AMERICAN CLEAN SKIES FOUNDATION

WHERE CAN I FILL UP?

A SURVEY OF PRIVATE AND PUBLIC SECTOR ACTIONS TO PROVIDE NEW FUELING FACILITIES FOR NATURAL GAS VEHICLES

AUGUST 2012

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750 1st Street, NE, Suite 1100 | Washington, DC 20002 | Main: 202.682.6294 | Fax: 202.682.3050
www.cleanskies.org | Twitter: @cleanskiesfdn

The Author

Matthew I. Slavin, Ph.D. is a senior consultant to the American Clean Skies Foundation (ACSF) and principal of Sustainability Consulting Group of Washington D.C., focused on clean energy and environmental policy, markets and technology, sustainable development and transportation.

About the American Clean Skies Foundation

Established in 2007, ACSF seeks to advance America's energy independence and a cleaner, low-carbon environment through expanded use of natural gas, renewables, and efficiency. The Foundation is a not-for-profit organization exempt from federal income taxes under Section 501(c)(3) of the Internal Revenue Code.

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Executive Summary

Within ten to fifteen years, more than 1.5 million natural gas vehicles (NGVs) – over 10 times the number currently in use – could be traveling on America's roads and highways. The market potential for NGVs is plainly much greater, but to reach even the 1.5 million mark, the number of public fueling stations that dispense compressed natural gas (CNG) and liquefied natural gas (LNG) must be vastly increased.

With the goal of accelerating the build-out of this refueling infrastructure – and thus bringing the NGV market to a tipping point -- this survey addresses five key questions:

- What barriers to access do NGV fueling facilities pose to widespread adoption of natural gas vehicles?

- What is the cost of building a national fueling network for NGVs?

- Who is currently building NGV fueling infrastructure? Where? And how much is being invested?

- What business models are currently being used to fund NGV fueling facilities?

- What steps are government entities at the federal and state level taking to ensure capital and other resources are available to build NGV fueling stations?

The survey was carried out during the first half of 2012 and is generally current as of July 2012. Major findings include the following:

- The U.S. CNG and LNG fueling infrastructure network is significantly underdeveloped, posing a critical impediment to expanded NGV market penetration. Taking into account the fuel energy security and environmental benefits of NGVs, there is a pressing need to increase investment in NGV fueling infrastructure and a particular need to increase the number of public access fueling stations.

- The cost of building out an adequate national fueling network for NGVs is in the billions of dollars. As a reference case, this assessment projects that approximately $32 billion in investment would be needed in the next ten years to develop a backbone of public and private access to a CNG and LNG network. This backbone would comprise 5,000 public access and 1,650 private access CNG stations, as well as 1,500 public access and 500 private access LNG stations (together with additional LNG liquefaction plant capacity).

- There are considerable economic, environmental, national energy security and job creation benefits to be obtained from converting a significant portion of the nation's automotive fleet to run on natural gas. Converting 10 percent of the nation's 49 million pickup trucks to run on CNG and 10 percent of nation's 2.6 million combination trucks to run on LNG could generate approximately $88 billion in lifetime national benefits measured in terms of reduced oil imports, lower pollution and greenhouse gas emissions and reduced military spending. Building out the reference case 8,650 new CNG and LNG fueling stations could create over 1.5 million new clean fuels technology jobs.

- NGV fueling service companies, natural gas producers, natural gas utilities and other commercial entities are already investing hundreds of millions in new NGV fueling infrastructure. A conservative estimate is that about $1.3 billion has recently been invested or has been committed to this task. Still there remains a large gap in the amount being invested and the funding needed to build a national NGV fueling network that will create a tipping point.

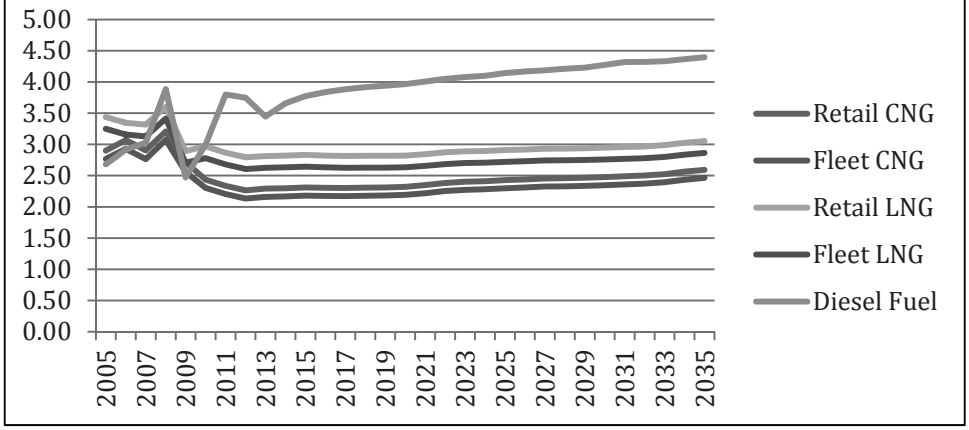
- Proven strategies are available at the federal and state level for incentivizing investment in NGV fueling infrastructure. These include providing tax credits; grants and loans to private commercial entities for infrastructure development; and enacting regulatory changes to enable utilities to invest in fueling infrastructure including the establishment of NGV tariffs. Consistent and adequate funding for accelerated deployment of NGV fueling infrastructure and purchase of NGVs is needed from all levels of government over the medium to long term.

- State governments are rapidly embracing the benefits from expanding the nation's NGV fleet. Recently, 22 states formed an NGV purchasing consortium and issued a multi-state RFP to automakers for procurement of new NGVs. The goal is to create economies of scale in NGV production, expand the number of NGV models available and reduce NGV incremental costs. These states have an instrumental role to play in encouraging other states (and the federal government) to provide sustained support for accelerated deployment of NGV fueling infrastructure and the purchase of NGVs.

1. NGV Fueling Infrastructure and the Tipping Point

The case for NGV technology is clear: Commercial, government and household consumers can save money by fueling their cars, trucks, vans and buses with compressed natural gas (CNG) and liquid natural gas (LNG) as compared to gasoline and diesel. The average price of CNG and LNG at the fuel pump is currently $1.50 to $2.00 below that of petroleum fuels measured on a gasoline gallon equivalent (GGE) and diesel gallon equivalent (DGE) basis. CNG and LNG prices are projected to remain well below those of diesel and gasoline for the next 25 years (Figure 1).

Figure 1
Projected Price CNG & LNG Through 2035
(DGE Constant 2010 $)



Source: U.S. Energy Information Administration, Annual Energy Outlook, 2012.

There are also environmental advantages for using natural gas as a transportation fuel: Vehicles fueled by natural gas produce significantly lower emissions of volatile organic compounds, nitrogen oxide, and carbon monoxide and emit almost no particulate matter. Past testing indicates that NGVs produce between 15 and 30 percent fewer greenhouse gas emissions than petroleum-fueled vehicles.[1]

[1] National Renewable Energy Laboratory (2002), *UPS CNG Truck Fleet Final Results, Alternative Fuel Truck Evaluation Project*; National Renewable Energy laboratory (2003), *An Emissions and Performance Comparison of the Natural Gas C-Gas Engine in Heavy Duty Trucks*; TIAX LLC (2007), *Full Fuel Cycle Assessment Well to Tank Energy Inputs, Emissions and Water Impacts*, California Energy Commission (CEC-600-2007-002-D). Recent research suggests that NGV emissions of methane may be different than earlier estimated on a well-to-wheels basis due to fugitive methane leakage. Government and industry research currently underway seeks to address this data gap. See Alvarez, R., Pacala, S., Winebrake, J., Chameides, W. & Hamburg, S. (2012), *Greater Focus Needed on Methane Leakage from Natural Gas Infrastructure*, Proceedings of the National Academy of Science, PNAS Early Edition, www.pnas.org/cgi/doi/10.1073/pnas.1202407109; Argonne National Laboratory (2010, August), *Natural Gas Vehicles: Status, Barriers and Opportunities* (ANL/ESD/10-4).

Widespread use of horizontal drilling and hydraulic fracturing technologies has created a plentiful supply of domestic natural gas. The Potential Gas Committee (PGC) places our nation's technically recoverable natural gas resources at almost 2,200 trillion cubic feet (TcF), enough to meet domestic demand for 90 years at current rates of consumption.[2] So abundant are the nation's domestic natural gas resources that, even with wider use of natural gas as a transportation fuel, more than ample supplies will remain available for increased use of natural gas for electric generation and industrial manufacturing[3]. It is estimated that adding even 10 million NGVs to U.S, roads, with half of those being heavy-duty trucks, would require less than 5 percent of total U.S. natural gas production in the foreseeable future. With the U.S. continuing to rely on imports to meet 45 percent of its demand for petroleum, converting a significant share of the U.S. motor vehicle fleet to run on natural gas will help free the U.S. from relying on oil imported from volatile regions of the world, strengthen national energy security and improve our balance of payments.

Perspective

There are only about 120,000 NGVs on U.S. roadways today, accounting for less than 0.1 % of the nation's 239 million motor vehicles. The U.S. is home to almost 25% of the planet's motor vehicles but only 1.5% of the world's NGVs.

1.1 Greater Growth in NGVs Within Reach

During the early 1990s, the American Gas Association forecast that there could be more than 12 million NGVs on American roadways in 2010. Significant investments were made in building fueling infrastructure to meet projected demand, and the number of U.S. fueling stations reached a peak in 1997, with U.S. sales of new heavy-duty NGVs peaking at about 8,000 in 2003.[4] But the disappointing performance of light-duty NGVs then available, petroleum prices that largely declined when measured in inflation adjusted terms during the 1990s and inconsistent government policies on alternative fueled vehicles derailed growth.[5] Out of 360,000 heavy-duty trucks sold in the U.S. in 2010, only about 860 were fueled by

[2] See Potential Gas Committee (2011, April), *Potential Supply of Natural Gas in the United States*. In *The Future of Gas* (2011, http://web.mit.edu/mitei/research/studies/natural-gas-2011.shtml), the Massachusetts Institute of Technology projected domestic U.S. natural gas reserves at 2,100 TcF, approximately 92 times annual U.S. natural gas consumption of 22.8 TcF in 2009. MIT projected a low case scenario (90% probability of being met or exceeded) at 1,500 TcF and a high case scenario (10% probability of being met or exceeded) at 2,850 TcF with 1,000 TcF recoverable at a breakeven price of about $5.00 per MMBtu. The U.S. Energy Information Administration projects that U.S. natural gas prices will range up to $7.25 per MMBtu through 2035 measured in 2010 dollars (US EIA, *Annual Energy Outlook, 2012)*.

[3] *See* U.S. Energy Information Administration, Annual Energy Outlook, 2012, p. 3.

[4] .*Id.*, p. 36; TIAX LLC (2011), *U.S. and Canadian Natural Gas Vehicle Market Analysis: Compressed Natural Gas Infrastructure*.

[5] For an in-depth description of the evolution of NGV fueling infrastructure in the U.S. see Yborra, S. (2007), *Roadmap for Development of Natural Gas Vehicle Fueling Infrastructure and Analysis of Vehicular Natural Gas Consumption by Niche Sector*, Clean Vehicle Education Foundation, pp. 58-70.

natural gas.[6] The share of the nation's motor vehicle fleet currently accounted for by NGVs is de minimis: only about 119,000 vehicles fueled by CNG and LNG were on the nation's roads in 2010, a figure that has grown to perhaps 123,000 today.[7] This represents less than 0.1 percent of the nation's 239 million registered cars, trucks, vans and buses.[8] The U.S. is home to almost one-quarter of the planet's motor vehicles yet only 1.5 percent of the world's NGVs are operated in the U.S.[9]

Despite limited deployment, there is considerable evidence that this time the U.S. NGV market really is poised for significant growth and a new, durable expansion phase. Recent projections point to the U.S. fleet of NGVs growing at a compound annual rate of approximately 25 percent between 2010 and 2016 with sales of over 30,000 CNG and LNG vehicles annually projected in 2016, up from 20,000 per year projected to be sold in 2012. Sales of heavy-duty vehicles will predominate, but light duty NGVs – pickup trucks, SUVs and vans – will also see strong growth, projected at a 10.8 percent compounded annual rate between 2012 and 2019.[10]

Perspective

The U.S. NGV market is entering a new, durable expansion phase: 25% plus annual compounded growth is projected through 2016. And over 1.5 million NGVs could be on U.S. roads if infrastructure barriers to NGV use can be overcome.

The U.S. Energy Information Administration (EIA) projects that total annual sales of new heavy-duty natural gas-fueled vehicles alone could reach 150,000 by 2025 and 200,000 by 2030 if current barriers that impede expanded NGV market penetration can be overcome – i.e., limited access to CNG and LNG fueling infrastructure and high incremental costs of purchasing new NGVs and converting existing diesel and gasoline vehicles to run on natural gas.[11]

[6] U.S. Energy Information Administration, Annual Energy Outlook, 2012.
[7] See Appendix A for a breakdown of the number of NGVs fueled by CNG and LNG by state.
[8] Murphy, J. (2010), *The Role of Natural Gas as a Vehicle Transportation Fuel*. Massachusetts Institute of Technology.
[9] International Energy Agency (2010), *The Contribution of Natural Gas Vehicles to Sustainable Transport*, www.iea.org/papers/2010/natural_gas_vehicles.pdf . With over 2 million, Pakistan is home to the most NGVs, followed by Iran (1.75 million), India and China (500,000+ each).
[10] Pike Research (2011), *Natural Gas Vehicles: Market Analysis and Global Forecasts for CNG and LNG Cars, Trucks and Busses*;Pike Research (2012), Light Duty Natural Gas Vehicles: Natural Gas Passenger Cars and Light Duty Pickup Trucks, SUVs, Vans and Light Commercial Vehicles Global Market Analysis and Forecast.
[11] U.S. Energy Information Administration, Annual Energy Outlook, 2012. One study has even projected that NGVs could reach 3 percent of total U.S. vehicles in the foreseeable future, or over 7 million NGVs, see IHS CERA (2010). *Natural Gas for Transportation: Market Niche or More?*

1.2 Fleets Main Driver of NGV Growth

Fleet vehicles currently account for the overwhelming majority of NGVs on U.S. roads and fleet vehicles, particular heavy-duty vehicles, will underpin the greatest near term growth in the U.S. NGV market. The reasons are economic and logistic. Put concisely, "The bigger and busier the vehicle, the greater the benefits of switching to natural gas."[12] On a per-vehicle basis, heavy-duty vehicles travel more miles, have significantly lower fuel economy and consume seven to eight times more fuel than other vehicles annually. In 2010, heavy-duty combination trucks on U.S. roads travelled an average of almost 69,000 miles annually, compared to an average of 10,641 miles for passenger and other light duty vehicles. Commercial trucks consume almost 45 billion gallons of diesel per year in the U.S.[13] Furthermore, in contrast to household consumer vehicles, fleet vehicles driving consistent and predictable routes can be fueled at centralized locations, a key consideration given that the currently underdeveloped status of the nation's NGV fueling infrastructure.

Perspective

A heavy-duty NGV truck with a fuel economy of 6 mpg can save between $0.21 and $0.26 in fuel costs per mile compared to a comparable diesel-fueled truck.

For light- and medium-duty vehicles, the incremental cost of purchasing an OEM (original equipment manufactured) NGV or converting a vehicle fueled by petroleum to run on natural gas ranges between $10,000 and $15,000. For heavy-duty vehicles, incremental costs can run $50,000 and up to $80,000 for the heaviest duty tractors utilizing compression ignition LNG technology.[14]

The actual lifecycle benefits for a vehicle owner operating an NGV vary depending on local fuel price, vehicle and engine type, and weight and mileage driven. For lower CNG and LNG prices to offset higher NGV incremental costs and meet lifecycle payback benefits expected by vehicle owners from a business case perspective, NGVs must be driven a high number of miles.[15] The owner of a heavy-duty NGV truck with an average

[12] America's Natural Gas Alliance, *Natural Gas Vehicles: Driving Change*, www.ANGA.us

[13] Federal Highway Administration (2012, February), Annual Vehicle Distance Traveled in Miles, 2010, by Highway Category and Vehicle Type, http://www.fhwa.dot.gov/policyinformation/statistics/2010/vm1.cfm.

[14] CNG engines utilize spark ignition technology similar to gasoline engines. Vehicles fueled by LNG utilize either spark ignition, or compression ignition technology similar to diesel engines. Compression ignition LNG engines are significantly more expensive than spark compression LNG engines.

