

**THE U.S. CAN ACT NOW TO SUBSTANTIALLY CUT OIL CONSUMPTION
BY PUTTING TRUCKS AND BUSES
ON THE PATH TO SUSTAINABLE FUEL**

A Federal Policy Paper by **Energy Vision**¹
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Summary

This paper makes the case that trucks and buses are the best starting point for ending the widely acknowledged dangers of the dependency on oil of U.S. transportation. It describes a practical strategy for moving these medium and heavy duty vehicles toward sustainable fuel and identifies policies that can help drive this shift. The key points are these:

1. The 10 million trucks and buses operating in the U.S., mainstays of the national economy, constitute only 4% of all road vehicles. However, they consume 23% of highway fuel (13% of the U.S. total), emit 26% of highway-related carbon dioxide, and generate large proportions of urban air pollutants.
2. There is one non-petroleum fuel for trucks and buses that is domestic, plentiful, affordable, clean, and – in its renewable form – fully sustainable. This fuel is natural gas. Its renewable, chemically-identical form, made from organic wastes, is called “biomethane.”
3. Proven natural gas vehicle technologies already exist, so trucks and buses can make the fuel shift to both forms of natural gas. These technologies include engines, storage tanks, fueling stations, and pipelines. Many millions of natural gas vehicles are on the roads worldwide.
4. A shift of trucks and buses from diesel to domestic natural gas and biomethane can enable the U.S. to make significant progress toward four top national goals in the following ways:
 - **Natural security** – by preventing oil price and supply disruptions to the vehicles (although small in number) on which much of the U.S. economy and the functioning of every community depends. Domestic natural gas and biomethane could displace all diesel vehicle fuel.
 - **Economic strength and job growth** – by bringing home billions of dollars now flowing to the foreign suppliers of U.S. oil and stimulating job growth through the expansion of natural gas and biomethane industries.
 - **Public health** – by eliminating a leading cause of air pollution that violates national standards in areas where 175 million Americans live.
 - **Climate protection** – by moving the largest per-vehicle emitters of greenhouse gases to lower-carbon natural gas and toward carbon-neutral biomethane.
5. The case for a shift by heavy vehicles to natural gas and biomethane fuels – quite apart from pragmatic considerations of availability and affordability – rests entirely on the national priorities this shift supports: energy security, economic strength, public health, and climate protection. All non-petroleum fuels should be evaluated by the same criteria. Currently, a Senate energy bill would provide rebates, loans, and grants for buying natural gas vehicles and building fueling stations. Other emerging fuels offering similar benefits to those of natural gas and renewable natural gas should receive equivalent policy incentives.

Introduction: An end to oil dependence deserves to be a top domestic priority for national security, economic, and environmental reasons.

Since World War II, the U.S. has gone from a position of energy plenty and security to a high-risk dependency on foreign countries to supply 65% of national demand for crude oil and petroleum products. (*Appendix 1*) Transportation is the sector chiefly responsible for U.S. dependency on foreign oil. This sector consumes two-thirds of the U.S. supply, followed by industry and commerce. Electric power generation consumes only 1% of the total (*Appendix 2*).

The catastrophic oil-spill crisis in the Gulf of Mexico is the most recent event to focus public attention on the urgency of reducing U.S. oil consumption. Yet the following dangers of oil dependency have been long recognized:

- **National security is at risk** due to the fact that 48% of the nation's net oil imports are controlled by the unpredictable policies of the Organization of Petroleum Exporting Countries (*Appendix 3*) and due also to the increasingly fierce competition from China and other developing countries for diminishing world supplies.²
- **The U.S. economy loses strength** due to the outflow of more than \$1 billion per day for oil imports and the related loss of more than two million domestic jobs; due to the impact of oil companies' tax breaks on government revenues; and due to oil-related defense expenditures and the loss of soldiers' lives.³
- **Public health is compromised** by emissions of soot, nitrogen oxides, and toxic substances from the 254 million cars, buses and trucks burning oil-derived fuels. These emissions are a major reason why 175 million Americans live in areas where air pollution violates national standards, set to protect public health.⁴
- **Global climate is altered** by atmosphere-warming gases, and of those gases emitted in the U.S., 27% originate in the transportation sector. (*Appendix 4*)

10 million buses and trucks are the place to begin the breakaway from oil.

