

FINAL REPORT

Construct New Public-Access CNG Station – Arrow Services, Inc.

MSRC Contract # MS16103

Submitted by:
Arrow Services, Inc.
May 3, 2018

Prepared for the Mobile Source Air Pollution Reduction Review Committee (MSRC) under the
AB 2766 Discretionary Fund Work Program.

ACKNOWLEDGEMENTS

Arrow Services, Inc. wishes to acknowledge the Mobile Source Reduction Review Committee for its funding and program support and guidance.

This report was submitted in fulfillment of MSRC Contract # MS16103, for the project to construct a new limited-access CNG Station by Arrow Services, Inc. under the partial sponsorship of the Mobile Source Air Pollution Reduction Review Committee (MSRC). Work was completed and the station placed in service as of September 1, 2017.

Disclaimer

The statement and conclusions in this report are those of the contractor and not necessarily those of the Mobile Source Air Pollution Reduction Review Committee (MSRC) or the South Coast Air Quality Management District (SCAQMD). The mention of commercial products, their sources or their uses in connection with material reported is not to be construed as either an actual or implied endorsement of such products.

PROJECT DESCRIPTION & WORK PERFORMED

The Mobile Source Air Pollution Reduction Review Committee (MSRC) provided grant funding support to the Arrow Services, Inc. (ASI) new compressed natural gas (CNG) station project. This project encompassed the design, construction, and operation of a limited-public access CNG fueling station with 200 standard cubic feet per minute (scfm) compression capability, ten time-fill dual-hose posts that are equipped with a total of 21 hoses, one quick fill capable hose and 12,200 standard cubic feet (scf) of compressed gas storage.

The station is located at 14241 Proctor Avenue, La Puente, California, less than two miles from the 605 freeway and between the 10 and 60 freeways. This location provides excellent accessibility for Arrow's natural gas-fueled refuse trucks, which serve several residential neighborhoods within the vicinity, and the general public throughout the basin. In the first full month of station operation, throughput averaged 12,685 diesel gallon equivalents (DGE). Currently it is averaging 14,380, at this current rate, the station is projected to dispense over 172,643 DGE in the first full year of operation. The three-year contractual target is a minimum of 224,640 DGE per year, beginning in Year 3 of the contract. This target will be achieved as ASI continues to transition its fleet to natural gas operation; an additional eight CNG trucks are anticipated to meet this three-year target.

PROBLEMS ENCOUNTERED

Below is a summary of challenges encountered during the implementation of this project:

- The primary setback was that the original construction and station design companies delayed project for four months with no progress on the project. Arrow had to fire these companies and hire a new station builder and designer. The original companies that were fired for non-performance were Amtek construction and Fuel Solutions. The newly hired company that successfully completed the project was TruStar Energy CNG.
- Once the project was in the final design stage, the newly hired station design consultant designed and built the station with equipment previously ordered under the original contractors. When TruStar attempted to commission the station, they found that the Southern California Gas Company (SoCalGas) meter was too small to serve the compressor. As a result, SoCalGas replaced the meter with a larger meter, adding significant cost to overall station project, as well as a delay in schedule. Arrow covered the additional project costs, driving the overall project cost far above expectations.
- As is typical with CNG station projects, Southern California Edison (SCE) required an additional 45 days after the station was completed to install the electric meter.
- SoCalGas delayed first meter installation by 30 days that were not allocated in the schedule do to the retirement of their field planner.
- Permit approvals from the city took an extra 30 days beyond the original planned project schedule.

EMISSIONS BENEFITS

Over the past 30 years, clean burning NGVs provided significant reductions¹ in criteria and toxic air pollutant emissions compared to conventional gasoline and diesel vehicles. When NGVs were first introduced to the transportation market, initial NGVs reduced key pollutants emissions such as oxides of nitrogen (NOx) and particulate matter (PM) by up to 98 percent. More recently, the light-duty CNG-fueled Honda Civic, which unfortunately is no longer being produced, emitted half the NOx, 80 percent less non-methane hydrocarbon (NMHC) and 60 percent less carbon monoxide (CO) than the gasoline Civic. New CNG-fueled medium- and heavy-duty trucks and buses reduce NOx by more than 90 percent and PM by 98 percent, compared to older in-use diesel fueled versions. These benefits drive grant programs in California that fund the accelerated replacement of diesel fueled trucks and buses with natural gas technology, with grant funds targeted to cover the higher incremental cost of the cleaner technology over comparable diesel engines. It is noteworthy that natural gas technology's successful in-use operation in all vehicle classes over the past few decades contributed to CARB's ability to continually restrict vehicle and engine emissions, culminating in the current 0.2 and 0.01 gram per brake horsepower-hour NOx and PM standards, respectively, which have been met by both natural gas and diesel fuel technologies since 2010.

More recently, Cummins Westport Inc. certified its natural gas engine with both the U.S. EPA and CARB at the 90 percent NOx reduction level of 0.02 grams per brake horsepower-hour. The engine is currently available for medium heavy-duty vehicle applications, such as urban transit buses, school buses and refuse trucks. Technologies such as these have the potential to further support the market deployment of medium- and heavy-duty natural gas trucks. By using both biomethane and low-NOX engines, natural gas trucks have the potential to reduce criteria pollutant and GHG emissions to levels near those of zero-emission battery and fuel cell electric vehicles.