[15] A general rule of thumb is that commercial fleet owners expect a payback period of about 3 years or less when making a new vehicle purchase. Factoring in incremental cost of a CNG engine, payback period for a Class 3 light duty vehicle exceeds five years unless the vehicle is driven at least 20,000 to 40,000 miles annually. A class 8 compression ignition combination tractor with an average fuel economy of 6 mpg (equivalent to a similar diesel truck) needs to be driven at least 100,000 miles annually to provide the owner a 3-year payback period. The payback period lengthens to eight years for a Class 8 vehicle driven only 40,000 annually (U.S. Energy Information Administration, Annual Energy Outlook, 2012).

fuel economy of 6 miles-per-gallon can save between $0.21 and $0.26 in fuel cost per mile driven compared to a comparable diesel-fueled truck, producing cost savings of up to 40 percent per vehicle annually.[16]

Most U.S. NGV's – 97 percent – are fueled by CNG (Table 1). Vehicles fueled by LNG account for the remainder. Heavy-duty trucks used for refuse collection comprise the fastest growing segment of the NGV market. Fleet heavy-duty trucks fueled by LNG that serve long haul and regional transport markets will see particularly strong growth in the near future. There are 2.6 million heavy-duty combination trucks in the U.S. and the industry has moved toward a hub-and-spoke model that facilitates fueling infrastructure strategically located along heavily trafficked trucking corridors.[17]

Table 1: Number of NGVs in Use, 2010 by Vehicle Class and Fuel Type

	CNG	LNG	Total
Automobiles	29,291	16	29,307
Vans	20,353	17	20,370
SUV	527	4	531
Pickup Trucks	29,889	107	29,996
Other Trucks	15,669	1,682	17,351
Buses	20,111	1,492	21,603
Other Vehicles	23	36	59
Total	115,863 (97.2%)	3,354 (2.8%)	119,217

Source: U.S. EIA, Alternative Fuel Vehicle Data, http://www.eia.gov/renewable/afv

Major vehicle manufacturers are beginning to offer a wide range of medium- and heavy-duty NGV models. At the Mid-America Trucking Show in March 2012, Cummins Westport announced introduction of new 12-liter and 15-liter natural gas engines.

[16] LNG's energy density is only 44% that of diesel; CNG energy density is only 17% of diesel and spark ignited CNG and LNG engines are less efficient than diesel engines and LNG compression-ignited engines. NGVs also incur an average weight penalty of 300-600 lbs. due to the need for heavier on-board storage tanks than needed for diesel and gasoline vehicles. The result is that spark-fired NGVs have 7 to 12 percent lower fuel economy than vehicles fueled by diesel or compression-ignited LNG engines. See Deal, A. (2012, May 1), *What Set of Conditions Would Make the Business Case to Convert Heavy Duty Trucks to Natural Gas? – A Case Study*, National Energy Policy Institute; Argonne National Laboratory, 2012, *Fuel Displacement & Cost Potential of CNG, LNG, and LPG Vehicles*, #VSS078.

[17] Federal Highway Administration. *Highway Statistics 2011*, www.fhwa.dot.gov; See Pettus, M. (2003), *Successfully Competing in the U.S. Trucking Industry: A Resource Based Perspective, Advances in Competitive Research*, http://findarticles.com/p/articles/mi_hb6482/is_1_11/ai_n29044342/pg_4/

Freightliner announced a 12-liter engine to power some of its models; Volvo will partner with Westport Innovations to develop a new 13-liter platform while Kenworth announced that four of its truck configurations will be available with a 12-liter natural gas engine. An expanding selection of medium- and heavy-duty natural gas engines and trucks recently prompted the CEO of the American Trucking Association to conclude "serious competition now exists between suppliers of diesel and natural gas trucking services."[18] GM and Chrysler are also introducing new CNG fueled pickup models.

Production economies of scale and investments being made to reduce NGV vehicle component costs will help narrow the incremental cost differential between NGVs and vehicles fueled by petroleum.[19] However a second major barrier that has impeded NGV market growth must be overcome – inadequate access to fueling infrastructure.

1.3 Fueling Infrastructure a Major Barrier

When it comes to NGVs, the U.S. faces a classic "chicken-and-egg" problem. As reported recently in Bloomberg View "There are fewer than 2,000 natural-gas stations across the country -- a fraction of the 120,000 that offer gasoline to the public. This makes people and companies reluctant to shift to the new vehicles. At the same time, the dearth of natural-gas vehicles on the road makes fuel companies reluctant to build the stations they need."[20]

Perspective

Only 524 stations dispense CNG or LNG to the public. NGV stations are highly concentrated in just 5 states. California, New York, Oklahoma, Utah and Texas account for 62% of U.S. public access NGV fueling stations.

There are approximately 120,000 convenience store outlets that dispense petroleum as a motor fuel to the public in the U.S.[21] Yet, as of July 23, 2012, the nation was home to only 1,120 stations where natural gas can be purchased as a motor vehicle transportation fuel – only 1,066 dispense CNG and only 54 dispense LNG. (Table 2) And the majority – 54 percent – of these fueling stations are private access stations not open to the public.

[18] Lavey, W. & Staple, G. (2012), *Oil Shift: The Case for Switching Federal Transportation Spending to Alternative-Fueled Vehicles,* American Clean Skies Foundation.

[19] On July 12, 2012 the U.S. DOE Advanced Research Projects Agency – Energy (ARPA–E) announced $30 million in grants to improve NGV technology; see http://apps1.eere.energy.gov/news/news_detail.cfm/news_id=18484

[20] Orszag, P. (2012, June 26), *Natural Gas Cars Can Drive Us Towards a Better Economy, Bloomberg.com*, www.bloomberg.com/news/2012-06-26/natural-gas-cars-can-drive-us-toward-a-better-economy.html

[21] The 120,000 figure is per the U.S. Economic Census (2007), NAICS 447110, Gasoline Stations with Convenience Stores, http://www.census.gov/econ/industry/hierarchy/i447110.htm. Using different criteria, the U.S. Energy Information Administration estimates that there are a total of 157,000 stations of all kinds that retail motor fuel (U.S. Energy Information Administration, Annual Energy Outlook, 2012).

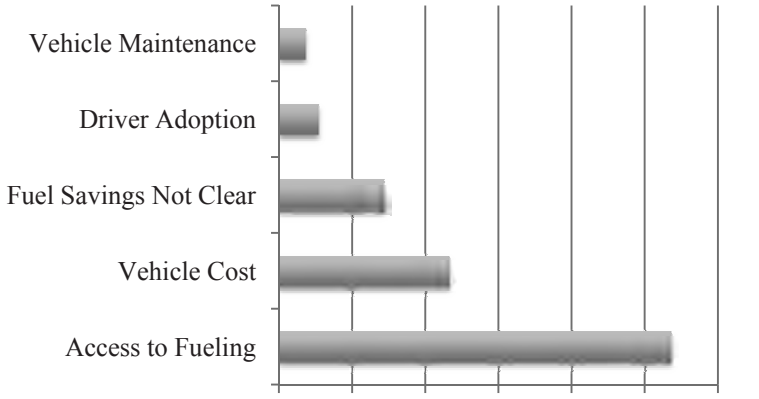
Table 2: Public and Private CNG and LNG Stations by State as of July 23, 2012					
State	Public Access CNG	Private Access CNG	Public Access LNG	Private Access LNG	Percentage Public
AK	1				100%
AL	4	9		1	29%
AR	3	2			60%
AZ	8	26		4	21%
CA	150	92	16	21	59%
CO	14	15			48%
CT	5	11	1		35%
DC		2			0%
DE	1				100%
FL	5	16			24%
GA	5	16			24%
ID	2	6			25%
IL	5	30			14%
IN	5	7			42%
KS	2	3			40%
KY	2	1			67%
LA	11	5	1		71%
MA	11	9			55%
MD	2	4			33%
ME		1			0%
MI	13	6			68%
MN	2	2			50%
MO	1	9			10%
MS	1	1			50%
MT	2				100%
NC	12	15			44%
ND	2				100%
NE	3	4			43%
NH	1	2			33%
NJ	5	21			19%
NM	4	5			44%
NV	6	1	1		88%
NY	35	73			32%
OH	7	12	1		40%
OK	58	22			73%
OR	2	10			17%
PA	11	23			32%
RI	3	2			60%
SC	3	4			43%
TN	3	5			38%
TX	24	14	2	4	59%
UT	40	45	1		48%
VA	3	9			25%
VT	1	2			33%
WA	6	12			33%
WI	18	6	1		76%
WV					0%
WY	4	4			50%
Total	500	566	24	30	46%

Public access stations currently account for 46 percent of all U.S. NGV fueling outlets – 500 CNG fueling stations allow access to the public and only 24 LNG stations are public access.[22] Existing NGV fueling stations are also heavily concentrated geographically: five states – California, California, New York, Oklahoma, Utah and Texas – account for 62 percent of the nation's public access CNG and LNG fueling outlets. Thirty-seven of the nation's 54 LNG fueling stations are in California, most of them in the Los Angeles area.

The private access status of the nation's NGV refueling infrastructure contrasts strongly with the refueling practices of most of U.S. commercial vehicles: only 24 percent of commercial diesel trucks fuel at private access outlets. Seventy-one percent of trucks of all weight classes and an even higher percentage of light-duty trucks are fueled at public access outlets.[23]

Interviews with stakeholders during the preparation of this report found that inadequate access to public fueling is a top barrier to more widespread adoption of NGVs. Prior research yielded similar results. TIAX LLC found that non-transit fleet owners ranked concern about access to NGV fueling alongside NGV incremental costs as a top barrier to expanded fleet adoption of NGV technology.[24] A May 2012 survey by PLS Logistics Services of 100 freight carrier company executives found that 85 percent of the executives understood that LNG costs less than petroleum fuels (Figure 2).[25] But

Figure 2
Barriers to Adoption of LNG Trucks



Source: PLS Logistics Services (2012), *Use of LNG Powered Vehicles for Industrial Freight*.

[22] U.S. Department of Energy, Alternative Fuels Data Center, http://www.afdc.energy.gov/data_download/
[23] TIAX LLC (2011), *U.S. and Canadian Natural Gas Vehicle Market Analysis: Compressed Natural Gas Infrastructure*.
[24] *.Id.*
[25] PLS Logistics Services (2012), *Use of LNG Powered Vehicles for Industrial Freight*.

only 5.6 percent of the executives reported believing that LNG technology will be widely adopted by the industry. Higher incremental vehicle costs were cited as an impediment to adoption by 23 percent of the executives. Over twice as many – 53 percent – pointed to access to fueling as the number one barrier to adopting NGVs for their fleets.

The number of CNG and LNG fueling stations has expanded rapidly since 2009 – by 28 percent for CNG and by 30 percent for LNG.[26] But this growth has taken place from a very low initial base. Many more CNG and LNG fueling stations need to be added. According to one study, 10 to 20 percent of all U.S. motor vehicle fueling outlets will need to dispense natural gas in order to reach a tipping point at which access to fueling no longer impedes economywide adoption of NGVs by American businesses and households.[27] This is equivalent of 12,000 to 24,000 stations, an 11- to 22-fold increase in the total number of stations that dispense natural gas as a transportation fuel today.

[26] US Department of Energy Alternative Fuels and Advanced Vehicles Data Center. www.afdc.energy.gov/afdc/fuels/natural_gas_stations.html

[27] See Yeh, S. (2007), *An Empirical Analysis on the Adoption of Alternative Fuel Vehicles: The Case of Natural Gas Vehicles*, Energy Policy, 35; IHS CERA (2011), *Natural Gas for Transportation: Market Niche or More?*

2. Costs and Benefits of a National NGV Fueling Network

NGV fueling infrastructure costs vary due to several factors: the type of fuel dispensed the number of vehicles to be fueled, and fuel volume or throughput. Other factors affecting infrastructure costs include the number of dispensers installed, whether fueling will be time-fill or fast-fill, the quality and pressure of gas service delivered by distribution pipeline for CNG, and proximity to gas liquefaction facilities for LNG. Purchase of land adds significantly to station development costs in cases where a new CNG and LNG infrastructure is located on a previously undeveloped site as opposed to being co-located at an existing outlet for petroleum fuels. While it currently costs an estimated $50,000 to $150,000 to install equipment needed to operate a conventional gasoline or diesel fueling station,[28] NGV fueling infrastructure costs are much higher. Given the high cost of building a CNG or LNG station and the large number of new stations that need to be added, the cost of building a national NGV fueling infrastructure totals in the billions of dollars.

2.1 NGV Fueling Stations Costs

There are three prevailing CNG fueling station technologies – cascade fast-fill, buffered fast-fill and time-fill.[29] Public access CNG stations use cascade fast-fill technology, which dispenses fuel to vehicles at the high rate needed to meet customer demands for rapid turnaround during the fueling process. Cascade fast-fill technology requires compressors and compressed gas storage vessels in addition to a gas drier (if needed) and dispensing and metering equipment (Figure 2).

It costs $1 million on average to construct a new public access CNG station that use cascade technology and built-in compressor redundancy to ensure system reliability and a single two-hose dispenser.[30] Buffered fast-fill technology and time-fill technology are used primarily for private access CNG fueling. Larger private access

[28] Idaho National Laboratory, Natural Gas Technologies – Low Cost Technologies, https://inlportal.inl.gov/portal/server.pt/community/natural_gas_technologies/437/low-cost_refueling_station/4370

[29] Public access CNG stations require cascade systems that incorporate multiple (high/medium/low) pressured storage tanks that ensure sufficient gas is available as vehicles arrive for fueling intermittently and during peak periods, as with a conventional public gas station. Buffer storage does not require multiple pressured storage tanks but a single smaller storage tank and is used primarily for private access CNG fueling for fleet vehicles that fuel sequentially at a given and predictable time but where rapid fueling is still needed, such as in the case of taxis or buses. Time-fill stations do not require storage tanks – fuel from a gas distribution pipe is compressed and directly dispensed to the vehicle and is used primarily for vehicles that can fuel overnight, such as buses or refuse collection trucks.

[30] TIAX LLC (2011), *U.S. and Canadian Natural Gas Vehicle Market Analysis: Compressed Natural Gas Infrastructure*.

Figure 3: Fast-Fill CNG Public Refueling Station Schematic

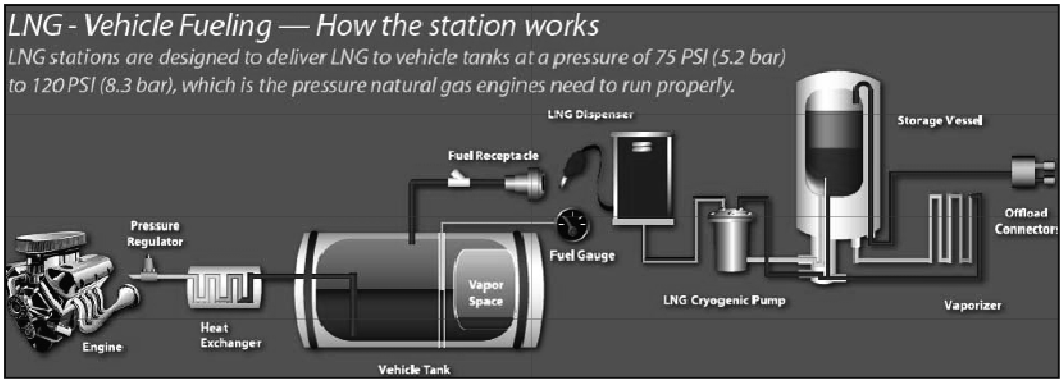
buffered and time-fill systems cost between $700,000 and $900,000 with an average cost of about $800,000. LNG fueling infrastructure is even more expensive. It requires that natural gas be liquefied at a temperature of -200 to -260 degrees F at a liquefaction facility and then transported by truck to the fueling point. Costs for building a public access LNG fueling station average between $2.25 million and $4.5 million with a principal cost driver being the need for a vacuum insulated vessel to store cryogenic methane gas (see Figure 4).[31] The largest LNG station in the U.S. is located at the Port of Long Beach in California. With 10 fueling lanes, the station cost $7.5 million.

LCNG (liquefied compressed natural gas) technology is also used. LCNG technology involves trucking LNG to a station site where it is warmed to ambient air temperature, compressed and can be dispensed as CNG. LCNG stations can dispense both CNG and LNG and allow CNG to be dispensed at fueling stations that cannot be connected to a natural gas pipeline. Many new LNG stations are likely to utilize LCNG technology.

Growth of LNG as a transportation fuel will require an increase in LNG liquefaction capacity. The cost of building a new liquefaction plant varies but averages between $20 million and $40 million per facility for large-scale production plants.

[31] TIAX LLC (2011), *U.S. and Canadian Natural Gas Vehicle Market Analysis: Liquefied Natural Gas Infrastructure*.

Figure 4: LNG Refueling Station Schematic



Source: Yborra, S. (2012), *The Compelling Case for NGV's in Public and Private Fleets*. NGV America.