In recent years, many U.S. policymakers, investors, and environmental advocates, and the media, have focused on breaking the oil dependence of transportation by developing electric vehicle technology for passenger vehicles. Yet this path to sustainability confronts significant scientific, engineering, financial, and logistical, challenges: how to "green" the nation's power generation with a massive shift to renewable sources of electricity; how to design and build long distance transmission lines that will carry renewably generated electricity from remote sources to urban users; how to reduce the weight and cost of electric batteries; how to manage widespread recharging of batteries on a "smart grid;" how to ensure environmentally safe battery disposal methods.⁵

No such obstacles impede immediate progress in breaking the oil dependence of the 10 million medium and heavy duty trucks and buses on U.S. roads. For three compelling reasons, these comprise the sector best suited to lead the first phase of transportation's exodus from oil:

- Trucks and buses consume 23% of highway fuel (13% of total U.S. oil consumption), although they constitute just 4% of all U.S. vehicles. (*Appendix 5*)

- The oil dependency of medium and heavy duty vehicles directly exposes every corner of the U.S. economy to the risk of disruption. Trucks alone or in combination with other transport modes, manage the movement of about 84% of all goods shipped, worth close to \$10 trillion and equal to about two thirds of the nation's annual Gross Domestic Product (GDP). (*Appendix 6*) In addition, both work trucks, buses, and other heavy vehicles provide essential services to every city and community – sanitation, recycling, emergency relief, road building and repair, commuter and school transit, and more.
- This small population of large vehicles, mainly diesel-powered, contributes disproportionately to emissions attributed to road vehicles: 26% of the heat-trapping greenhouse gas carbon dioxide, 66% of health-threatening fine soot particulates, and up to 80% of the nitrogen oxides that are especially noxious in urban areas.⁶

A practical path exists today for enabling trucks and buses to get off oil and move toward sustainable fuel. This path involves a shift to natural gas and its chemical “twin,” renewable natural gas: biomethane.

Today there is a robust alternative to petroleum-derived fuel for trucks and buses – and there is a fuel that meets the practical and environmental criteria for a shift of crucial fleets to sustainability. That fuel is natural gas.

Natural gas comes from, not one, but two sources. Most commonly, it is extracted by drilling into underground fossil formations to tap reservoirs that eventually will be depleted. But it can also be produced from the gases created wherever organic wastes decompose in the absence of oxygen (in landfills, in animal manure lagoons, etc.). This form of natural gas, called biomethane, is renewable.⁷

When used as vehicle fuels, both “fossil” gas and its biomethane equivalent emit significantly smaller amounts of global-warming gases per gallon as compared to either diesel fuel or gasoline. Moreover, biomethane made from organic wastes can be virtually carbon neutral, or even carbon negative (depending on the wastes from which it is made) thus reducing its climate impact to near zero or even lower. (*Appendix 7*)

Traditional natural gas and renewable natural gas are chemically identical. Each molecule of both contains four atoms of hydrogen and one of carbon. Mixable in any proportions, these chemical twins can be used in the same engines, delivered through the same pipelines, stored and transported in the same tanks, and dispensed through the same fueling stations. Hence, shifting truck and bus fleets to natural gas puts in place both vehicles and infrastructure needed for phasing in biomethane.

Natural gas and biomethane fuels already power a growing number of vehicles worldwide. The U.S., which lags behind other countries in the use of these fuels, is now poised to catch up with international leaders.⁸

Natural Gas

Over the past decade, the number of natural gas vehicles (NGVs) has shot up from 1.7 million to more than 11 million, an average growth rate of more than 25% per year since 2000. The U.S. has only 100,000 natural gas vehicles⁹ on its roadways (ranking 16th by number of vehicles on the road), even though natural gas technology was essentially developed in North America three decades ago. (*Appendix 8*)

