to the public. This limited access has resulted in artificially high prices…. that in turn have resulted in barriers for the business operators to enter the marketplace.

With expansion comes competition…. which in turn will help improve access to more cost-effective goods and services. Continued promotion and financial support from SCAQMD and other funding agencies will continue to help move the pendulum from older diesel burning vehicles to cleaner burning natural gas vehicles.

GLOSSARY

BORDER VALLEY TRADING, LLC. (BVT)—Border Valley Trading, LLC. was founded in 1989. Since its founding, the Border Valley team has been committed to being the best, most reliable, and most diverse exporter and domestic supplier of alfalfa and grass hay/straw.

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.

HAY DAY FARMS (HDF)—Hay Day Farms focuses on producing quality feed for foreign and domestic dairy and beef cattle.

NITROGEN OXIDES (OXIDES OF NITROGEN, NOx)—A general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes and are major contributors to smog formation and acid deposition. NO2 is a criteria air pollutant and may result in numerous adverse health effects.

LIQUEFIED NATURAL GAS (LNG)—Natural gas that has been condensed to a liquid, typically by cryogenically cooling the gas to minus 260 degrees Fahrenheit (below zero).

PARTICULATE MATTER (PM)—Unburned fuel particles that form smoke or soot and stick to lung tissue when inhaled. A chief component of exhaust emissions from heavy-duty diesel engines.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)—The air pollution control agency for all of Orange County and the urban portions of Los Angeles, Riverside, and San Bernardino counties. This area of 10,740 square miles is home to over 17 million people—about half the population of the whole state of California. It is the second most populated urban area in the United States and one of the smoggiest. Its mission is to clean the air and protect the health of all residents in the South Coast Air District through practical and innovative strategies.