2.2 Billions Needed for NGV Infrastructure

The number of NGV fueling stations in operation in the U.S is projected to grow to 1,972 in 2016.[32] This figure would represent almost a doubling in the number of NGV fueling outlets compared to today – still only about 1 percent of all U.S. motor vehicle fueling outlets, well short of the 10 percent plus required for a tipping point.[33]

As seen in Table 3, this assessment has developed a reference case that projects the ten-year cost of building a backbone national NGV fueling network needed to serve growth potential in the fleet market for heavy-duty trucks and other high-mileage vehicles, where the business case for NGVs will be strongest during the near term. The reference case projects that total investment of $31.655 billion is needed over this ten years, broken down as follows: $5 billion for 5,000 public access CNG stations; $4.125 billion for 1,500 public access LNG stations; $1.155 billion for 1,650 private access CNG stations; and $1.375 for 500 private access LNG stations. Twenty billion dollars are needed to increase LNG liquefaction plant capacity to support an expanded LNG fueling network.

2.3 Benefits of NGVs in the Billions

While billions need to be invested to develop NGV fueling infrastructure, the economic, environmental and other social benefits to Americans from expanded NGV use can also be measured in the billions. Christopher Knittel, professor of Energy Economics at the Sloan School of Management at MIT, has modeled the economic value of these benefits. As depicted in Table 4, lifetime fuel savings to the owner of a pickup truck are projected at $4,171; for heavy-duty trucks, owner lifetime savings are projected at between

[32] Pike Research (2011), *Natural Gas Vehicles: Market Analysis and Global Forecasts for CNG and LNG Cars, Trucks and Busses*.
[33] *.Id*.

Table 3: Ten Year NGV Fueling Infrastructure Cost Projection		
Type of Station	**Buildout**	**Cost**
Public Access	CNG at 5,000 stations LNG at 1,500 truck stops Total	$ 5 billion $ 4.125 billion $ 9.125 billion
Private Access	CNG at 1,650 locations LNG at 500 locations Total	$ 1.320 billion $ 1.375 billion $ 2.695 billion
New LNG Liquefaction		$ 20 billion
Total	8,650 stations	$ 31.82 billion
Assumptions:	$1 million per new public access CNG station development cost. $800,000 per new private access CNG station development cost $2.75 million per new LNG station development cost $10 million in new LNG liquefaction plant investment per new LNG station (Utilizing small scale LNG liquefaction technology could reduce per new plant cost but increase overall number of plants needed). Currently existing CNG and LNG stations not included; inclusion would reduce estimates somewhat Assumes market penetration by heavy duty trucks and other high mileage vehicles will be the primary driver of NGV growth during the ten year period as per NGV market penetration scenarios by Clean Energy Fuels Corp, July 2012.	

$63,000 and $116,000. This does not include national social benefits arising from reduced pollution and greenhouse gas emissions, less spending on overseas military interventions and reduced economic vulnerabilities that arise from macroeconomic shocks generated by dependence upon imported oil.

For pickups, total lifetime national social benefits of switching from gasoline to CNG are $8,620; for heavy-duty trucks, these benefits range from $106,000 to $176,000. If, for example, just 10 percent of the 2.6 million combination trucks on U.S. roads convert to natural gas, lifetime national social benefits could total $45.9 billion with a combined $30.4 billion of this being derived as economic benefits to the vehicle owners.[34] There are an estimated 49 million pickup trucks on U.S. roads. If 10 percent of these pickups were to convert to natural gas, vehicle owners could accrue a combined lifetime private economic benefit valued at $20.4 billion with lifetime social benefits to the nation as a

[34] Assumes heavy-duty Class 8 trucks with 5 mpg.

whole projected at $42.2 billion. Ensuring even more NGVs are on the road would elevate national social and private benefits into the hundreds of billions.

Table 4: Private and Social Benefits of NGVs				
Private Benefits		Pickup Truck (15 mpg)	Heavy Duty Truck (5 mpg)	Heavy Duty Truck (7 mpg)
Fuel Savings		$15,171	$186,828	$133,449
Vehicle Incremental Cost		-$11,000	-$70,000	-$70,000
Total Private Benefits		$4,171	$116,828	$63,449
Reduction in External Costs				
Lower Carbon Emissions		$1,093	$8,768	$6,263
Fewer Pollutants		$1,661	$32,586	$23,276
Lower Macro-Economic Externalities (e.g., impact of oil price shocks)		$1,694	$18,466	$13,190
Total External Benefits		$4,448	$59,820	$42,729
Total Social Benefit		$8,620	$176,648	$106,177
Source: Knittel, C. (2012, June), *Leveling the Playing Field for Natural Gas in Transportation*. Brookings Institution, The Hamilton Project (Discussion Paper, 2012-03).				

2.4 New Clean Fuel Technology Jobs

A 2009 study commissioned by the U.S. Department of Energy's Clean Cities program found that every additional alternative fueled truck added to the nation's motor vehicle fleet produced directly or indirectly 1.6 new clean fuel technology jobs, in fueling station construction, maintenance and operation; vehicle production, training, service, and operation; and natural gas production and exploration.[35] As depicted in Table 5, this suggests that building out the reference case 8,650 NGV stations fueling stations could generate 1.56 million new jobs, significantly bolstering the nation's economic recovery.

Table 5: NGV Fueling Infrastructure Reference Case Job Creation Projection	
Number of Stations	Direct and Indirect Job Creation
8,650	1,563,920
Assumptions: 1.6 jobs created per new NGV added to nation's fleet 113 trucks fuel on average at each station.[36]	

[35] See Gladstein, Neandross and Associates, Inc. (2011, April), NGV Roadmap for Pennsylvania Jobs, Energy and Clean Air.

[36] Fishkind and Associates, Inc. (2012, Aug. 1), Economic Impact of Incentives to Facilitate Compressed Natural Gas Vehicles in Florida.

3. Models Used to Develop NGV Fueling Infrastructure

NGV fleet owners fuel their vehicles using four basic models: onsite private access fueling; onsite private fueling with public dispensing; limited access private fueling and public access fueling. While each model has variations, these models primarily define how the great majority of NGV fueling stations are currently built, financed, operated and maintained.

Whether a fleet owner uses private or public access fueling reflects a number of considerations implicit to the value proposition. These include the number of vehicles to be fueled, where fleets are garaged, whether fleet vehicles need to fuel during the day or can be fueled at the end of the workday, and the degree to which public access fueling outlets are convenient. Also important is a fleet owner's access to capital and investment priorities. Turnkey partnerships, where a fuel services vendor or utility entity owns, finances and/or installs and maintains fueling infrastructure on property owned by a third party are also frequently employed, particularly with regard to new public access fueling stations. The principal attributes of these four fueling infrastructure models are summarized in Table 6.

3.1 Onsite Private Access Fueling

Onsite private access fueling refers to infrastructure dedicated for use by a fleet owner's own vehicles. Fueling equipment is located "behind the fence" where fleet vehicles are garaged. This model is most common to larger fleets where the number of vehicles to be fueled and fuel throughput is high. The private access model is also common to return-to-base fleets where vehicles begin and end the day at a common garaging location. Smaller fleets in areas where public access stations are not conveniently located also operate private access fueling stations.

Private access fueling allows the fleet owner to specifically design and size infrastructure to meet the needs of the serviced fleet and provides a high level of security. It also places the burden for financing infrastructure on the fleet owner and may not be an option for owners lacking access to sufficient capital. Onsite private access fueling can sub-optimize a fleet owners return on investment (ROI) compared to a station that dispenses fuel to multiple users, as capital costs must be fully amortized by the fleet owner alone. There is also a perception that private access fueling sub-optimizes awareness of CNG and LNG as a transportation fuel since the stations are not publicly visible. This wrongly suggests that natural gas is not a fuel for widespread use by the public, but specialized fuel for industrial and commercial applications.

Table 6: Fueling Infrastructure Development Models		
	Private Access	**Public Access**
Types of Fleets and Vehicles	• Return-to-Base Fleets • Larger fleets with high throughput • Smaller fleet owners lacking nearby public access • Government Utilities, Transit, Airports, Ports • Time-fill (slow-fill) stations	• Any fleet or individual customer • Smaller fleets with throughput insufficient for private access expense • Long haul trucks • Must be fast-fill
Location	• Fleet garaging site • Offsite for Limited Access Private Fueling	• Strategic locations accessible to public • Dedicated location or hosted on islands at existing petroleum fueling outlets, convenience stores
Financing	• Fleet owner finances • Can sub-optimize ROI • Can be opened to "outside the fence" fleets to increase throughput and ROI	• Independent fuel retailer, commercial entities (e.g.,CLNE, LDC) • Station developer secures fleet fuels sales contracts to ensure minimum throughput • Fleet owner avoids infrastructure capital cost
Branding	• Fosters image that natural gas is not a fuel for widespread use	• Builds brand identify for natural gas as a public transport fuel
Turnkey Partnership	• Widely used to develop new public access fueling • All-in-one turnkey where fueling services company or utility finances, owns, builds, operates and maintains infrastructure at fleet owner property, existing petroleum retail station or convenience store • Property owner responsible for retailing function and transactions processing, receives royalty based upon GGE dispensed • Eases market entry, reduces risk and land cost, allows access to established retailing sites convenient to customers	

3.2 Onsite Private Fueling with Public Dispensing

Under this model, fleet owners open their onsite private fueling stations to the public. Public vehicles are fueled either with the same dispensing equipment used to fuel the fleet owner's vehicles or with separate dispensing equipment located in an area designated for public use. Onsite private fueling with public dispensing is a growing trend because, as a value proposition, it allows the owner of the infrastructure to increase throughput volume, spread capital, operating and maintenance costs, and increase ROI.[37] While allowing public dispensing affords more widespread use of private fueling infrastructure, problems arise from the fact that onsite private access stations are often located in inconvenient locations. This not only limits the number of vehicles than can be fueled but again can sub-optimize awareness branding of CNG and LNG as a fuel for the general public.

Perspective

Onsite private access fueling with public dispensing is a growing trend as it allows a fleet owner to increase throughput and ROI.

3.3 Limited Access Private Fueling

Limited private access fueling stations are typically owned and operated by a third-party commercial entity where vehicles from multiple fleets purchase fuel. These are typically card-lock stations with payment for fuel being made either with a branded key card, a fuel-purchasing card or a credit card. Under this model, the station owner is responsible for project development, operation and maintenance costs and obtaining financing. As a result, the owner must typically secure contracts with one or more anchor fleets to ensure the minimum throughput needed to make the station economically viable. As with onsite stations that allow public access, this model allows fleet owners to fuel their vehicles without having to incur fueling infrastructure capital, operating, maintenance costs and without the need to secure commodity natural gas supply.

3.4 Public Access Fueling

Public access stations allow fleet and consumer vehicles to fuel their NGVs without restriction at high visibility and heavily trafficked areas that offer convenient access to customers. Long-haul combination trucks typically use public access fueling, as do most personal vehicles. By providing fueling to a wide array of customer's public access fueling helps build brand identity for natural gas as a transportation fuel. Fleets fueling at public access stations avoid the capital, operating and maintenance costs involved in

[37] In a sign of the trend toward onsite private fueling with public dispensing, a new CNG station opened by Waste Management Inc. in Conroe, Texas, in May 2012 to serve company fleet vehicles is also open to the public, including commercial and government fleet vehicles as well as privately owned cars.

building private access infrastructure.

Before building a station, developers of public access stations generally seek to execute fueling contracts with anchor fleets to ensure minimum throughput. A new $1 million CNG fueling installation consisting of two dispensing kiosks capable of dispending up to 1 million GGE in CNG per year requires a minimum sales throughput of 300,000 GGE per year to ensure sufficient ROI. A station developer may seek to secure contracts with anchor fleets to purchase 50 to 60 percent of the station's fueling capacity before building the station.

As noted earlier, the majority of commercial U.S. fleet vehicles fuel at public access petroleum stations. Yet, only 41 percent of the nation's NGV fueling stations are public access. With limited access to NGV fueling infrastructure the top concern among commercial fleet owners, the number of public access CNG and LNG stations will need to grow appreciably if NGVs are to gain widespread market penetration.

3.5 All-in-One Turnkey Partnerships

An increasingly common method used in building public access fueling is an all-in-one turnkey partnership. This model is based on an independent fuel services vendor, service provider or a natural gas utility. The turnkey provider installs, owns, finances, operates and maintains the fueling infrastructure which is hosted at a fleet owner's site, an existing gasoline station, or a convenience store. Under this arrangement, the turnkey company assumes all responsibility for the capital investment. In return for hosting the infrastructure and providing retailing and transaction processing service, the host property is typically paid a royalty based on the dispensed volume of CNG or LNG on a GGE basis.

Perspective

Turnkey partnerships, enable a services company or utility to finance, own and install fueling infrastructure at a fleet location, petroleum retailer or convenience store. It eases market entry, reduces risk and cost, and enables fueling to be located at prime sites.

All-in-one turnkey arrangements help ease entry into the NGV fueling market by lowering risk, allowing infrastructure to be deployed at existing properties and thus avoiding the need to purchase land – an otherwise significant expense in station development. This model also permits new NGV fueling infrastructure to be installed at already established locations that fleet customers are accustomed to using and find convenient. All-in-one turnkey partnerships account for a significant share of new public access CNG and LNG infrastructure being deployed today.

4. Assessing Investment in NGV Fueling Infrastructure

Fueling installations that dispense CNG and LNG are owned and operated by a range of different entities – natural gas producers, independent fuel retailers, regulated and unregulated natural gas utility entities, governments and quasi-government entities such as transit, port and school districts, and commercial fleet owners.[38] No central clearinghouse tracks exactly how much is being invested today in building NGV fueling infrastructure although evidence presented below suggests that it is measured in the hundreds of millions with hundreds of millions more in the pipeline – as much as $1.32 billion. There is robust interest in building fueling infrastructure for NGVs, and interviews conducted for this survey suggest a willingness and ability among increasingly diversified investors to deploy capital to build fueling stations. Even so, the amount invested to date appears well short of the tens of billions needed to build a national fueling network.

Perspective

$150 million is being invested by CLNE to build American Natural Gas Highway, a backbone LNG fueling network along America's to catalyze the market for LNG-fueled heavy-duty trucks.

The case-by-case briefs detailed below highlight the investment strategies being employed to build NGV fueling infrastructure. Major CNG and LNG fueling infrastructure investments announced to date are summarized in Table 7.

4.1 Clean Energy's Investment in America's Natural Gas Highway

The largest single investor today in NGV fueling infrastructure is Clean Energy Fuels Corporation (CLNE). The Seal Beach, California-based company is the nation's largest independent NGV fuel vendor and fueling services company, owning, operating and maintaining or providing fuel to third-party stations through fueling contracts at 313 locations as of July 31, 2012.[39]

[38] According to Yborra, in 2007, 16% of U.S. NGV fueling stations are operated by independent (non-utility) fuel providers, 27% by utilities (overwhelmingly private access to fuel utility fleets), 37% by governments and quasi-government entities (e.g., transit, school, airport), 17% by private businesses (e.g., linen services, package companies, building trades contractors) and 3% are operated by individual consumers. See Yborra, S. (2007), *Roadmap for Development of Natural Gas Vehicle Fueling Infrastructure and Analysis of Vehicular Natural Gas Consumption by Niche Sector, Clean Vehicle Education Foundation*. TIAX LLC estimated that utilities operated 37 percent of all CNG stations in 2011 (TIAX LLC, 2011, *U.S. and Canadian Natural Gas Vehicle Market Analysis: Compressed Natural Gas Infrastructure)*.

[39] Per CLNE correspondence, August 2, 2012.

Table 7: Investments in CNG and LNG Fueling Infrastructure	
Entity	Investments
Chesapeake Energy	• $150 million invested in CLNE's Natural Gas Highway • Invested in 14 public access CNG stations in Oklahoma • Plans to invest $50 million for 200 more public access CNG stations
Apache Corporation	• Opened the first of 13 public access CNG stations planned for this year
Encana	• Opened LNG station in Shreveport, LA.
Andarko, Noble and Encana	• Jointly invested funds in 2 public access CNG stations opening this year in Weld County, CO. • Could lead to investment in up to 25 public access CNG stations in Weld County in the future
Royal Dutch Shell	• Building LNG fueling network on highways in Western Canada • Will invest $300 million in 100 station U.S. LNG highway fueling network located at Travel Centers of America truck stops
DeBartolo Development	• To invest in 1,000 new CNG stations over the next four years with an estimated value of $800 million

In 2011, CLNE secured commitments for $450 million in equity and debt investment that will be used to further expand its fueling infrastructure footprint. Included were investments of $150 million each, by Chesapeake Energy, the nation's second largest natural gas producer and largest independent producer of natural gas; by CLNE founder T. Boone Pickens; and by a group of Asian investors.[40]

The centerpiece of CLNE's plan is use of $150 million from Chesapeake Energy to build 150 LNG and LCNG fueling outlets every 250 to 300 miles along major U.S. interstate trucking corridors to create America's Natural Gas Highway. Under an exclusive agreement, CLNE will install most of the stations at Pilot Flying J truck stops; Pilot Flying

[40] iStockAnalyst.com (2011, December 29), *Clean Energy Fuels (CLNE): $450M Total Investment Commitments in 2011*, www.istockanalyst.com/finance/story/5615817/clean-energy-fuels-clne-450m-total-investment-commitments-in-2011

J is the nation's largest truck stop operator with over 500 truck stops in 43 states. Under a turnkey partnership, CLNE will own, operate and maintain the new fueling infrastructure and make royalty payments to Pilot Flying J based upon fuel sales.