While the U.S. lags behind other countries in adopting natural gas vehicles, more than 70 communities across the country now have shifted all or part of their bus and/or truck fleets to natural gas, according to Energy Vision's research. While these communities appreciate the immediate benefits in emission reductions and energy security brought about by these shifts, a critical factor in making most of the U.S. projects economically viable has been the federal economic incentives provided for them. Under the 2005 Energy Policy Act, 80% of the incremental costs of the more expensive natural gas vehicles are covered through the end of 2010, along with a significant part of the cost of building refueling stations. In addition, an alternative fuel excise tax reduction, also passed in 2005, lowered the already low cost of natural gas fuel. (This credit expired in 2009 but may be reinstated by Congress this fall.)

Biomethane

Thousands of Europe's NGVs belong to fleets that are phasing in biomethane, which is either used alone or blended with natural gas. These vehicles include 500 refuse trucks in Madrid, Spain; 300 city buses in Lille, France; more than 760 buses and most of the refuse trucks in sixteen cities in Sweden; dozens of buses in Bern and Basel, Switzerland; 100 buses in Harlem, the Netherlands; 200 buses in Oslo, Norway; and all the natural gas vehicles in Iceland.¹⁰

Countries with commercial projects for developing biomethane as a vehicle fuel now include ten European nations, plus Brazil, China, India, Korea, Pakistan, and the U.S.¹¹ In the U.S., the world's largest liquid biomethane plant has just opened at the Altamont landfill in Livermore, California. At full production capacity, this plant will convert enough landfill gas into fuel to power 300 refuse trucks that collect trash from 20 communities and tip their loads at Altamont.¹² At a large publicly owned landfill in Franklin County, Ohio, biomethane is produced to fuel pick up trucks and work vehicles. Similar projects are being planned in Georgia and other states.¹³

An accelerated shift of trucks and buses to natural gas fuels can increase national security, strengthen the U.S. economy, create jobs, protect air quality, and reduce heat-warming greenhouse gas emissions.

National Security

U.S. natural gas reservoirs, although eventually depletable, hold enough supply to last for a century or more at current consumption rates, according to the Potential Gas Committee,¹⁴ a noted non-profit group of public and private sector experts on natural gas. However, a small fraction (7%) of current natural gas production could meet about one-third of the current fuel demand of trucks and buses.¹⁵

But the U.S. also creates – continuously – vast quantities of organic wastes from industries, communities, institutions, and farms, which could be used as feedstocks for making biomethane. So much residential and commercial organic waste is now managed in landfills that the biogases emitted from the 1754 EPA-regulated active landfills alone could produce enough biomethane to fuel 25 percent of all U.S. buses and trucks.¹⁶ Manures produced by millions of cattle and pigs greatly expand this potential.¹⁷ Wastes treated in 16,000 wastewater treatment plants and thousands of smaller landfills push the estimates even higher. According to research from Ohio, the use of advanced anaerobic digestion to convert all available waste streams to vehicle fuel, could meet the fuel demand of all U.S. trucks and buses.¹⁸ Moreover, as new technologies for gasifying woody wastes come on line, biomethane production potential will become even greater because it will include “cellulosic” materials that cannot be processed in anaerobic digesters.¹⁹

Economic Strength and Job Creation

Replacing imported oil with natural gas fuels would bring billions of dollars home for clean-energy investments in the U.S.; and a steady investment in the manufacture and maintenance of natural gas vehicles, pipeline, storage tanks, and fueling stations would create millions of nonexportable jobs. One analysis of the jobs impact of converting just 168,000 trucks and buses to natural gas fuel pegs at more than 500,000 the new jobs that would be created.²⁰

Because a majority of all trucks and buses (67%, mostly in urban areas) travel within 50 miles of their home base,²¹ cost-effective centralized fueling hubs can be built to serve neighboring fleets, thus spurring conversions and in some cases achieving far-reaching impact.²² Moreover, because natural gas is typically 20 to 30% less expensive than diesel, public agencies and companies that shift to natural gas can anticipate significant fuel cost savings over the lifetime of their vehicles. (*Appendix 9*)