All NGVs fueling at the Arrow station provide well-established environmental benefits, as evidenced by the South Coast Air Quality Management District's seven fleet rules², which require the use of clean fuels such as natural gas in a variety of fleet applications. Table 1 is reproduced from the Natural Gas Vehicle Association's summary of environmental benefits for NGVs. Tables 1 and 2 show the percent emission reduction for various vehicle classes based on 2012 emission standards, compared to new and in-use vehicles, respectively. Since emission standards have not changed since 2012, this summary is current for the comparison of new vehicles or engines. Since PM certification levels of diesel engines now meet the same level of particulate matter of natural gas engines, new natural gas engines no longer offer quantifiable PM reductions compared to new diesel engines (diesel PM emissions are currently controlled by aftertreatment devices such as diesel particulate traps). Of course, when NGV technology is implemented to replace older diesel technology, valuable PM emission reductions are achieved.

¹ Since detailed mileage information for customer vehicles is not available, a qualitative discussion of emissions benefits is provided.

² <http://www.aqmd.gov/home/regulations/fleet-rules> (accessed 11/14/2017).

Table 1: Percentage Emissions Reductions (%) of New NGVs Compared to New Gasoline and Diesel Vehicles

	CNG v. Gasoline		CNG v. Diesel	CNG v. Diesel
	Passenger Car	Light-Duty Truck	School Bus	Heavy-Duty Truck
GHG	13	14	13	13
NOx	16	16	16	40

Source: NGV America, <http://www.ngvamerica.org/natural-gas/environmental-benefits/>. Accessed 11/14/17.

Table 2: Percentage Emissions Reductions (%) of New NGVs Compared to In-Use Gasoline and Diesel Vehicles

	CNG v. Gasoline				CNG v. Diesel		CNG v. Diesel	
	Passenger Car		Light-Duty Truck		School Bus		Heavy-Duty Truck	
	2002	2007	2002	2007	2002	2007	2002	2007
GHG	18	18	25	25	25	25	25	25
NOx	91	34	97	91	92	76	95	88
PM10	50	0	98	12	98	21	98	22

Source: NGV America, <http://www.ngvamerica.org/natural-gas/environmental-benefits/>. Accessed 11/14/17.

PHOTOGRAPHS & OUTREACH

Press released was sent out and published to websites covering transportation news for business will be informed of the event. Arrow shall prepare informational material for the station to be distributed via a broad range of websites, including, but not limited to:

- PR Newswire
- SoCalGas Social Media sites
- Green Fleet News
- US Gas Vehicles.com
- Natural Gas Vehicles Journal
- NGV Global News

This new station supports state and local goals to increase petroleum fuel displacement in the region while enhancing air quality by reducing criteria pollutant and greenhouse gas emissions.

Below are photographs of the project station. The compression, dryer and storage facilities are depicted below in Figure 1. The time-fill area is depicted below in Figure 2 and the MSRC decal is depicted in Figure 3.

Figure 1: Arrow Compression, Dryer and Storage Facilities



Figure 2: Time-Fill Area



Figure 3 –Display of MSRC Decal at ASI Station



SUMMARY & RECOMMENDATIONS

Summary

The successful design, construction and reliable operation of the ASI time-fill CNG station have been demonstrated during the station demonstration period. This station includes a 140 horsepower, 200 scfm compressor and ten time-fill posts, with a total of 21 (20 time-fill and one quick-fill) hoses to provide simultaneous overnight fueling. Currently there are 18 ASI fleet vehicles using the time-fill system regularly on week nights.

As a limited public access station, Arrow has arranged to allow fueling at this station by Nasa Service Inc., a refuse service company, when their drivers are in need of fuel.

The station construction and start-up followed well-established best practices for CNG station implementation (i.e., design, construction and commissioning). This station was designed to meet all applicable codes and standards for CNG fueling stations. These codes and standards were met in order to obtain approved plumbing, electrical and building permits and ultimately commission the station.

The actual measured throughput during the first month of data collection period was 12,685 DGE. Currently it is averaging 14,380, at this current rate, the station is projected to dispense over 172,643 DGE in the first full year of operation. The three-year contractual target is a minimum of 224,640 DGE per year, beginning in Year 3 of the contract, which will be achieved once the planned additional eight CNG units are placed in service.

The GHG reduction benefits of natural gas as a transportation fuel are demonstrated by comparing the carbon intensity (CI) of natural gas to baseline fuels. According to the California Air Resources Board (CARB), “carbon intensity means the amount of lifecycle greenhouse gas emissions, per unit of energy of fuel delivered, expressed in grams of carbon dioxide equivalent per megajoule (gCO₂E/MJ), where gCO₂e/MJ is defined as grams of carbon dioxide per megajoule. In the case of CNG, CI is typically less than gasoline and diesel. According to the CARB’s Low Carbon Fuel Standard (LCFS) regulation, the CI of CNG is 78.37 gCO₂e/MJ. This compares with 102.01 gCO₂e/MJ for diesel fuel and 98.47 gCO₂e/MJ for gasoline. Based on current carbon intensity values, CNG provides a net reduction in greenhouse gas emissions of about 23 percent compared to gasoline and diesel.

A method to further reduce the CI of natural gas fuel is to procure natural gas that is derived from renewable feedstock, i.e., biogas, landfill gas or biomethane. Landfill gas (bio-methane) that is cleaned up to pipeline quality natural gas and compressed in California is rated by CARB with a CI of 46.42 gCO₂e/MJ, far below existing pipeline natural gas. SoCalGas is investigating the availability of renewable feedstock for its pipeline. Should this become available, the CI of natural gas at this station would further improve (i.e., be lower than current estimates).

Recommendations

Continued support for NGV implementation from state and local agencies in the form of vehicle buy-down incentives is important to ensure that existing and future natural gas fueling stations maximize their station throughput. The MSRC’s support of low-NO_x vehicle incentives is a great example of a current program that will be instrumental in supporting the growth natural gas fueling station throughput.