The partnership allows CLNE to leverage its risk by obtaining prime strategically located fueling outlets at prime Pilot Flying J's locations and allows truckers to continue to use familiar fueling locations. CLNE has identified 98 prospective locations; earlier this year CLNE opened eight new stations. The company has 20 sites under construction at the time of this writing, 24 sites in design and permitting, and six sites under review.[41] CLNE's goal is to have 70 LNG/LCNG stations open in 33 states by the end of 2012. The company has adopted a corridor strategy for most if its initial sites with new stations to be arrayed along interstate corridor segments connecting the Texas triangle of Houston, Dallas and San Antonio; Los Angeles, Dallas, and Atlanta; Chicago and Dallas and Chicago and Atlanta. The remaining stations are expected to be open by the end of 2013.

To help generate demand, CLNE has entered into an agreement with Navistar, which plans to produce eight new NGV truck models by the end of 2013. Under the agreement, CLNE will provide fuel incentives to owners of Navistar trucks who fuel at CLNE's LNG stations; the incentive will guarantee fuel prices at a significant level below the price of diesel for a period of five years for customers who commit to purchasing at least 1,000 DGE of LNG per month under take-or-pay contracts.[42] An innovative provision of these contracts will allow fleet owners to amortize the incremental cost of purchasing Navistar LNG trucks over the lifetime of the fueling contract; CLNE will effectively cover the incremental cost through the contract fuel price, providing an increased incentive to purchase Navistar NGVs. According to CLNE, fleet owners will obtain "the same lease cost of a diesel truck and get fuel savings too," an offering made possible due to the price spread between natural gas and diesel.[43]

Perspective

Innovative supply contracts by Clean Energy Fuels will allow purchasers of Navistar LNG trucks to amortize vehicle incremental costs over the life of their fueling contracts.

CLNE also owns two LNG liquefaction plants – in Willis, Texas, and in Boron, California, in the Mojave Desert. Along with LNG procured from third-party suppliers, CLNE relies on these plants for the LNG it sells to its customers. The company is in the process of expanding capacity at its California plant. Most of the fuel sold by CLNE to fleets is

[41] Seeking Alpha (2012, May 8), *Clean Energy Fuels CEO Discusses 2012 Q 1 Results – Earnings Call* Transcript, http://seekingalpha.com/article/567841-clean-energy-fuels-ceo-discusses-q1-2012-results-earnings-call-transcript

[42] Navistar International Corp (2012, Feb. 1), *Navistar Advances Commitment to Natural Gas Through Partnership with Clean Energy*, http://media.navistar.com/index.php?s=43&item=541

[43] Fleet & Fuels (2012, February 2), *Navistar International and Clean Energy Fuels Team on Natural Gas Trucks*, www.showtimesdaily.com/fleetsfuels/navistar-clean-energy-team-on-natural-gas-trucks-2012

priced on an index-plus basis which is calculated by adding a margin to the local index or utility price for commodity natural gas, though the company also sells a small amount of CNG under fixed-price contracts.[44] Fleet customers are billed monthly based on the volume of fuel purchased. The balance of the fuel the company sells is per fill-up whereby the customer typically pays for fuel dispensed at the time of purchase.

4.2 Investments by Natural Gas Producers

As CLNE pointed out in a recent regulatory filing, interest in investing in NGV fueling infrastructure is high: "A significant number of established businesses, including oil and gas companies, refuse collectors, natural gas utilities, industrial gas companies, station owners and other organizations have entered or are planning to enter the natural gas fuels market."[45] With regard to natural gas producers, *American Oil and Gas Reporter* noted in May 2012:

Perspective

Amidst a groundswell of support for natural gas as a transportation fuel, independent oil and gas producers and operators are investing in CNG and liquefied natural gas refueling stations.

"Amidst a groundswell of support for natural gas as a transportation fuel, leading North American independent oil and gas producers and operators are investing in CNG and liquefied natural gas technologies and refueling stations in their own operating areas and corporate headquarters, and even public facilities in urban areas. The nation's leading natural gas producers believe that if they build the infrastructure and chart the course to a natural gas-fueled transportation sector, producers trust the industrial, governmental and private market sectors will come."[46]

Available information suggests that natural gas producers have recently invested or are in the process of investing at least $520 million in building public access LNG and CNG fueling infrastructure with more expected.[47]

[44] CLNE, Form 10-Q dated May 7, 2012, http://yahoo.brand.edgar-online.com/DisplayFiling.aspx?dcn=0001104659-12-033817

[45] CLNE, Form 10-Q dated May 7, 2012, http://yahoo.brand.edgar-online.com/DisplayFiling.aspx?dcn=0001104659-12-033817

[46] American Oil and Gas Reporter. *Leading by Example, Independent Producers Chart Source for Natural Gas in Transportation Sector*, 2011, May, www.aogr.com/index.php/magazine/cover-story/leading-by-example-independent-producers-chart-course-for-natural-gas-in-tr

[47] This estimate is based upon a review of public sources. Not all investments by natural gas producers are publicly reported and this figure does not, for example, account for investments in LNG liquefaction plants. The actual amount being invested by these entities is almost certainly higher.

Oklahoma City-based Chesapeake Energy (CHK) is at the forefront of investing in NGV fueling infrastructure. The $150 million the company invested in CLNE is part of a $1 billion commitment Chesapeake made to invest in natural gas vehicles and infrastructure in the next decade. To manage these investments, the company created a subsidiary, Chesapeake NG Ventures Corporation. Investor website Seeking Alpha has called Chesapeake's investments "a solid long-term play on the growing demand for natural gas as a fuel source."[48]

Perspective

With a commitment to invest $1 billion in NGV technology and fueling over a decade, Chesapeake Energy is at the forefront in developing the nation's NGV resources.

Last year, Chesapeake invested in development of fourteen new public access CNG fueling outlets in Oklahoma, hosted on islands at OnCue Express convenience stores and Love's Travel Shops – Love's operates 300 truck stops in 39 states. Anchor throughput for the Oklahoma stations is being provided by take-or-pay contracts under which Chesapeake will fuel company fleet vehicles being converted to run on CNG.[49]

Chesapeake plans to convert its entire 4,000-plus company fleet vehicles to run on CNG by the end of 2014. The company also has announced that it will invest an additional $50 million to add 200 or more public access CNG fueling outlets in 17 or more states through partnerships with other convenience stores and fueling retailers. Possible hosts for the Chesapeake fueling infrastructure investments include outlets at 7-Eleven, Murphy USA, Gulf, Valero, QuikTrip, Kum & Go, Wawa, Giant Eagle, Sheetz, and at locations owned by the Meijer and Kroger supermarket chains.[50] The Chesapeake partnership model – investing in infrastructure hosted by independent fuel retailers – is driven in part by IRS regulations that limit independents gas producers to no more than $5 million in revenue from retail gas sales.[51] But as with CLNE's agreement with Pilot Flying J, turnkey partnerships help ease market entry for fueling infrastructure deployment by targeting existing strategically located fuel retailer sites that fleet customers are already familiar with bolstering the image of natural gas as a readily accessible transportation fuel.

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[48] Seeking Alpha (2012, March 13), *Chesapeake Energy: A Long Term Play on Natural Gas as an Automotive Fuel*, http://seekingalpha.com/article/431861-chesapeake-energy-a-long-term-play-on-natural-gas-as-an-automotive-fue

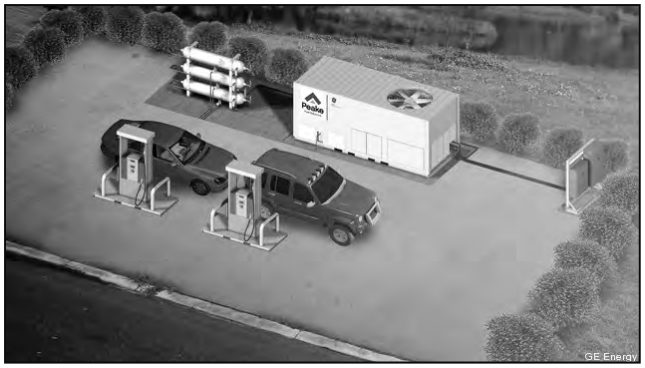
[49] American Oil and Gas Reporter (2011, May). *Leading by Example, Independent Producers Chart Source for Natural Gas in Transportation Sector*, www.aogr.com/index.php/magazine/cover-story/leading-by-example-independent-producers-chart-course-for-natural-gas-in-tr

[50] The State Journal (2012, April 13), *Chesapeake Identifies Chains Interested in Selling Natural Gas for Vehicle Use*, www.statejournal.com/story/17158023/chesapeake-identifies-chain-interested-in-selling-natural-gas-for-vehicle-use

[51] Internal Revenue Code Section 613(a). In May 2012 Representative William Cassidy of Louisiana introduced H.R. 1712, which would remove the $5 million retail sales limitation upon independent natural gas producers for gas sold as a transportation fuel.

Through its Peake Fuel Solutions subsidiary, Chesapeake has entered into an agreement to market CNG-in-a-Box technology (Figure 4). Produced by GE, this technology allows CNG compressors and other needed equipment to be delivered to a dispensing site in a single all-in-one container. This saves space and allows installation more quickly than with custom designed systems; it also reduces installation costs.

Figure 5
CNG-in-a-Box Refueling Station



Other natural gas producers are also investing in CNG fueling. Apache Corporation (APA), the 13th ranked U.S. natural gas producer, operates private access CNG stations to fuel its fleet. Apache recently opened the first of thirteen new public access CNG outlets it plans to invest in by the end of 2012. Fifth-ranked independent natural gas producer Encana Corporation (ECA) operates two private access CNG fueling outlets in Colorado and one in Wyoming to service its fleet vehicles; it also has private access stations in British Columbia and Alberta. In February 2012, Encana opened its first public access LNG fueling station outside of Shreveport, La., projected to dispense 15,000 to 30,000 GGE in LNG daily. LNG will be supplied by a liquefaction plant owned by AGL Resources subsidiary Pivotal LNG, as part of a new AGL company effort to sell LNG for transportation fueling. To meet expected demand, Pivotal purchased a liquefaction plant in Trussville, Ala., in August 2011 with a capacity to process up to 60,000 gallons of LNG per day.[52]

The 3rd and 23rd largest U.S. gas producers, Andarko (APC) and Noble Energy (NBL), have joined with Encana and local governments to invest matching funds being used to construct 2 new public access CNG stations in Weld County, Colo. The stations will be built, owned and operated by Mansfield Gas Equipment Systems Inc., which entered the turnkey contractor market in March 2011 with its acquisition of California-based Gas

[52] Hydrocarbon Processing (2011, August 22), *AGL to Supply Encana with LNG for Louisiana Truck Fueling Stations*, www.hydrocarbonprocessing.com/Article/2887761/AGL-to-supply-Encana-with-LNG-for-Louisiana-truck-fueling-stations.html

Equipment Systems Inc. (GESI); GESI has constructed, operated and maintained more than 150 CNG fueling stations over its 13-year history. Fueling contracts between the gas producers and municipal agencies converting their fleets to CNG will provide anchor throughput. The station is being built as part of a local government Smart Energy plan that calls for up to 25 public access CNG stations in Weld County, home to more producing natural gas wells than any other county in the U.S.[53]

In March 2012, Southwestern Energy Company (SWN), the nation's 8th largest gas producer, opened its first public access CNG fueling station in Damascus, Ark., after already having invested in a public access CNG fueling station in North Little Rock. Southwestern plans to continue investing in CNG fueling infrastructure although details on additional investments have not been announced.[54]

Royal Dutch Shell (RDS.A) is not an independent gas producer but an oil and gas major with petroleum refinery and retail operations. In 2012, Shell expects to produce more natural gas than oil for the first time in the company's history, and it has announced that LNG is the fuel of the future for the commercial transportation sector. Based on that forecast, the company will make its first large-scale investments in LNG transportation fueling in Western Canada with a LNG fueling facility hosted at Shell Flying J truck stops. Construction will begin in the third quarter of 2012 with fueling stations in Calgary, Edmonton and Red Deer. Shell also is building a new liquefaction facility that will begin production in 2013 at the company's existing Jumping Pound gas processing facility located about 20 miles southwest of Calgary. Shell will procure LNG under a third-party supply agreement until the new facility begins operating.

Perspective

Oil and gas major Shell sees LNG as its transportation fuel of the future. Shell is making its first large-scale investments in public access LNG with $300 million for 100 new LNG fueling outlets to be located at Travel Centers of America truck stops.

Shell's investments in Canada are only a first step. In June of this year, the company announced a preliminary agreement under which it will invest $300 million in 100 new LNG fueling outlets in the U.S. Most of the fueling outlets will be hosted at Travel Centers of America truck stops along interstate highways.[55] With the Financial Post

[53] See www.weldsmartenergy.org/SmartEnergyPlan.html for more information Weld County's plans to develop a CNG fueling network under its Smart Energy Plan.

[54] Industry Week (2012, March 28), *The Road to More Natural Gas Cars Start With Infrastructure*, www.industryweek.com/articles/the_road_to_more_natural_gas_cars_starts_with_infrastructure_26956.aspx?ShowAll=1

[55] For additional information on Shell's investment plans, see http://royaldutchshellplc.com/2012/06/08/shell-expands-lng-option-for-18-wheelers/; http://www.forbes.com/sites/christopherhelman/2012/06/13/shell-investing-300m-to-fuel-lng-powered-

referring to Shell's move into LNG for transport "changing the energy game," Shell's entry into the U.S. market is noteworthy for several reasons.[56] First, Shell's plan represents the first entry into the NGV fueling market by an oil and gas major. With a current market capitalization of $203 billion, Shell is the 8th largest company in the world. Second, Shell's business model appears to be similar to that of CLNE – to build LNG fueling infrastructure along major highway truck corridors – and may herald a more competitive fueling market for long-haul and regional trucking fleets, providing further impetus to adoption of NGVs. Also, Shell plans to offer trucking fleets incentivized fueling contracts tied to the price of diesel fuel – fleets entering into contracts will be assured of a price equivalent to at least 30 percent less than the cost of diesel fuel on a GGE basis for the lifetime of the trucks. As with CLNE's incentives, Shell's move is a clear sign of confidence that natural gas prices will remain significantly below those of petroleum fuels, boosting the value proposition for fleet owners to purchase NGVs.

4.3 DeBartolo CNG Investment

In late June 2012, Tampa-based DeBartolo Development LLC, one of the nation's leading property developers, announced plans to invest in development of up to 1,000 new CNG fueling stations in the next four to five years.[57] The development program is being undertaken as a partnership between DeBartolo and Keystone Consulting Group of Jacksonville, Fla. DeBartolo will provide the capital funding for station development and act as a preferred developer for the turnkey stations, with Keystone Consulting Group conducting site selection and location acquisition/leasing services. Also part of the new investment initiative is Chesapeake Energy's Peake Fuel Solutions subsidiary, which will provide technical station development services. The group plans to begin with installation of ten pilot stations to test various development models. Initial station development will be focused on California, Florida, Oklahoma, Texas and West Virginia. The group plans to break ground on its first stations by the end of 2012. Initially, the group anticipates that investments in private access fueling will predominate, but as the NGV market is seeded, investment will also focus on public access fueling stations. The DeBartolo group believes that it can install many of the new stations at a cost of $750,000 by using new technologies including CNG-in-a-Box where applicable. However, assuming an average development

Perspective

DeBartolo Development will invest an estimated $800 million in 1,000 new CNG fueling stations, doubling the current number.

trucks/; http://www.upi.com/Business_News/Energy-Resources/2012/06/08/Shell-to-offer-LNG-truck-refueling/UPI-70221339177161/

[56] Financial Post (2012, June 8), *Shell is Changing the Energy Game – and in a Big Way*, http://opinion.financialpost.com/2012/06/08/shell-is-changing-the-energy-game-and-in-a-big-way/

[57] Tampa Bay Business Journal (2012, June 28), *DeBartolo Development to Enter CNG Station Market*, http://www.bizjournals.com/tampabay/news/2012/06/28/debartolo-development-to-enter-cng.html?ana=RSS&s=article_search&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+industry_5+%28Industry+Energy+%26+the+Environment%29

cost of $800,000 for all stations built, total investment in 1,000 new stations could total as much as $800 million.

4.4 Utility Investment in NGV Fueling Infrastructure

Regulated natural gas local distribution companies, also known as LDCs, were some of the earliest investors in NGV fueling infrastructure. Today, LDCs own an estimated 37 percent of all U.S. NGV access fueling stations, most of which are used to fuel utility fleet vehicles. Utah-based Questar Gas owns and operates the most fueling outlets with 30.[58] Next in line are Pacific Gas & Electric Company (PG&E) with 24, Oklahoma Natural Gas (23), National Grid (13) and Sempra Energy's SoCalGas unit (12).