Building the biomethane industry simultaneously with the expansion of natural gas vehicle and fuel markets offers an attractive job strategy for virtually every state in the nation. In the state of Ohio alone, there are reported to be nearly 6,450 separate sites where anaerobic digesters could economically convert organic wastes (especially from industries and farms) into electricity or vehicle fuel.²³ To build the plants needed to realize this potential would inject new economical vitality into virtually every community and farm region in the state. It would require an estimated investment of \$15.3 billion, which would be paid back by earnings within six to seven years, at current energy prices. Developed on this scale, biomethane plants in Ohio could create nearly 187,000 new jobs.²⁴

Cleaner Air

The emissions of vehicles powered by natural gas (and of equivalently pure biomethane) are virtually free of soot and are lower in nitrogen oxide by up to 80% compared to diesel, without need for costly after-burn treatment such as is now required for diesels by 2010 EPA standards. (*Appendix 10*)

Greenhouse Gas Reduction

Natural gas from fossil sources has a “carbon intensity” that is 28% lower than diesel, according to the California Air Resources Board, which translates into a large reduction in greenhouse gas (GHG) emissions over its entire life cycle, from production to combustion. When natural gas is made from organic waste gases collected at landfills (thus preventing their escape into the atmosphere), its carbon intensity plummets to 88% below diesel. However the remarkable greenhouse gas benefits of biomethane can go even higher: When made from liquid manures instead of landfill waste – thereby capturing a more concentrated source of heat-trapping methane gases – the greenhouse gas lifecycle reductions can approach 200% compared to diesel, as shown by Swedish research. (*Appendix 7*)

Incentives to move more trucks and buses to natural gas fuels based on inherently “fuel neutral” criteria, merit the strong support of Congress and the Administration, as well as state and local governments.

The natural gas – biomethane pathway to sustainable truck and bus fuel merits endorsement and support by policy makers at all levels of government because it meets criteria that are inherently “fuel neutral.” These criteria are 1) degree of achievable independence from foreign oil; 2) size of economic benefits including job growth; 3) degree of air pollution reduction (meeting or exceeding EPA standards); and 4) magnitude of greenhouse gas benefits. The same **fuel-neutral criteria** – in addition to pragmatic considerations of fuel availability and cost – should be used to gauge the contributions achievable by a shift to any and all present and future alternatives to oil-derived fuels in transportation.

Recent legislative proposals that pertain to natural gas and biomethane, and that either have counterparts already in place for other alternative fuels or that could be extended to fuels meeting criteria listed above, include the following:

- **Economic incentives to boost commercial markets for alternative fuel vehicles.** The 2005 Energy Policy Act established incentives in the form of tax credits, which proved successful in enabling companies and dozens of communities to cover the higher purchase costs of new vehicles and refueling stations. Because these credits expire at the end of 2010, similar incentives are crucial to ensure continued progress. Similarly, the recently expired alternative fuel tax credit, which rewards the providers and purchasers of alternative fuels, should be reinstated. The use of taxpayer dollars to support alternative-fuel industries should be based on the anticipated capacity of these industries to stand on their own within a reasonable time period.
- **Consistency of policy incentives over time to encourage and support multi-year planning by public and private investors in new vehicle and fuel technology.** One example of a long-term proposal is the NAT GAS bill (H.R. 1835, S. 1408), which would have established decade-long vehicle, infrastructure, and fuel incentives to make it possible for truck and bus fleet owners to plan and carry out full fleet turnovers. Although this bill has been withdrawn in favor of a measure that would provide rebates for NGV purchase and infrastructure, the long-term approach embedded in it deserves to be incorporated in the transportation-related provisions of any new energy or climate change bill. (*Appendix 11*)
- **Comparable policy treatment of fuels that are “renewable,” “low carbon,” “sustainable.”** This principle should apply to tax code provisions, fuel mandates, research dollars, rebates, access to loans, and other forms of support. The Low Carbon Fuel Standard of California is the leading example of regulation that even-handedly establishes both mandates (required reductions in the carbon intensity of transportation fuels) and incentives (an in-state, transportation-linked carbon market) to move the transportation sector toward sustainable fuels.

In the case of biomethane, (which has uses other than as vehicle fuel) the incentives afforded to producers of biogas-based electricity should also be afforded to producers of biogas-based vehicle fuel. Markets, not government policy, should decide which end-use of biomethane has the highest social value over time. At the federal level a key issue involves a tax code advantage given to producers of biogas-based electricity, but not to producers of biogas-based high-grade biomethane for pipeline injection or vehicle fuel.²⁵

It is also crucial that education and technical support be provided to businesses and communities seeking to move their local fleets toward sustainable fuel. Here, the Clean Cities program of the U.S. Department of Energy, which is active in 88 communities, plays a valuable role. It should be assigned permanent status within the Department of Energy to assist in building public-private partnerships to plan, fund, and advance alternative fuel vehicle initiatives to reduce petroleum in the transportation sector. **The Clean Cities Program Authorization Act (H.R. 3488)** would achieve this goal and deserved to be passed.²⁶

A Strategy to Cut Oil Use: Ready To Go

Over the last 20 years, the natural gas industry has developed the technologies and fuels that now enable the U.S. to put a “green fuels revolution” into high gear – to catalyze action that, by reaching a tiny minority of all road vehicles, could cut U.S. oil dependence by a huge 13%. No scientific, technological, or major economic obstacles prevent the rapid implementation of this strategy. It is too good an opportunity to miss.

¹ Energy Vision, a leading U.S. authority and public educator on alternative transportation fuels, conducts research and outreach at national, state, and local levels to hasten the transition from import-dependent oil-based fuels to sustainable, job-creating domestic fuels. Energy Vision is a 501(c)(3) organization supported by contributions from corporations, foundations, individual donors, and public agencies.

² Cannon, James S. (2005) *Transportation Boom in Asia*. New York City: INFORM.

³ Copulus, Milton (2007). *The Hidden Cost of Oil: An Update*. National Defense Council Foundation: Washington, D.C.

⁴ American Lung Association (2010). *State of the Air Report*. .

⁵ Even on the narrowest of grounds, developing affordable technology (without considering the source or distribution of sustainable electrical power), Xavier Mosquet, co-author of a recent study (*Batteries for Electric Cars: Challenges, Opportunities, and the Outlook to 2020*) by the Boston Consulting Group is not optimistic. He writes, “For years, people have been saying that one of the keys to reducing our dependency on fossil fuels is the electrification of the vehicle fleet. The reality is, electric-car batteries are both too expensive and too technologically limited for this to happen in the foreseeable future.” (BCG Press Release, January 7, 2010).

⁶ U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007*, Table 3-12, April 2009 (for carbon dioxide data); *Transportation Energy Data Book: Edition 28* (2009), op. cit., Table 12.11 (fine particulates, PM-2.5, in 2005) and Table 12.5 (nitrogen oxides, in 2005). Data beyond 2005 is not available. The original source for both is the U.S. EPA.

⁷ The two most common sites for producing biomethane today are 1) landfills, where escaping gases emitted by the organic fraction of mixed solid waste are captured and purified; 2) anaerobic digesters, processing plants that speed up the decomposition of organic wastes and the production of raw biogas (which is then purified, as at landfills).

⁸ Energy Vision. *Energy Vision News*. Volume III, Issue 1, 2010.

⁹ Natural Gas Vehicle Association – Europe. <http://www.ngvaeurope.eu/worldwide-ngv-statistics>. These data, updated as of December 2009, constitute the best available on worldwide natural gas vehicle (NGV) markets. The U.S. is listed with 100,000 NGVs (a lower estimate than from some domestic sources of data).

¹⁰ “The Rapidly Expanding Use of Biomethane in Europe and Beyond.” Presentation to Energy Vision Board of Directors. (January 25, 2008). guardian.co.uk/environmentblog. January 28, 2009. For Oslo buses, see guardian.co.uk/environmentblog. January 28, 2009.

¹¹ Boisen, Peter. “Development of Infrastructure for Biomethane Used as a Vehicle Fuel in Germany and Europe.” NGVA Europe (2009). guardian.co.uk/environmentblog. January 28, 2009.