There are two main ways utilities invest in NGV fueling infrastructure. LDCs can receive approval from their state regulatory commissions to use ratepayer funds to invest in NGV related activities. The LDC conducts a cost-of-service study to isolate fueling infrastructure capital and depreciation costs and separate these from other costs allocated to all utility customers. Utility holding companies that operate LDCs can also use shareholder funds or private capital to invest in NGV activities by creating or acquiring non-regulated investment entities that function in the market as any ordinary commercial entity.

At least 15 states have authorized special NGV or CNG tariffs for prices at which LDCs sell CNG as a transportation fuel (Table 8). In a selected number of states, these tariffs also enable LDCs to rate base and recover their capital costs in installing fueling equipment to dispense CNG at public and private access stations where the LDC owns fueling infrastructure equipment.

Enabling more LDCs to operate NGV fueling stations and rate-base their capital costs through CNG/NGV tariffs could significantly expand the number of stations in operation.[59] Regulated LDC investment in NGV fueling infrastructure that serves non-utility owned vehicles is a highly contentious matter, however. The Petroleum Marketers Association of America strongly opposes allowing regulated LDCs to operate fueling infrastructure for commercial fleets, seeing this as unfair competition.[60] Consumer advocates also often oppose rate basing of LDC capital costs in fueling infrastructure out of concern that rate basing can result in subsidization by LDC customers who do not consume natural gas as a transportation fuel. As a result, the ability of LDCs to own and operate NGV fueling infrastructure has been circumscribed in most states.

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[58] TIAX LLC (2011) U.S. and Canadian Natural Gas Vehicle Market Analysis.

[59] Knittel, C. (2012, June), *Leveling the Playing field for Natural Gas in Transportation.* Brookings Institution, The Hamilton Project (Discussion Paper, 2012-03).

[60] See, e.g.*, Initial Comments of the Colorado Wyoming Petroleum Marketers Association*, *In The Matter of the Investigation of the Issues Related to Electric and Gas Vehicles in Colorado,* Colorado Public Utilities Commission, Docket 11I-704EG, October 21, 2011.

Table 8: States With NGV or CNG Tariffs				
State	**Utility**		**State**	**Utility**
Arizona	• Southwest Gas		New Jersey	• N. J. Natural Gas • South Jersey Gas
Connecticut	• Yankee Gas • Southern Connecticut		New Mexico	• N. M. Natural Gas
Delaware	• Chesapeake Utilities		New York	• National Fuel Gas
Florida	• TECO		North Carolina	• Piedmont
Illinois	• Intergys • Peoples Gas		Pennsylvania	• Columbia Gas • National Fuel Gas • PECO Energy • Philadelphia Gas • UGI
Indiana	• Vectran North • Vectran South		Tennessee	• Piedmont
Missouri	• Laclede Gas		Utah	• Questar
			Wyoming	• Questar
Source: Includes Marple, C. (2011, February), Presentation to NARUC Staff Sub-Committee, American Gas Association.				

Types of LDC NGV fueling ownership and operational models are summarized in Table 9. A further discussion of selected LDC initiatives follows.

Questar's Utah Model

With a population of 2.8 million and 40 public access CNG fueling outlets, Utah ranks second only to Oklahoma (3.8 million population, 58 stations) in terms of public access CNG fueling stations per capita. Questar Gas is the largest natural gas distribution utility in Utah, where Questar owns and operates 30 public access CNG stations. Questar dominates public access CNG fueling in Utah – the utility owns 75 percent of CNG fueling infrastructure deployed in the state. Officials at Questar credit a supportive regulatory environment for having allowed it to make investments that have transformed Utah into a state where CNG can be easily be purchased by transportation consumers.

Table 9: Selected Utility NGV Fueling Infrastructure Investment Programs		
Utility	State	Program Description
Questar Gas	Utah	LDC owns 30 CNG fueling stations in Utah under state regulatory commission approved NGV CNG tariff that allows rate based capital cost recover. About 10% of costs cross-subsidized by all utility customers. Parent Questar Corporation recently created unregulated entity to serve NGV fueling infrastructure market.
Intergys	California, Texas	Chicago-based utility holding company acquired turnkey contractors and fueling station operators Trillium and Pinnacle with 20 CNG stations in Arizona, California and Texas. Additional investment in fueling infrastructure expected.
Piedmont	North Carolina	LDC currently operates 6 private access CNG fueling outlets to fuel its owned fleet. Plans to open an additional 6 public access fueling stations this year under newly approved NGV tariff.
AGLC	Georgia	Public Service Commission approved program to use $10 million in Universal Service Fund to install leased CNG fueling infrastructure at 7-10 public access retail locations; limited access also allowed. Hosts responsible for retailing and fuel procurement from third part certificated gas marketers.
National Gas	New York	New LDC pilot program approved by state Public Service Commission to make up to $3.5 million in grants for infrastructure and NGV purchase and conversion. Station owner must commit to gas commodity purchase agreement with LDC, which proves for LDC grant cost recovery. Public or private access station owner's option.
New Jersey Natural Gas	New Jersey	LDC has received approval from the N.J. Board of Public Utilities to invest $10 million in public access fueling infrastructure at fleet host sites. Host fleet must contract with NJNG for commodity gas purchase, commit to 20 percent of throughput and conduct retailing function.
Chesapeake Utilities	Florida	Utility holding company entered into agreement with Wise Gas of Florida to build public access CNG fueling station in Florida through unregulated PESCO gas marketing subsidiary. First station opening this year, others planned.
SoCalGas	California	LDC has applied to the California Public Utilities Commission for approval of a compression services tariff to rate base recovery of capital cost for providing CNG compression services to the utility's customers at customer host locations. CLNE, Integrys and the California Division of Ratepayer Advocate have protested. A decision on the application is due by the end of 2012.

Key for Questar is 1989 legislation that allowed the Utah Public Service Commission to approve a CNG tariff. Questar's first CNG tariff went into effect in 1989 with the tariff rate set at $0.51 per therm, equivalent to $0.617 on a GGE basis at the time. When initially enacted, Questar's investments in fueling infrastructure were treated as a rate-based "balancing cost" and allocated across all utility consumers, resulting in significant cross-subsidization of the company's NGV investments by all utility customers, not only CNG consumers. During the next two decades, the tariff rate was adjusted upward but remained significantly below a full cost of service level, allowing Questar to continue to build CNG fueling infrastructure even as other LDCs were divesting their fueling infrastructure assets. Questar's current NGV tariff rate is depicted in Table 10, and provides an example of an NGV tariff that allows for capital cost recovery through rate basing. Substantive revisions to the tariff were made in 2009 and, with a recent revision approved in 2012, the tariff rate now stands at $10.20638 per dekatherm (10 therms) dispensed, equivalent to $1.63 per DGE and $1.28 per GGE.[61] It has been estimated that the tariff continues to allocate about 10 percent of Questar's NGV fueling capital infrastructure across all LDC customers.

Perspective

Questar's CNG tariff can be viewed as a model in states that consider not just pure utility economics but the full range of social and environmental benefits to be derived from encouraging NGV fueling infrastructure investments.

Piedmont Natural Gas

Piedmont Natural Gas (PNY) owns and operates six CNG stations throughout its regulated service territory in North Carolina. The stations were installed to service 115 of Piedmont's fleet vehicles that run on CNG. Given the increased demand among fleet owners, Piedmont is opening its stations for 24-hour public access and plans to open an additional five CNG fueling outlets this year once fueling contracts can be executed with fleets to ensure minimum needed throughput. All of Piedmont's existing stations are located on utility-owned property, but Piedmont is seeking to partner with independent fuel retailers or fleet owners who agree to host its new fueling outlets. Piedmont has already secured one such partnership with Frito-Lay Co. Frito-Lay is in the process of accepting delivery of 67 new Freightliner CNG trucks this summer and will host the new public access fueling station in Charlotte. Piedmont's expansion is taking place under a NGV tariff rider approved by the North Carolina Public Utilities Commission that allows the utility to rate-base $0.40 per therm of CNG dispensed for compression infrastructure capital cost recovery when the utility installs its own owned compression

[61] See www.psc.utah.gov/utilities/gas/tariffs.html for additional information on Questar's CNG tariff in Utah. Assumes 1.35 therms per DGE; 1.25 therms per GGE.

Table 10: Questar Gas Company Utah NGV Tariff Rate	
Base Distribution Non-Gas Rate	$5.01140 per Dth used
Energy Assistance	$0.02310
Infrastructure Rate Adjustment	$0.16010
Distribution Non-Gas Rate	$5.19460
Base Supplier Non-Gas Rate	$0.84514
SNG Amortization	$0.0000
Supplier Non-Gas Rate	$0.84514
Base Cost Gas	$4.16664
Commodity Amortization	$0.0000
Commodity Rate	$4.16664
Total Rate	$10.20638
Per DGE	$1.63
Per GGE	$1.28
Source: http://www.questargas.com/AboutUs/GasRatesTariffs.php. Dth = Dekatherm = 10 therms = 1,000,000 Btu. Taxes not included.	

infrastructure at a third-party site.[62] This is in addition to basic commodity gas, transport and other customer gas service costs. The tariff in effect for Piedmont is full cost-of-service based, and there is no cross subsidy provided by other utility customers.

National Fuel Gas Fuel's Pilot Grant Program

Headquartered in Buffalo, N.Y., National Fuel Gas Company (NFG) markets and transports natural gas, serving more than 700,000 consumers in western New York and northwestern Pennsylvania. In November 2011, NFG received approval from the New York State Public Service Commission for a three-year pilot program under which the utility will issue $3.5 million in grants to leverage investment in new NGV fueling infrastructure and NGV fleet purchases and conversions. To be eligible for the program, a fleet owner must estimate the total number of gallons of diesel or gasoline that will be displaced by use of CNG over a five-year period and execute a minimum five-year fuel purchase contract with the utility. If fleet fuel consumption exceeds contract requirements, the fleet will receive a credit toward fuel purchases in the following year.

[62] See www.piedmontng.com/about/ourrates/home.aspx for Piedmont Natural Gas's Natural Gas Vehicle tariff.

Utility cost recovery of grant amounts will be incorporated into fuel sales contract terms. National Fuel has pending agreements for development of one private access and one public access fueling station and estimates that grant awards of up to $200,000 will be available per project. The program is innovative – it differs from other LDC investment strategies in that NFG will not own or operate the fueling stations but issue grants to help offset up-front infrastructure development costs. The performance of this pilot project will be evaluated by the state PSC. If successful, the program could be expanded to other LDCs in New York and could serve as a potential model for LDCs in other states as well.

Atlanta Gas Light's Infrastructure Lease Program

Under a program approved in 2011 by the Georgia Public Service Commission, Atlanta Gas Light Company (ATLC) issued a RFP in March of this year outlining terms under which the LDC will use $11.57 million from the state's Universal Service Fund (USF) to lease compression and CNG storage equipment to privately owned retail outlets. AGLC will own, operate and maintain the equipment.[63] Host vendors will be responsible for retail and marketing functions including transactions processing and for procurement of gas supply from one of Georgia's ten certificated natural gas marketers.

Perspective

AGLC's lease program can serve as a model by other utilities in states where LDCs are prohibited from rate-basing fueling infrastructure capital costs if special funds can be obtained to offset the rate base impact of utility investments.

To be eligible for the program, host vendors must secure fuel sales contracts with fleet customers to purchase a minimum of 30,000 GGE per year for a five-year period during which the agreement with AGLC and the retailer will run. Upon expiration of the agreement, hosts will have the option to purchase the AGLC equipment at depreciated value. Lease revenues received by AGLC will be deposited in a reserve account to cover program costs and for use in a second project phase to further deploy fueling infrastructure. Expectations are that AGLC will execute contracts with up to 10 retailers in mid-2012 with infrastructure installation to begin before year's end. The program's emphasis is on public access fueling, but up to 25 percent of available program funds can be used to install limited access stations that serve government or commercial fleets that serve a public purpose.

On May 30, 2011 AGLC announced that it had received qualified proposals from the City of Atlanta and seven commercial entities to open up to nine new CNG stations under the program with the entities having 90 days to execute fueling contracts for the minimum throughput required. The utility expects to have the first stations open in

[63] See www.atlantagaslight.com/cngplan/ for additional information on AGLC's program.

2013.[64] AGLC's lease program can serve as a model for other utilities in states where LDCs are prohibited from rate-basing capital costs associated with fueling infrastructure and where LDCs are able to obtain state or federal grants that can be used to offset the rate base impact of utility investments.

New Jersey Natural Gas

In June 2011, New Jersey Natural Gas (NJNG) filed a petition with the state's Board of Public Utilities (BPU) to invest up to $15 million over an 18-month period to build CNG fueling outlets in its service territory in Monmouth, Ocean and Morris counties. The LDC proposed to install, own, operate and maintain between seven and ten public access fueling stations hosted at locations provided by government or commercial fleet entities. In exchange for the NJNG investment, host fleets would receive a nominal land lease payment and need to enter into agreements to consume at least 20 percent of a station's throughput. Station hosts would also be responsible for procuring natural gas supply from certificated third-party gas marketers and need to provide retail functions including transaction processing for third-party customers. Proceeds from NJNG's delivery of natural gas would be credited back to ratepayers to offset the utility's investment costs. The utility's filing was predicated on its ability to take advantage of a 50 percent bonus depreciation allowance that expires at the end of 2012 and the utility planned to begin construction of the new fueling outlets no later than the end of the year.[65] On June 18, 2012, the state BPU and NJNG entered into a stipulation under which the utility will proceed with a scaled down $10 million, one-year pilot program. However, the utility will not recover its capital costs for the program, at least during its initial one-year pilot phase.[66] Pointing to the controversy that can surround LDC involvement in NGV fueling, the state's Division of Rate Counsel (consumer advocate) declined to sign onto the stipulation despite findings that the rate impact on the average utility customer would be only one-tenth of one percent, or $0.30, per month. With BPU approval, NJNG plans to move ahead immediately to identify fleet operators willing to host the new fueling outlets.

[64] Reuters (2012, May 30), Atlanta Gas Light Considers Proposals for Nine New CNG Stations, www.reuters.com/article/2012/05/30/idUS209539+30-May-2012+HUG20120530

[65] The bonus depreciation provision was authorized under the Tax Relief, Unemployment Insurance Reauthorization and Job Creation Act of 2010 (PL 111-312) expires on December 31, 2012. See Section 5.

[66] See www.njspotlight.com/stories/12/0618/2112/ for additional information on the NJNG NGV infrastructure pilot program. The stipulation is not currently available online.

SoCalGas

Sempra Energy's (SRE) SoCalGas is the primary supplier of natural gas in Southern California (along with Sempra's San Diego Gas and Electric). SoCalGas owns 13 stations that dispense natural gas for use by the utility's fleet vehicles. These stations are operated and maintained by turnkey commercial fuel vendors (e.g. CLNE, Trillium) and are also open to the public. In November 2011, SoCalGas applied to the California Public Utilities Commission (CPUC) for approval of a compression services tariff that would allow the utility to install CNG compression infrastructure at third-party customer locations.[67] These customers could include conventional gas stations and commercial fleets. SoCalGas would own and operate the compression equipment with fuel dispensing equipment and all other operations beyond the point of compression delivery being the responsibility of the station host. The compression services tariff application has been protested by CLNE, Integrys, which owns turnkey operators Trillium and Pinnacle (see below) and the California Division of Ratepayer Advocate. The basis for the challenge includes whether the tariff rates reflect full cost of service and whether the tariff is consistent with CPUC policy regarding LDC entry into the commercial CNG fueling market.[68] Other market participants have filed for party status in support of the tariff application, including Mansfield Gas Equipment Systems, Clean Fuel Solutions and Propel Fuels, as has the American Gas Association. A decision by the CPUC on the SoCalGas compression services tariff application is expected at the end of 2012.[69]

Perspective

The SoCalGas application for a compression services tariff points to controversy that revolves around allowing LDCs to enter the NGV fueling market.

Unregulated Utility Investments in NGV Infrastructure

There is an increasing trend for utilities to use unregulated entities to invest in NGV fueling infrastructure. Several examples follow.

In April 2011, Questar Corporation (STR), parent of Questar Gas, formed a non-regulated subsidiary, Questar Fueling, to provide consulting, design, packaging and turnkey installation and operation of NGV fueling infrastructure.[70] In September 2011, Chicago-

[67] See the Compression Services Tariff Application SoCalGas filed with the California Public Utilities Commission, www.socalgas.com/regulatory/A1111011.shtml.
[68] See www.socalgas.com/regulatory/A1111011.shtml.
[69] Whereas SoCalGas is seeking to expand its NGV fueling infrastructure portfolio, Pacific Gas and Electric Company (PG&E) is seeking to sell the stations it currently owns. PG&E has issued an RFI which would result in a third party entity purchasing the fueling stations and continuing to operate them at existing PG&E service center locations. CPUC approval will be required before sale of PG&E's fueling station assets can be concluded.
[70] See Questar Fueling, http://www.questarfueling.com/.

based utility holding company, Intergrys Energy Group (TEG), made a $42.6 million all cash acquisition of Pinnacle CNG Systems and Trillium USA.[71] Pinnacle operates CNG fueling stations at 16 locations in California and Texas and has announced the 2012 opening of two new CNG stations in Arizona that will be hosted at Golden Eagle Distributor truck stops. Trillium operates four CNG fueling outlets in California. Pinnacle and Trillium will operate as wholly owned subsidiaries of Integrys Transportation Fuels, a non-regulated entity created by Intergrys for making NGV fueling investments.

Perspective

Integrys Energy Group's acquisition of turnkey operators Trillium and Pinnacle points to utility holding companies entering the NGV fueling market by establishing or acquiring non-regulated entities.

In April 2012, utility holding company Chesapeake Utilities Corporation (CPK), agreed to have its unregulated Peninsula Energy Services Company (PESCO) subsidiary partner with natural gas services company Wise Gas Inc. to develop public access CNG fueling infrastructure for municipal and commercial fleets in Florida. Chesapeake will own the station infrastructure and Wise Gas will act as a turnkey contractor in building, operating and maintaining the stations. Two stations are under development – one to be hosted at an existing fueling retailer and the second at a Greenfield site in Clearwater.

4.5 Key Investment Strategies for NGV Fueling Infrastructure

The case studies described above point to several strategies being employed to finance NGV fueling infrastructure. These strategies are summarized in Table 11.

[71] See Intergrys Energy Group Form 10-Q, September 30, 2011, www.wnd.com/markets/action/getedgarwindow?accesscode=110465911060164; www.Intergrysgroup.com; Fleet & Fuels (2011, September 8), www.showtimesdaily.com/fleetfuels/trillium-and-pinnacle-to-intergrys

Table 11: Key Investment Strategies for NGV Fueling Infrastructure	
• Use company fleet vehicles for anchor throughput at start-up • Turnkey partnerships to leverage risk, lower cost and gain access to locations readily convenient to fleet users • Index fuel contracts at guaranteed discount to diesel prices to ensure long term price certainty for customers • Use fueling contracts that amortize fleet owner's vehicle incremental costs over contract life to offset higher NGV purchase costs	• Establish CNG or LNG tariffs that allow LDCs to rate base fueling infrastructure capital costs based upon full range of social and environmental benefits • Lease fueling infrastructure to independent fuel retailers with cost recovery through lease payments • Authorize LDCs to make grants to fleets and commercial fuel retailers with cost recovery through fuel sales contracts • Enter fueling market by creating a non-regulated LDC affiliate

5. Government's Role in Building NGV Fueling Infrastructure

To date, the federal government and state authorities have used tax credit, loan and grant programs to incentivize development of CNG and LNG fueling infrastructure. Several of these programs have proved effective in spurring investment in NGV fueling infrastructure. However, to close the infrastructure gap described above and generate the related public interest benefits (see e.g., Table 4 *supra*), these programs will need to have more adequate and consistent funding.

New York Times economics columnist Floyd Norris recently underscored the principal rationale for doing so: "Last year the United States spent $750 billion importing oil and oil products — it makes sense for the government to move to develop the natural gas transportation market as quickly as possible."[72]

5.1 Federal Support in Transition

The federal government's support for natural gas as a transportation fuel is in the midst of a transition. On the one hand, grant funds that have been available in the past through the U.S. Department of Energy's Clean Cities program have dried up, and federal tax credits available in the past for infrastructure investment have expired with an uncertain future for renewal. On the other hand, in February 2012, President Obama announced a National Community Deployment Initiative that could provide up to $1 billion of new funding for infrastructure development beginning in 2013. The outlook for options at the federal level to accelerate the pace of deployment of NGV fueling infrastructure are reviewed below.

Perspective

The federal CNG and LNG excise tax credits of 50 cents per gallon providing capital offsets for NGV fueling infrastructure have expired.

<u>Sales and User Excise Tax Credit for CNG and LNG</u>

Effective October 1, 2006, the federal government began offering a motor fuel sales and user excise tax credit of $0.50 per GGE of CNG and per liquid gallon of LNG sold (as well as for other alternative fuels) as authorized under the Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (Act) (P.L.109-59, section 11113, 26 USC section 6426, 6427). Business entities could claim this credit as an offset against fuel sold in the case of retail transactions; fleets using their own private fueling could also claim the credit. In both cases, the entity needed to first claim the credit as an offset against taxes owed and take any remainder as a refundable income

[72] Norris, F. (2012, June 21), Natural Gas for Vehicles Could Use U.S. Support, New York Times, www.nytimes.com/2012/06/22/business/natural-gas-vehicles-are-a-compelling-target-for-a-federal-program.html?pagewanted=all.

tax credit. Tax exempt government and non-profit entities not owing excise taxes could apply for what amounted to a rebate. While the excise tax credit did not itself provide a direct up-front capital offset for investment in NGV fueling infrastructure, it did provide an indirect offset and as such, helped incentivize infrastructure investment. Authorization for the tax credit tax credit was renewed through December 31, 2011, under the Tax Relief, Unemployment Insurance Reauthorization and Job Creation Act of 2010 (PL 111-312). However, the credit has now expired.[73] A provision of the NAT GAS ACT of 2011 (see below) would have renewed the excise tax credit for five years but Congress has not approved the legislation.[74]

Clean Cities Grants

Established under the Energy Policy Act of 1992 (EPAct 1992), for almost two decades, the Department of Energy's Clean Cities program has provided grants used by public and commercial entities to buy vehicles fueled by CNG, LNG and other alternative fuels; convert vehicles to natural gas; build fueling infrastructure for alternative fuels.[75]

Perspective

Clean Cities grants have resulted in more than $1 billion in NGV and NGV fueling infrastructure since 1993 but no grant funds for infrastructure were available in 2012.

Since 1993, grants made by Clean Cities have funded more than 500 projects through a network of almost 100 local and regional coalitions, distributing $366 million and leveraging an additional $740 million for NGV procurement and infrastructure development. In 2009, the American Reinvestment and Recovery Act (ARRA) allocated $300 million to Clean Cities, which helped fund new construction or upgrades to at least 140 CNG and LNG fueling outlets. But funding for Clean Cities has been limited since ARRA. Lacking sufficient appropriations, Clean Cities did not issue any notice of grant offering for infrastructure development in 2011 and has no plans to issue funding notices in 2012.

CMAQ Funds

First authorized by Congress under the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 (P.L. 102-240), the Congestion Mitigation and Air Quality Improvement (CMAQ) program has provided hundreds of millions of dollars to support alternative vehicles.[76] Administered by the Federal Highway Administration (FHWA), CMAQ

[73] See US DOE Alternative Fuels Data Center, http://www.afdc.energy.gov/laws/law/US/319

[74] The ACT also would have ended current discrimination related to the excise tax levy on each gallon of LNG which leads to an effective excise tax rate of $.41 per diesel gallon equivalent vs. $.243 for diesel fuel. This is because LNG has a lower energy density per gallon than diesel, but the tax is applied on a volume (gallon) basis rather than on an energy equivalent basis.

[75] For additional information on Clean Cities see US DOE Energy Efficiency and Renewable Energy Clean Cities, www1.eere.energy.gov/cleancities/

[76] See Federal Highway Administration, www.fhwa.dot.gov/environment/air_quality/cmaq/

allocates funding to states through a statutory formula. Each state, in turn, allocates funds to metropolitan planning organizations in so-called "non-attainment areas" where federal air quality standards for ozone and other pollutants have not been met. Between 2005 and 2009, CMAQ funding totaled $8.6 billion. CMAQ funds can be used for offset the incremental cost of converting and purchasing NGVs as well as for development of NGV fueling infrastructure and can be used for joint public-private projects. CMAQ is a major source of funding for state, regional and local programs aimed at encouraging expansion of alternative fuel use including grant programs to encourage NGV fueling infrastructure development (see below).

EPA DERA Grants

EPAct 2005 authorized the Environmental Protection Agency to issue grants for projects to reduce emissions from diesel engines. Known as the Diesel Emissions Reduction Program, or DERA, Congress first appropriated funding for DERA in 2008 in the amount of $49.2 million. The ARRA authorized up to $300 million in DERA funding, with $120 million being appropriated in 2009-2010 and $49.9 million for FY 2011. Reauthorization of DERA in 2011 provided up to $100 million for fiscal years 2012 through 2016; for 2012, $29.9 million was appropriated.

Under the DERA program, 70 percent of grants must be disbursed through national competitive solicitations with the remaining 30 percent of funding allocated directly to state governments.[77] DERA grants may be used to offset 75 percent of costs involved in converting diesel trucks to CNG or LNG and up to 35 percent of the cost of purchasing new OEM NGVs. However, CNG and LNG fueling infrastructure is not currently eligible for funding through DERA. Amending DERA to allow grant funds to be used for design, equipment purchase and installation of CNG and LNG fueling infrastructure could provide one avenue to expand future federal support for natural gas fueling infrastructure.

National Community Deployment Initiative

On March 7, 2012, President Obama used a visit to a North Carolina truck manufacturer to announce his support for new incentives to expand the nation's fleet of alternative-fueled vehicles. The plan includes a "Race to the Top" National Community Deployment Initiative that would award $1 billion in competitive grants to 10 to 15 "model communities" to catalyze investment in CNG and LNG and other alternative fueling infrastructure.[78] The initiative includes a provision for funding development of up to five natural gas corridors to complete a LNG fueling network to serve the combination truck

[77] See US Environmental Protection Agency, www.epa.gov/diesel/grantfund.htm

[78] See White House, President Obama Announces $1 billion National Community Development Challenge to Spur Development of Clean Advanced Vehicles and Expansion of Advanced Vehicle Tax Credit, www.whitehouse.gov/the-press-office/2012/03/07/fact-sheet-all-above-approach-american-energy

sector. The program would also authorize $3.7 billion in tax credits to promote purchase of vehicles fueled by CNG and LNG, hybrid and electric vehicles, and vehicles powered by other alternative fuels. Purchasers of NGV's would be eligible for a tax credit of 50 percent against the incremental cost of purchasing a vehicle fueled by CNG or LNG or for conversion of a vehicle to run on CNG or LNG.

Perspective

A National Community Deployment Initiative would provide $1 billion to 10 to 15 communities to catalyze investment in NGV fueling infrastructure.

The Community Deployment Initiative is part of the Obama Administration's "all of the above" approach to national energy policy. While not specifically targeted to natural gas vehicles and fueling infrastructure, the initiative would amount to a significant boost in capital available to expand the nation's NGV fueling infrastructure. The plan, however, likely will need to be authorized by Congress.

NAT GAS ACT

Championed by a bipartisan coalition in Congress and with the support of President Obama, the NAT GAS ACT of 2011 was introduced in the House of Representatives (H.R. 1380) in April 2011 by Reps. John Sullivan (R-Okla.), Dan Boren (D-Okla.), John Larson (D-Conn.), and Kevin Brady (R-Texas), with a total of 76 cosponsors, rising to 181 in November. In November 2011, a companion measure (S. 1863) was introduced in the Senate by Sens. Robert Menendez (D-N.J.), Richard Burr (R-N.C), Saxby Chambliss (R-Ga.) and Majority Leader Harry Reid (D-Nev.).

The House and Senate versions would provide a business income tax credit equal to 50 percent of CNG and LNG fueling infrastructure development costs up to a maximum of $100,000 and a tax credit of up to $2,000 for investment in home CNG fueling units. Also included are tax credits worth up to $7,500 for the purchase of a natural gas-fueled car and up to $64,000 for heavy-duty trucks. The House version included restoration of 50-cent per gallon excise tax credit that expired December 31, 2011. This provision, however, was not included in the Senate bill. Also the Senate bill, unlike the House version, included a provision whereby NGV fuel consumers would pay back the federal Treasury for the cost of incentives via a fuel surcharge over a 10-year period, from zero in the first two years to 12.5 cents per gallon in the last two years. In March 2012, Sens. Burr, Menendez and Reid offered their version of the NATGAS Act as an amendment to the federal transportation bill (S. 1813). On a 51-47 vote, supporters failed to limit debate on the amendment, and it not considered. At this writing, H.R. 1380, the companion House bill, has yet to be voted out of committee, and its prospects in the current session of Congress are uncertain.

Past infrastructure tax credits expired in December 2011 and a tax credit for NGV purchase and conversion expired in December 2010. As noted above, a federal sales and user fuel excise tax credit of $0.50 per GGE also expired on December 31, 2011.

Absent adoption of the NAT GAS Act, the federal government currently provides no direct tax support for NGV fueling infrastructure or natural gas vehicle purchase or conversion.[79]

The State Natural Gas Act of 2012

On July 25, 2012, the State Natural Gas Act of 2012 was referred to the Senate Committee on Energy and Natural Resources. Sponsored by Sen. Robert Casey (D-Pa.), the bill would authorize $500 million in grant funding in each fiscal year beginning in 2013 through 2022 to states that enact initiatives to encourage public and private investment in NGVs and related infrastructure. States would apply for grants through the Department of Energy, with the minimum grant set at $1 million. Grant awards would be increased from the minimum level based on criteria reflecting the amount of public and private funds that state plans are likely to leverage; the degree to which state programs support investment that is unlikely to be met by the private sector in the absence of grant funding; the degree to which grants will act as a bridge to private investment and sustainable NGV market conditions; and the level of state public and private investment in natural gas transportation and infrastructure. The bill would provide up-front capital to new investors in NGV infrastructure and vehicle purchase that might otherwise lack initial tax liability that could be offset by tax credits.

Perspective

The State Natural Gas Act of 2012 would provide a minimum grant of $1 million to states that demonstrate a commitment to encouraging public and private investment in natural gas vehicles and fueling infrastructure.

5.2 State Government Support for NGVs

As the National Council of State Legislatures recently reported, “Natural gas is playing an increasingly important role in the nation’s energy portfolio as economically recoverable resources enhance supply and more stringent emissions requirements strengthen

[79] Former OMB director Peter Orszag has argued that the benefits of NGVs are of such magnitude that a 80 percent federal tax credit for infrastructure should be provided up to a maximum of $250,000 for additions to existing NGV fueling stations and $2 million for new stand-alone facilities. Orszag, P. (2012, June 26), *Natural Gas Cars Can Drive Us Towards a Better Economy, Bloomberg.com, www.bloomberg.com/news/2012-06-26/natural-gas-cars-can-drive-us-toward-a-better-economy.html*

demand for cleaner burning transportation fuels."[80]

America's state governments have shown a heightened interest in spurring NGVs. The strongest sign to date is a consortium of 22 state governors who have joined to solicit proposals from auto manufacturers for procurement of NGVs for state fleets. The aim is to provide auto manufacturers an economy of scale incentive to produce more and diverse NGV models at competitive prices. Led by Governors John Hickenlooper of Colorado and Mary Fallin of Oklahoma, the initiative is also backed by the governors of Arkansas, Kentucky, Maine, New Mexico, Pennsylvania, Utah, West Virginia, Wyoming, Texas, Ohio, Mississippi, Louisiana, Connecticut, Minnesota, Montana, Nevada, South Carolina, Vermont, Virginia and Hawaii. City and county governments are also invited to participate in the purchasing consortium. On April 27, 2012, 13 of the governors supporting the initiative notified 19 auto manufacturers of their NGV procurement intentions and encouraged the automakers to expand the number of NGVs they produce.[81] The governors stated:

Perspective

22 state governors have joined in a multi state RFP to solicit proposals from auto makers for procurement of NGVs, to save money and incentivize manufacture of affordable, functional natural gas vehicles.

"A bipartisan partnership between governors and auto manufacturers in the U.S. makes sense and has the potential to create new options for alternative fuel vehicles and transportation fuel diversity. We are committed to explore the aggregation of our annual state fleet vehicle procurements to provide an incentive to manufacture affordable, functional natural gas vehicles."[82]

Given financial difficulties, many states have deferred purchasing fleet vehicles in recent years, leading to pent-up demand. Acting on behalf of the other states, on July 24, 2012, the Oklahoma Department of Procurement issued a RFP soliciting bids for a range of compact and mid-size cars and trucks and cargo vans fueled by natural gas.[83] The RFP projected potential purchase of about 1,800 NGVs though the exact number remains to be determined and could be greater. Automakers and vehicle dealers met to discuss the solicitation with state purchasing officials on August 8 in Oklahoma City. Sealed bids are to be submitted by September 7, 2012, and a contract award for vehicle procurement could be issued in October. With 22 states involved, each with its own purchasing requirements, the RFP is complex, and many details remain to be worked out. The 22-

[80] National Council of State Legislatures (2012). *Transportation Energy For the Future: A Guide for Policymakers*. Washington D.C., pp. 14.
[81] See SW035C FY13 RFP at https://www.ok.gov/dcs/solicit/app/solicitationDetail.php?solID=410 –
[82] ShaleStuff (2012, June 14), http://shalestuff.com/featured/west-virginia-lead-nation-natural-gas-vehicles/
[83] See www.ok.gov/dcs/solicit/app/solicitationDetail.php?solID=410

state consortium stands as a clear sign that America's state governments are assuming a leadership position in recognizing the benefits of using natural gas to fuel their fleets.