¹² <http://gas2.org/2009/11/06/waste-management-turns-landfill-into-fuel-pump>

¹³ The August Chronicle, March 31, 2010. McCord, Susan. “Landfill Gas Would Fuel City Vehicles Under Plan.”

¹⁴ Potential Gas Committee. Press Release, June 18, 2009. The Potential Gas Committee is a prominent non-profit organization consisting of leading public and private sector experts on natural gas.

¹⁵ See footnote 21, below, for source of estimate of fuel use by trucks and buses traveling within 50 miles of home base, as a proportion of all truck and bus fuel consumption. The basic unit conversions involved here are as follows: 1 diesel gallon = 138,690 British thermal units (Btu), and 1 cubic foot (cf) natural gas = 1027 Btu. One-third of current diesel consumption of 38 billion gallons is 14.4 billion gallons. To convert this to cubic feet (cf) of gas, multiply 14.4 billion by 138,690, then divide the result by 1027. The answer is 1.9 trillion cf of natural gas, or 7% of the total 2009 natural gas production and withdrawals (26.1 trillion cf). U.S. Energy Information Administration. <http://www.eia.gov/dnav/ng/hist/n9010us2A.htm>.

¹⁶ Lanny Hickman (“Wasted Energy,” MSW Management, September 2008) estimates that 115.3 million tons of combustible materials (post-recycling) are deposited annually in 1,754 Sub-D, EPA-regulated, sanitary landfills, and that this practice “wastes about 1,137 trillion Btus of energy every year, which he equates to about ”9.4 billion gallons of diesel oil.” The actual amount might be closer to 8.3 billion gallons, assuming that each gallon contains 137,000 Btus, the higher heating value of diesel fuel.

¹⁷ Amanda D. Cuellar and Michael E. Webber (“Cow Power: The Energy and Emissions Benefits of Converting Manure to Biogas,” Environmental Research Letter 3,2008) estimate the “annual energy available in the U.S. from manure amounts to 928 trillion Btu. At 137,000 Btu’s per gallon, this would amount to 6.8 billion gallons. The U.S. These estimates do not take into account thousands of smaller landfills, the 16,000 wastewater treatment plants that process large quantities of both household and industrial organic wastes, or the potential expansion of supplies when woody (“cellulosic”) feedstocks can be economically turned into renewable natural gas. (In Sweden a plant to do just that is expected to be operational in Gothenburg in 2012).

¹⁸ Quasar Energy Group. May 2010. Presentation at the Moving Ahead 2010 Conference, Ohio State University. Quasar is Ohio-based waste-to-energy with facilities operating in Akron and Wooster and a number of new facilities under construction in Ohio and elsewhere in the East.

¹⁹ It appears highly likely that the gasification of biomass, especially of woody feedstocks, will play a central role in the future development and commercialization of sustainable fuels. Gasification is a familiar process for converting carbon-

bearing materials including fossil fuels and biomass into carbon monoxide and hydrogen (“syngas”). This is done by reacting the raw material at high temperatures with a controlled amount of oxygen and/or steam, thereby extracting more energy than is possible with ordinary burning.

Syngas itself can be used as fuel for heating and power and/or converted into one or more liquid and gaseous vehicle fuels including Fischer-Tropsch (F-T) diesel, methanol, and (in principle) ethanol; synthetic natural gas (SNG=biomethane), di-methyl ether (DME, a propane-like diesel substitute), and hydrogen.