5.3 State Tax Credit, Grant and Loan Programs

Several states operate tax credit, grant and loan incentive programs that leverage investment in NGV fueling infrastructure. Key features are highlighted in Table 12.

The case studies below offer guidance in developing effective state incentive strategies to accelerate public access NGV fueling infrastructure. Additional references on these programs including citations for legislative authorization are provided in footnotes.

Arkansas

In 2011, the Arkansas Legislature authorized the state energy office to offer a one-time grant program for public access CNG refueling stations.[84] Funding totaling $470,000 is derived from a remaining $400,000 balance in the state's oil overcharge settlement account and a $70,000 allocation from a general improvement fund. Solicitations for the grant closed in October of 2011 with 2 grants being awarded. Satterfield Oil Company received a $235,000 grant to add CNG fueling to an existing station in Conway and the City of Little Rock will receive $235,000 to add CNG to an existing station. The two grants will complement the state's CNG vehicle rebate program, for which $2.2 million has been allocated in 2012. Applicants were eligible for rebates of up to 50 percent of the cost of CNG vehicle purchase and conversion with no single rebate to exceed $25,000. With the two 2011 grants, infrastructure grant funds are now exhausted and Arkansas ability to offer a new round of funding in the future depends upon the state's ability to find a sufficient funding source.

California

California is home to one-third of all CNG and LNG fueled vehicles in America.[85] Keys to California's leadership in NGVs are: (a) California Air Resources Board (CARB), and South Coast Air Quality Management District (SCAQMD) rules that require municipal agencies to replace diesel buses; and (b) substantial funding provided by the California Energy Commission (CEC) to incentivize NGV vehicle purchase and conversion and NGV fueling infrastructure.

[84] See www.afdc.energy.gov/laws/law/AR/6192; Arkansas code 15-13-101, 15-13-102, 15-13-301 to 15-13-306, and 19-6-809. For information on Arkansas vehicle rebate program, see www.afdc.energy.gov/laws/law/AR/6192

[85] See Appendix A.

Table 12: State Incentives for NGV Fueling Infrastructure					
State	Program	Terms	Access	Projects	Status
Arkansas	Grant	Funding limited to only two $235,000 grants	Public	2- public access CNG stations @ $235,000 each	One-time grant program; ARRA funds exhausted
California	Grant	50% of infrastructure costs; Cap of $300,000 for CNG; $600,000 for LNG or LCNG; Must be public access.	Public & Private	$5.7 million for 20 projects, 2011-2012	In effect; ARRA funds exhausted
Louisiana	Tax Credit & Grant	Tax credit of 50% of refueling equipment; no cap and refundable. Grant program for 50% of project costs, cap of $1.25 million per station	Public & Private	Credits and grants have supported 8 CNG stations.	Tax credit still available; ARRA funded grants have been exhausted
Oregon	Tax Credit	35% of infrastructure costs; maybe carried forward 5 years. Pass through provision for government and non-profits	Public & Private	None for CNG/LNG to date	$2 million of credits available in 2012; program expires end of 2018
Pennsylvania	Grant	Projects cannot exceed more than10% of available funds	Public & Private	$1.6 Million for two CNG stations in Pittsburgh. $1 million for CNG station at Philadelphia Intl Airport	Program closed in 2011. New $20 million Natural Gas Energy Development Program launched in 2012
Texas	Grant	Up to $100,000 for CNG stations; $250,000 for LNG only stations; and $400,00 for LCNG stations	Public	Awards to be announced in May – 21 projects seeking grants (14 CNG, 3 LNG, and 4 CNG & LNG)	Launched in Feb 2012; Authorized for two years. Grant requests of $3.7 million out of budgeted $4.4 million in first cycle
Utah	Grant & Loan	Grants of 50% of total cost, cap of $100,000. Loans of 100% of cost not to exceed $100,000. Loans must be repaid in 10 years. Low interest rate for private entities, 0% interest for government	Public & Private	5 NGV refueling projects received funding to date	Program stated in 2006, in effect. $250,000 in grants and $2500,000 in loans budgeted annually for Alt fuel vehicles and infrastructure
West Virginia	Tax Credit	50% allowable cost up to $250,000 per station; credit drops 200,000 in 2014, $150,000 in 2016; both CNG & LNG	125% multiplier for public access	No CNG/LNG project so far	Program started 7/2011, In effect

California is also home to more CNG and LNG fueling stations that any other state. There are 150 public and 92 private access CNG fueling outlets, and 16 public and 21 private access LNG fueling stations in California. The CEC utilizes a grant program to encourage NGV and other alternative fuel infrastructure deployment as well as NGV fleet purchase and conversions under the aegis of Assembly Bill 118. Enacted in 2007, the legislation created the Alternative and Renewable Fuel Technology Program. Under California's program, grant awards cannot exceed 50 percent of development costs and are capped at $300,000 per CNG station and at $600,000 for a station dispensing LNG or both CNG and LNG. Funding is provided under federal CMAQ grants and other sources, and eligible entities must provide matching funds from non-federal funding sources. All recipients of CEC grants must agree to open their stations to public access.[86]

Perspective

Only public access stations are eligible for California Energy Commission grants of up to $300,000 for CNG and up to $600,000 for LNG.

Between 2007 and 2010, a total of $5.7 million was issued for 20 NGV fueling stations (16 CNG, 3, LNG, and 1 CNG/LNG). The largest recipient of grants has been SCAQMD, the air pollution control agency that oversees Los Angeles, Orange, Riverside, San Bernardino, Ventura, Santa Barbara and San Diego counties where the state's NGV fueling infrastructure is most heavily concentrated. Eight million dollars have been allocated by the CEC for grants to support new NGV fueling infrastructure and upgrades to existing infrastructure in FY 2011-12. SCAQMB received $2.9 million from the CEC in 2011 to install twelve CNG stations. Eleven of the stations will be installed and operated by Clean Energy Fuels with the remaining station being developed and operated by Earth Energy Fuels, Inc. The CEC $1.6 million in grants in Spring 2012 for new CNG and LNG fueling infrastructure, with recipients being Sysco Food Services, Atlas Disposal Industries, Bear Valley Unified School District, SCAQMD and the City of Riverside.[87]

[86] For additional information on California incentives and NGV program, see Alternative and Renewable Fuel Technology Program, Assembly Bill 118: www.energy.ca.gov/ab118/documents/ab_118_bill_20071014_chaptered.pdf; California Energy Commission, 2011-12 investment plan for alternative and renewable fuel and vehicle technology program, Sept 2011, www.energy.ca.gov/2011publications/CEC-600-2011-006/CEC-600-2011-006-CMF.pdf. See also www.afdc.energy.gov/laws/state_summary/CA; www.afdc.energy.gov/laws/law/CA/6307; http://www.afdc.energy.gov/laws/law/CA/5809; www.afdc.energy.gov/laws/law/CA/9573.

[87] NGV Global News, www.ngvglobal.com/cec-funds-alternative-transportation-fuels-and-natural-gas-refuelling-stations-0614

Colorado

In 2011, Colorado allowed an alternative fuel infrastructure tax credit to expire. The tax credit provided for up to 20 percent of the total cost of refueling infrastructure not to exceed $400,000 and could be carried forward for five years. To encourage development of public access infrastructure, the credit provided a 125 percent base multiplier to developers of public access stations. Before 2010, the credit allowed an entity to claim up to 35 percent of the cost of infrastructure development with no limit upon the maximum allowable credit – the 2011 program actually represented a pull back from earlier levels of support.[88] About 20 CNG fueling installations were granted tax credits before the program's expiration. Colorado continues to offer a tax credit for CNG vehicle purchase and conversion although a vehicle conversion and purchase rebate was ended at the close of 2011.

Perspective

Colorado's recent deregulation of sale of CNG and LNG as a transportation fuel will expand the ability of retailers and fleets to sell fuel to the public.

Although Colorado's tax credit expired, a recent development may add impetus to investment in NGV fueling in the state. In May 2012, Colorado Governor John Hickenlooper signed into law HB 1258, removing the sale of natural gas for transportation use from regulation by the state Public Utility Commission, expanding the ability of retail venues such as convenience stores as well as fleet operators to sell CNG and LNG to the public.[89]

Indiana

In 2009, the Indiana Legislature authorized an alternative fueling station grant program with authority to provide up to $200,000 to any individual entity for fueling infrastructure to dispense propane and CNG.[90] Under program guidelines, total grants made in any single year are capped at $1 million. Despite the grant program having been authorized in 2009 and continuing to be authorized under Indiana law, the program has never received an appropriation from the Legislature and no grants have ever been awarded.

[88] For additional information on Colorado's expired tax credit program, see Alternative Fuel Infrastructure Tax Credit, Colorado Revised Statues 39-22-516; Colorado Department of Revenue's Income 9 FYI, Alternative Fuel Income Tax Credits, www.colorado.gov/cs/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1251793535004&ssbinary=true

[89] See CNG NOW,www.cngnow.com/news/post.aspx?id=630; Smart Energy Universe, http://smartenergyuniverse.com/electric-vehicle/1965-colorado-adopts-legislation-to-deregulate-sale-of-electricity-for-charging-electric-vehicles

[90] For additional information on Indiana's grant program, see Alternative Fueling Station Grant Program, Indiana Code 4-4-32.2: www.in.gov/legislative/ic/code/title4/ar4/ch32.2.html

Kansas

Kansas enacted a business tax credit for developers of new alternative vehicle fueling infrastructure in 1996.[91] As originally enacted, owners of new CNG and LNG fueling infrastructure could claim a business tax credit equal to 40 percent of the cost of design, equipment purchase and installation with a maximum allowable credit of $100,000 per fueling station. In July 2007, however, Kansas changed its eligibility requirements to exclude CNG and LNG fueling infrastructure from tax credit eligibility, and the state no longer offers any tax incentive to support CNG and LNG fueling infrastructure development. But from 1996 to 2007, when CNG and LNG fueling infrastructure investments were eligible, no tax credits were granted to support NGV fueling infrastructure development.

Louisiana

Louisiana is at the forefront in encouraging development of NGV fueling infrastructure. The state has offered an alternative fueling infrastructure tax credit since 1990 that can be used for the cost of infrastructure design, equipment purchase and installation. Owners of both private and public access fueling stations are eligible. The credit was significantly increased to its current 50 percent level (from 20 percent) in 2009, and there is no cap on the aggregate amount of tax credit that can be claimed. The tax credit is also refundable – credit that exceeds the tax liability of an entity is refunded to the station owner.[92] Over the life of the program, Louisiana has awarded a total of $14 million in tax credits for both AFV fleet purchases and conversions and fueling infrastructure development although information on exactly how much of this total was deployed specifically for NGV infrastructure is not available. In 2009, the state drew on funding provided under federal stimulus programs to create the EmPower Louisiana Transportation Efficiency and Alternative Fuels Grant program. More than $2.5 million in grants have been awarded to support construction of eight NGV fueling stations. Included is a public access station opened in February by Encana, the first LNG fueling station in the state. LNG will be supplied from a liquefaction plant operated by Pivotal LNG, a subsidiary of AGL Resources. With depletion of the federal funds, the grant program is set to expire, though the tax credits will remain available.

Perspective

Louisiana has offered a tax credit for NGV fueling infrastructure since 1990, increasing its tax credit in 2009 to 50 % from 20% with no cap on the amount of tax credit that can be claimed.

[91] See Alternative Fueling Infrastructure Tax Credit, Kansas Statutes 79-32,201: www.kslegislature.org/li/b2011_12/statute/079_000_0000_chapter/079_032_0000_article/079_032_0201_section/079_032_0201_k/ for additional information on Kansas' tax credit.

[92] See Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Tax Credit, Louisiana Revised Statutes 47:6035: www.legis.state.la.us/lss/lss.asp?doc=672160 for additional information on Louisiana's tax credit.

Missouri

In 2009, Missouri enacted an alternative fuel infrastructure tax credit under which owners of new AFV fueling infrastructure are eligible for a business income tax credit equal to 20 percent of the cost of design, equipment purchase and installation up to a maximum of $20,000 in any given year.[93] Additional credit can be carried forward in succeeding years up to the 20 percent limit. The state authorized a total tax credit cap for all eligible applicants of $3 million in 2009; $2 million in 2010; $1 million in 2011. Between 2009 and 2011, 85 percent of tax credits granted went to developers of E-85 fueling infrastructure and 15 percent went to developers of propane fueling infrastructure. No tax credit was granted for development of CNG or LNG fueling infrastructure. In the face of a constrained state budget, the incentive program was allowed to sunset on December 31, 2011, and the state currently offers no tax incentives to support development of NGV fueling infrastructure.

Nebraska

Nebraska initiated its Dollar and Energy Savings Loan Program in 1990, providing low cost loan capital to developers of alternative fuels fueling infrastructure including LNG and CNG.[94] Operated as a revolving loan fund originally capitalized with oil overcharge settlement funds, the program received supplemental funding made available through the ARRA in 2009. In addition to CNG and LNG fueling infrastructure, the loan program lends to support infrastructure for other alternative fuels, alternative fueled vehicle procurement and conversion, building energy retrofits, and household appliances replacements. The maximum amount of a loan is $750,000 per borrower with interest rates averaging 5 percent or less. Currently, the revolving loan fund is capitalized at an estimated $11 million, but the only loan made to date is one in 2011 for $2.2 million for development of two public access CNG fueling stations in Omaha by the Metropolitan Utilities District. This contrasts with the 20,000 projects that the Nebraska program has participated in funding during its 20-plus lifespan, with an estimated overall capitalized value of $230 million. Funding for the Nebraska program appears stable and additional loans for NGV fueling infrastructure are likely given heightened interest in using the program for NGV infrastructure development.

Perspective

Nebraska's revolving loan fund provided $2.2 million in low-cost loans to build two new CNG public access stations in Omaha.

[93] See Alternative Fueling Infrastructure Tax Credit, Missouri Revised Statutes 135.710, www.moga.mo.gov/statutes/c100-199/1350000710.htm

[94] See Nebraska Dollar and Energy Saving Loans, www.neo.ne.gov/loan/index.html

New Mexico

The New Mexico Department of Energy, Minerals, and Natural Resources has administered the state's Clean Energy Grants Program since 2004. Under the program, commercial, government and tribal entities can apply for grants to build fueling infrastructure for natural gas and other qualified alternative fuels.[95] Grants are awarded on a competitive basis and the maximum amount of any single grant cannot exceed $100,000. From the program's founding in 2004, it has awarded five grants, each of $100,000, for public access CNG stations. Program funds can also be used for incremental costs of NGV purchase and conversion. Eleven of these grant awards have been made.

New York

New York ranks behind only California and Texas in the number of natural gas vehicles on the road.[96] The state also ranks second in the number of NGV fueling stations in operation. The state encouraged investment in NGV fueling infrastructure by providing a 50 percent business tax credit on the incremental cost of infrastructure installation. The tax credit was available to developers of both public and private access fueling outlets and was not capped – investors could claim a 50 percent tax credit up to the full investment amount. Due to state budget constraints, the tax credit program was allowed to expire at the end of 2010.

Perspective

Tax credits for NGV infrastructure have been allowed to expire in New York, Colorado, Ohio, Pennsylvania and Missouri.

The New York Energy Research and Development Authority (NYSERDA) offers competitive grants to state and local transportation authorities and school districts for infrastructure development as well as for NGV purchase and conversions. NYSERDA grants are available for up to 100% of the incremental cost for fueling infrastructure development. Grant funds can only be used for fueling infrastructure that serves government fleets and not for public access fueling infrastructure.[97] Established in 1996, the NYSERDA program has awarded grants of $24.5, though a breakdown on how much has been dedicated for NGV fueling is not available. NYSERDA estimates that a combined 100 CNG fueling stations have received funding either through the expired state business tax credit or through NYSERDA's Alternative Fuel Vehicle Program.

[95] See Advanced Energy Technologies Economic Development Act, New Mexico Statutes 71-7-1 to 71-7-7: www.conwaygreene.com/nmsu/lpext.dll?f=templates&fn=main-hit-h.htm&2.0

[96] See Appendix A.

[97] Additional information on NYSERDA grants for natural gas vehicles and NGV infrastructure can be found at www.nyserda.ny.gov/Page-Sections/Research-and-Development/Alternative-Fuel-Vehicles/New-York-City-Private-Fleet-Program.aspx

Ohio

In 2008, Ohio authorized an alternative fuels transportation grant program. The grants are available to public and commercial developers of CNG and LNG and other eligible alternative fuels infrastructure for up to 80 percent of the cost for new infrastructure installation. Between 2008 and 2011, $1.7 million in grants were awarded to 72 infrastructure projects. Most grants supported fueling infrastructure for E-85 and bio-diesel. Due to state budget constraints, Ohio's grant program was allowed to sunset at the end of 2011 without having ever issued a grant to support CNG or LNG fueling.[98] In a state with significant natural gas reserves, officials are discussing future approaches to providing incentives to encourage NGV and fueling infrastructure deployment. The nature of such a program has yet to be determined at the time of this writing.