In fall 2007, participants at an international seminar in Sweden reviewed the operations of 17 European and US gasification and methanation (SNG) plants, most of them demonstration sites, with an interest in assessing progress toward the commercial production of SNG from biomass, especially wood residues. Conference materials (*available online through the Swedish Gas Center at www.sgc.se/biomethane/programme.asp*) noted the impossibility of identifying the “best” gasification “route” to methanation. There may be many. Each combination of combustion, gas-cleaning, and synthesis technologies depends, for its efficacy, on such local variables as plant scale, feedstocks, markets, and financial incentives.¹⁹

However, it has been certainly possible to identify which end products of gasification convert the greatest amount of locked-up energy in wood into usable energy as a vehicle fuel. Here, the results from a wood gasification plant in Austria are instructive. (*Vogel, A., M. Kaltschmitt & M. Seiffert (2007). Methane from Wood—the Bio-SNG Project. Presentation at the International Seminar on Gasification and Methanation, September 20, 2007, Gothenburg, Sweden.*) This plant, located in Gussing, is demonstrating that more energy is made available by converting a given quantity of wood chips into gaseous fuels—SNG and DME (di-methyl ether, a propane-like diesel substitute)—than into liquid fuels, including the Fischer-Tropsch (F-T) synthetic diesel. The energy efficiencies of SNG, DME and F-T are 60-70 percent, 50-60 percent, and 35-45 percent respectively. Volvo has come to similar conclusions in its research on sustainable diesel substitutes for the future. (*Willkrans, Rolf (2005). Volvo: Future Fuels for Commercial Vehicles. Volvo Headquarters, Gothenburg, Sweden.*) High conversion efficiency will become increasingly important as prices for biomass feedstocks, like wood, rise in the future, as they surely will.

Another economic factor that strongly favors the production SNG through wood gasification is the smaller plant size needed to be economical, as lower financial risk facilitates market entry. Plants of only 10 to 100 megawatts are required for commercial production of SNG. By contrast, plants larger than 100 megawatts are required to produce either DME or F-T economically.

Hence, the stage is set for the advent of wood-gasification technology as a major commercial source of sustainable SNG/biomethane. The larger the natural gas/biomethane markets created in the short term by a shift of transportation out of petroleum fuels—a shift that is already underway and needs to be rapidly expanded—the more promising the future of this technology is likely to be.

²⁰ Clean Energy’s estimate was publicized by the Western Governor’s Association. 2010

²¹ According to the Vehicle Inventory and Use Survey (VIUS) conducted by the U.S. Census Bureau in 2002 (none has been conducted since), 67% of medium and heavy trucks travel 50 miles or less from home base and travel 36% of all vehicle miles traveled for the sector. If these proportions continue to be true today, this would mean that 36% of total fuel use (mostly diesel) is burned in trucks that travel short enough routes to make efficient use of relatively few strategically located and shared fueling stations.

²² The three largest communities on Long Island, Smithtown, Brookhaven and Huntington, sequentially converted to the use of natural gas refuse trucks and are now sharing a new refueling station. The result: 1 million of the 3 million people living in Long Island’s Suffolk County now have their refuse collected by natural gas trucks.

²³ Even though fuel is the highest value market for biomethane, existing federal and state incentives virtually compel biomethane producers to make electricity in order to recover their investment. An example of these incentives is the IRS Section 45 tax credit that currently rewards investors for generating electrical power from biogas, but offers no similar incentive for the production of biomethane vehicle fuel. The Biogas Production Incentive bill, currently before Congress, would fill this gap.

²⁴ Unpublished research by Battelle, Ohio State University, Quasar Energy Group, and U.S. Department of Agriculture.

²⁵ The Biogas Production Incentive bill (H.R. 1158 and S. 306), whose chances of passage during the remaining months of this Congress are fading, is a good example of what’s needed here. It proposes tax credits for producing renewable gas similar to those that exist for renewable electricity and renewable liquid transportation fuels. Specifically the measure would give tax credits to producers of “High Btu Renewable Gas,” which is purified biogas that can be injected into a pipeline and used in vehicles. A biomethane producer at a landfill would receive a credit of \$2.00 per thousand Btu’s; a producer using anaerobic digestion would receive \$4.27 per thousand Btu’s, or about \$.59 per diesel gallon equivalent.

The incentives in this bill, if passed, would encourage communities to begin at once to develop and use renewable natural gas fuel – biomethane. They can take the first steps today by assessing local sources of organic wastes and by redesigning their waste management systems and practices so that organic materials are handled as valuable fuel resources to be aggressively developed, rather than as garbage to be buried or flushed away at high cost.

²⁶ U.S. Department of Energy. Clean Cities