Oklahoma

Oklahoma has been a leader in providing incentives to encourage development of NGV fueling infrastructure. The state offers a business income tax credit of up to 75 percent of the cost of installing fueling infrastructure for CNG and LNG.[99] The credit allows business entities to carry the credit forward for up to five years and the program does not cap the amount of credit taken in a given year. According to the Oklahoma Tax Commission, the tax credit has enabled development of over 40 CNG stations statewide. The largest recipient of the credit has been Oklahoma Natural Gas, a subsidiary of ONEOK, Inc., the state's largest natural gas distributor, which owns and operates 25 CNG stations in Oklahoma. The Oklahoma Department of General Services also offers zero percent interest loans to state and local agencies, school districts, and public transit authorities to build NGV fueling stations. Loans cannot exceed $150,000 and must be paid back within seven years. Loan repayment by the recipient is made through a fuel surcharge. In 2011, loans leveraged construction of three public access CNG fueling stations in Norman, Oklahoma City at Will Rogers Airport, and Stillwater at Oklahoma State University.

Perspective

Oklahoma offers a 75 percent tax credit for the cost of building NGV fueling infrastructure with no cap on the amount taken in any given year. Credits can be carried forward for 5 years.

Oklahoma recently took a step that will provide further impetus to development of NGV fueling infrastructure. The Oklahoma Corporation Commission (OCC) approved a new tariff for Oklahoma Natural Gas that will fund rebates to customers who have purchased

[98] See Alternative Fuel Transportation Grant Program, Ohio Revised Code, codes.ohio.gov/orc/122.075

[99] Alternative Fueling Infrastructure Tax Credit, Oklahoma Statutes: 68-2357.22; Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Loans, Oklahoma Statutes: 74-130.4 and 74-130.5; www.afdc.energy.gov/laws/law/OK/5951

new CNG-fueled vehicles on or after June 18, 2012 (conversions are not eligible).[100] The rebates will be funded through a $0.25 surcharge per GGE of CNG sold by the utility. The surcharge began on July 1, 2012. The OCC expects to evaluate the program in August to determine if sufficient revenues have been derived to begin issuing rebates. Once a determination has been made, rebates will be issued on a first-come, first- served basis. This innovative program is a first of its kind to use a fuel surcharge to incentivize NGV purchase and could provide a model for other states. The program does not provide a direct capital offset for fueling infrastructure investment. By stimulating demand for NGVs, it should increase the demand for new fueling station development.

Oregon

In 2011, the Oregon Legislature restructured an existing alternative fueling infrastructure tax credit for business with the new provisions that took effect January 1, 2012. Commercial, non-profit and government entities are eligible for a tax credit for qualified costs incurred in developing infrastructure for natural gas and other alternative fuels. The program provides a total 35 percent tax credit. Ten percent of credit can be claimed in each of the first two years of credit issuance, with the remaining 15 percent being claimed in 5 percent increments in the following three years.[101] The Oregon program is unique in that it provides for a "pass through" provision. This enables entities that have no or low tax liability, including government and non-profit entities, to transfer the credit to another (commercial) entity with a tax liability. In return, the infrastructure developer receives a lump sum payment from the pass through partner. The pass through provision is similar to that used in the state's BETC – Business Energy Tax Credit – whereby companies such as Walmart have served as pass-through partners, providing developers of renewable energy installations up front, immediately available capital. The state only recently issued an opportunity announcement for the revised program so it is unknown how many tax credit applications for CNG and LNG fueling infrastructure may be submitted in 2012. Prior years did not see any tax credit awards made for CNG and LNG infrastructure development.

Perspective

Oregon's pass through tax credit allows an entity without tax liability to secure an up-front lump sum payment needed to build fueling infrastructure by transferring the tax credit to an entity with tax liability.

[100] The Oklahoma CNG rebate tariff is at the Oklahoma Corporation Commission, CNG Rebate Program, www.oklahomanaturalgas.com/SaveEnergyAndMoney/NaturalGasVehicles/CNGRebateProgram.aspx

[101] See Alternative Fueling Infrastructure Tax Credit for Businesses, House Bill 3672, 2011: www.leg.state.or.us/11reg/measures/hb3600.dir/hb3672.en.html. Oregon also offers a residential tax credit of 25 percent up to $750 for home fueling infrastructure, see www.afdc.energy.gov/laws/law/OR/5315

Pennsylvania

Pennsylvania began offering an alternative fuel incentive grant program in 1992. The program allowed recipients to use grant funds for NGV purchase and conversion as well as for fueling infrastructure development. Grants were awarded on a competitive basis with no single applicant eligible for more than 10 percent of total allocated grant funding available in a single year. The total grant money awarded in any given year typically ranged between $5 million and $6 million, though in 2009, the state – bolstered with federal stimulus funding – awarded more than $8 million in alternative fuel incentive grants. This sum included grants totaling $1.6 million for development of two CNG fueling stations in the Pittsburgh area and another $1 million grant to Philadelphia International Airport for construction of a CNG fueling station and procurement of CNG- fueled buses.

Perspective

Pennsylvania's new program does not provide grants for infrastructure, only vehicles. But the program provides a preference for grant applicants who plan to fuel their vehicles at public access stations.

Pennsylvania's alternative fuel incentive grant program was closed on June 17, 2011. The incentive program is being replaced by a state Natural Gas Energy Development Program created under the Marcellus Shale Law signed into law in February 2012.[102] The program is projected to provide up to $20 million in grants over a three-year period with funding derived from county impact fees within the state's shale gas regions. The amount of the fee in a year will fluctuate based on the average price of natural gas in the preceding year. At least 50 percent of grant funds have been set aside for use by local transportation agencies. Notably, the program does not provide funding for fueling infrastructure, only for vehicle acquisitions and conversion.

Texas

Second only to California in terms of registered NGVs, Texas has put in place an ambitious grant program to accelerate deployment of NGV infrastructure.[103] In 2011, the state Legislature authorized a natural gas vehicle and fueling infrastructure grants program tied to the Texas Clean Transportation Triangle (CTT) plan and the Texas Emissions Reduction Plan (TERP).[104] Administered by the Texas Commission on

[102] See Natural Gas Energy Development Program, created by Act 13 of 2012: www.puc.state.pa.us/naturalgas/naturalgas_marcellus_Shale.aspx; www.portal.state.pa.us/portal/server.pt/community/act_13/20789/natural_gas_vehicle_program/1157504

[103] See Appendix A.

[104] See Clean Transportation Triangle, Alternative Fueling Facilities Program, and Texas Natural Gas Vehicle Grants Program created by Senate Bill 385: www.capitol.state.tx.us/tlodocs/82R/billtext/pdf/SB00385F.pdf#navpanes=0

Environmental Quality (TCEQ), government and commercial entities are eligible for grants – entities must make their fueling stations public access to be eligible with public access defined as being opened at least eight hours a day Monday through Friday between the hours of 6 am and 8 pm. The grant program is capitalized by surcharges on off-road, heavy-duty equipment excluding agricultural equipment, surcharges on the sale or lease of heavy-duty diesel motors, a surcharge on registration fees for truck-tractors and semi-trailers, and an inspection fee levied on the same. Under program guidelines, grants are awarded on a competitive basis. For stations that dispense only CNG, grants cannot exceed $100,000 while stations that dispense LNG are eligible for grants of up to $250,000. Stations dispensing CNG and LNG are eligible for grants of up to $400,000. Eligibility requires that a station be located three miles or less from an interstate highway within the TCC with preference given to stations located less than one mile from an interstate access ramp. No single entity is eligible for more than three grant awards. Any entity selected for an award must commission the refueling station by June 2014 to remain grant eligible. Program authorization expires August 31, 2017.

Perspective

Texas recently awarded $3.15 million in grants of between $100,000 and $400,00 each for 15 new CNG, LNG and LCNG stations as part of the plan to build the Texas Clean Corridor NGV fueling network connecting the Dallas Metroplex, Houston and San Antonio.

On July 17, 2012, TCEQ announced 15 grants totaling $3.15 million out of the $4.4 million in grant funding authorized for the current year. Transtar Energy Company LP, a division of CLNE, received three grants of $400,000 each for LCNG stations in the Dallas Metroplex and San Antonio areas. Other grants between $100,000 and $400,000 were awarded to Love's Travel Stops (three CNG stations), Intergys subsidiary Trillium (one CNG), United Parcel Service (two LNG), Sysco Corporation (one LNG), CNG Station Contractors (one CNG), CPS Energy (one CNG), Texas Gas Service (one CNG), Central Freight Lines (one CNG) and the City of Denton (one LCNG).[105] Most of the stations will be open to the public 24 hours a day.

TCEQ has also launched a second program – the Alternative Fueling Facilities Program (AFFP) – to provide grants for natural gas and other alternative fuels fueling infrastructure. AFFP grants are targeted toward Texas air quality non-attainment areas outside of the TCC. As with the CCT grant program, to be eligible, commercial and public entities must make their stations public access. Grants will cover up to 50 percent of the cost of construction, reconstructing or acquiring CNG, LNG and other eligible alternative fuels infrastructure with a maximum grant to any single entity capped at $500,000. The

[105] Texas Commission on Environmental Quality, Clean Transportation Triangle Program, http://www.tceq.texas.gov/airquality/terp

closing date for applications was July 31, 2012, and grants are expected to be announced in the early fall.[106]

Utah

Utah's Clean Fuels and Vehicle Technology Grant and Loan program began in 2006 and is funded through the state's Clean Fuels and Vehicle Technology Fund. The program offers competitive grants and loans to commercial and government entities for NGV purchase and conversion and for CNG and LNG infrastructure development.[107] Awards will be made to commercial entities only if a fueling station is public access. Grant awards may not exceed 50 percent of a project's total development cost with the maximum grant or loan awarded to any single project capped at $100,000. For loans, repayment must be made within 10 years of loan issuance. For government entities, the interest rate on loans is zero percent, while the interest rate for private borrowers is set by the state treasury and based on state borrowing costs. A total of $250,000 is budgeted annually for grants and an equal amount for loans. Since 2009, five awards have been made to support NGV refueling infrastructure, but the most recent 2011 funding cycle did not see any grant or loan funding provided for infrastructure development.

Perspective

Utah allows government owned CNG fueling stations to provide public access in areas where alternative public fueling options are absent.

Utah has also enacted a law that allows government CNG fueling stations to provide public access in areas where alternative public access fueling options are absent. This might serve as a model for other states seeking to ensure availability of NGV fueling in areas lacking commercial service.

West Virginia

In 2011, a new West Virginia business income tax credit for CNG, LNG and other alternative fuel infrastructure went into effect under the state's Marcellus Shale Act (SB 465). A credit of 50 percent up to a total of $250,000 is authorized for any individual entity.[108] Public access fueling stations are eligible for a 125 percent multiple of the baseline credit amount with a maximum cap of $325,000. The maximum tax credit allowed is scheduled to decrease to $200,000 on January 1, 2014, and to $150,000 on

[106] Texas Commission on Environmental Quality, Alternative Fueling Facilities Program, http://www.tceq.texas.gov/airquality/terp/affp_apps.html#projects

[107] See Clean Fuels and Vehicle Technology Grant and Loan program, Utah Code 19-1-401 through 19-1-404: http://le.utah.gov/~code/TITLE19/htm/19_01_040100.htm

[108] See Alternative Fueling Infrastructure Tax Credit, West Virginia Code 11-6D: www.legis.state.wv.us/WVCODE/Code.cfm?chap=11&art=6D#06D

January 1, 2016. Home fueling infrastructure is also eligible for a 50 percent credit of up to $10,000. To date, no applicant has applied for or been awarded a tax credit for installation of CNG or LNG fueling infrastructure.

5.4 Key Government Strategies

Table 13 summarizes effective government strategies to incentivize investment in NGV fueling infrastructure.

Table 13: Key Government Strategies	
• Enact federal infrastructure tax credit and CNG/LNG sales and excise tax credit • Restore Clean Cities Grant funding • Implement the National Community Deployment Initiative • Ensure sufficient long-term funding, as inconsistent funding impedes market growth • Set tax credits incentive level between 35% to 75% of project cost to achieve best results	• Amend existing alternative fuel programs to ensure inclusion of CNG and LNG as an eligible fuel • Consider pass through or transferability provisions for tax credit programs to provide up-front investment capital • Stand alone NGV infrastructure Incentives preferred; allowing for array of technologies crowds out potential funding for NGV development and infrastructure • Adopt incentive multiplier as bonus for public access stations for tax credit, loan and grant programs

5.5 Conclusions for Policy Makers

The foregoing survey of NGV infrastructure activities demonstrates how regulations and special NGV tariffs can enable LDCs to make investments in NGV fueling infrastructure. States with the most robust tax credit, grant and loan programs – California, Oklahoma, Louisiana, Texas and Utah – claim that government incentives have a key role in building a fueling network for NGVs.

Despite heightened interest in NGVs, new infrastructure incentives proposed in Iowa, Massachusetts, Montana and Rhode Island, all failed to receive legislative approval and the majority of states still have not enacted incentives.

Stakeholders offer differing perspectives on whether government incentives should focus on encouraging NGV purchase and conversion or fueling infrastructure. Most members of NGV America, the trade association that is a leader in supporting expansion of the nation's fleet of NGVs, endorse incentives that focus on vehicle purchase or conversions, not infrastructure. However, according to Steve Mueller, CEO of Southwestern Energy, "incentives may not be imperative for the expansion of natural gas vehicles...the key…will be getting the infrastructure in place to support CNG vehicles."[109]

This survey did not seek to resolve the disparity of opinions on how best to stimulate the NGV market. It does affirm, as all stakeholders agreed, that government incentives will accelerate the pace of NGV deployment significantly, whether the incentives are focused on vehicles or infrastructure.

This survey also found that optimal incentives require governments to ensure that programs are both consistent and sustained. Programs must be funded sufficiently over the long haul, as inconsistent funding levels tend to impede user buy-in for NGVs.

Two other conclusions bear emphasis: (1) given the significant public interest benefits of expanding public access to NGVs, programs should encourage entities to open private stations for public access; (2) when enacting tax credits, it is optimal to provide a pass through provision or transferability option. This enables government agencies and non-profits to take advantage of incentives as well.

[109] Industry Week (2012, March 28), *The Road to More Natural Gas Cars Start With Infrastructure*, http://www.industryweek.com/articles/the_road_to_more_natural_gas_cars_starts_with_infrastructure_26956.aspx?ShowAll=1

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Appendix A: Number of CNG and LNG Fueled Vehicles by State, 2010

State	CNG	LNG		State	CNG	LNG
Alabama	455	0		Montana	15	0
Alaska	431	0		Nebraska	423	0
Arizona	10,571	582		Nevada	2,188	0
Arkansas	292	0		New Hampshire	125	0
California	40,022	2,092		New Jersey	4,022	0
Colorado	1,082	0		New Mexico	692	0
Connecticut	420	0		New York	9,521	0
Delaware	30	0		North Carolina	693	0
D.C.	1,646	0		North Dakota	18	0
Florida	1,992	0		Ohio	1,008	0
Georgia	1,990	0		Oklahoma	3,135	0
Hawaii	0	0		Oregon	1,647	0
Idaho	267	0		Pennsylvania	2,135	0
Illinois	3,041	0		Rhode Island	1,105	0
Indiana	1,116	0		South Carolina	239	0
Iowa	0	0		South Dakota	27	0
Kansas	254	0		Tennessee	336	0
Kentucky	49	0		Texas	11,275	319
Louisiana	347	0		Utah	3,545	0
Maine	22	0		Vermont	19	0
Maryland	2,034	0		Virginia	1,683	0
Massachusetts	2,193	0		Washington	1,646	0
Michigan	561	0		West Virginia	9	0
Minnesota	112	0		Wisconsin	706	0
Mississippi	145	0		Wyoming	392	0
Missouri	141	0		Not Specified	46	324
				Total	115,863	3,354

Source: U.S. Energy Information Administration, Alternative Fuel Vehicle Data, www.eia.gov/renewable/afv

Appendix B: Sources For Additional Information

American Clean Skies Foundation www.cleanskies.org
America's Natural Gas Alliance and American Gas Association Transportation Collaborative www.anga.us/issues--policy/transportation
Clean Cities – U.S. Department of Energy www1.eere.energy.gov/cleancities
Clean Vehicle Education Foundation www.cleanvehicle.org
CNG NOW www.cngnow.com
Natural Gas Vehicle Institute www.ngvi.com
NGV America www.ngvc.org
The CNG Times wwwcng-times.com
U.S. Gas Vehicles.com www.usgasvehicles.com/home.php
U.S Department of Energy Alternative Fuels Data Center www.afdc.energy.gov/vehicles/natural_gas.html