

## DAWN OF THE AGE OF BIOMETHANE

According to Peter Boisen, head of the Natural Gas Vehicle Association of Europe, in Europe biomethane is “the next big thing” in transportation fuels. Boisen, the speaker at a January 25th Energy Vision luncheon sponsored by Linklaters, LLP, estimates that in 20 years biomethane derived from organic wastes could meet 10 to 18 percent of vehicle fuel demand in 14 European countries. It already powers buses in a dozen Swedish cities as well as in Lille, Bern, and Basel, while in Madrid, 500 natural gas garbage trucks will soon be converted to run on biomethane.

For years, some of the biogas emitted during the bacterial digestion of organic waste at municipal landfills, manure lagoons, and other waste sites, has been captured and used for local heating and to generate small amounts of electricity. But recently, according to Boisen, several new technologies for cleaning and cooling raw biogas have yielded vehicle grade fuel that can be compressed and used at the site or transported by pipeline, or liquefied and trucked to offsite end users. The first successful project in the US, one which was piloted in 2005 at the Burlington County, NJ, landfill, was described by Robert Simkins, head of the County’s Resource Recovery Agency, who also spoke at the lunch.

Thermal gasification of woody material is emerging as an even newer process for making biomethane fuel. In Gotenberg, Sweden, a plant now under construction will transform forest residues into 24 million gasoline gallon equivalents beginning in 2012. For countries like Sweden and Finland and in states like Maine and Minnesota with extensive forests this new technology could provide fuel for at least half their vehicles.

## AN EXPLODING WORLD MARKET FOR NATURAL GAS VEHICLES



Worldwide, the number of cars, trucks, and buses fueled by natural gas has nearly doubled over the past three years to a total of more than 7.1 million in 2007. This boom is an early harbinger of

“massive disruption of the two biggest industries in the world, energy and transportation,” according to David R. Demers, CEO of Westport Innovations of Vancouver, who was the featured luncheon speaker at the state-wide conference co-sponsored by Energy Vision and Rutgers University on alternative fuels, held on January 24 in Piscataway, New Jersey.

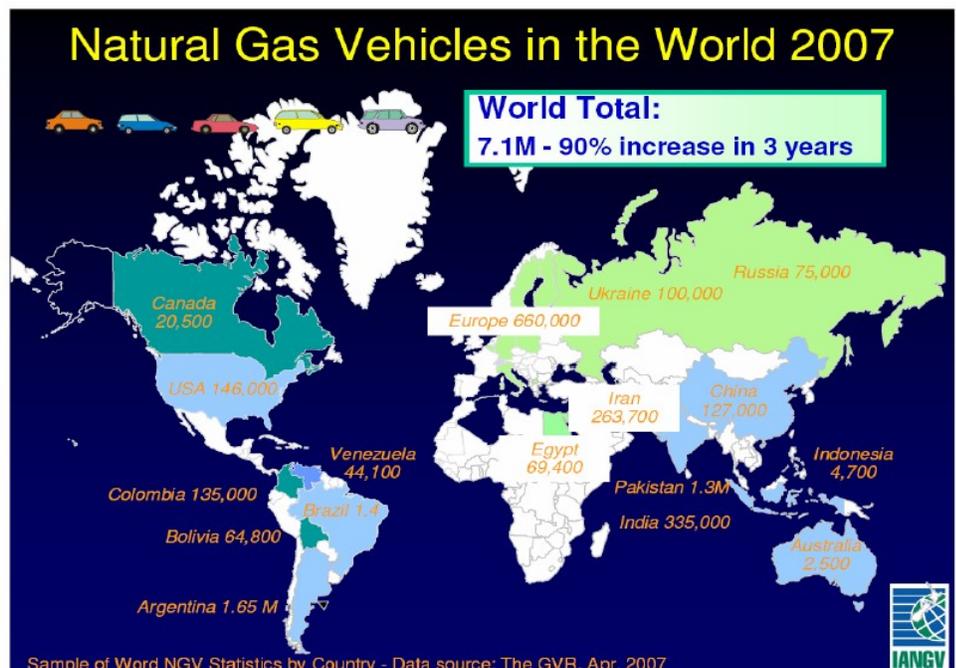
As recently as five years ago a joint venture of Demers’ company and Cummins Inc., Cummins Westport, marketed almost all of its output of heavy-duty natural gas engines in the Los Angeles basin. There, due to air quality regulations, fleets of 15 or more refuse trucks or transit or school buses

were required to burn natural gas, because, compared to diesel, it emits fewer greenhouse gases and practically eliminates the particulates and nitrous oxides that account for the lion’s share—84%—of the increased cancer risk in the region, as documented in long-term research conducted by the California South Coast Air Quality Management District.

Now Cummins Westport sees its markets exploding in China, India, Philippines, and Thailand and has customers in over 50 countries. According to Demers, the dizzying upward spiral of crude oil prices is driving the rapid pace of conversion to natural gas fuel in the developing world and, increasingly, in Europe. So, too, is growing uncertainty about future oil supply.

### Two Views of the Future of Oil

Currently unearthed at the rate of 85 million barrels per day, crude oil production will someday “peak,” but experts disagree about just when global production will begin its irreversible decline. The National



## LETTER FROM THE PRESIDENT



Gov. James Florio and Joanna Underwood,  
NJ AFV Conference

On January 24<sup>th</sup>, Energy Vision and Rutgers University Eco-Complex co-sponsored a groundbreaking alternative fuel vehicle conference for the State of New Jersey. It was the first of many university-co-sponsored forums that we plan to hold in states where the need for clean alternative fuels is greatest, and where education of government leaders, businesses, civic

organizations, labor leaders and fleet operators could serve as a catalyst for change.

No state needs to find solutions for cleaning up its vehicle-related air pollution more than New Jersey. Its 7.6 million people—1138 people per square mile—make it the most densely crowded state in this country. Furthermore, almost all New Jersey's counties that were studied by the American Lung Association for its *State of the Air* report received a D or F for particulate and ozone pollution.

Speakers came to Rutgers from across the country and beyond—bringing cutting-edge information to New Jersey's leaders, and to many eager-to-learn municipal officials and refuse fleet operators: from California on policies that most effectively promote alternative fuels use; from Vancouver, Canada, on the world's cleanest engines (natural gas) for heavy duty trucks and buses; from Smithtown, NY on the great success of the first 100% natural gas refuse truck fleet on the East Coast, and from Sweden on biomethane, the renewable form of natural gas made by transforming potent greenhouse gas streams formerly escaping from landfills, sewage treatment plants and other organic waste sites, into a clean transportation fuel. (see page one articles)

The conference focused especially on cleaning up heavy duty refuse and recycling truck fleets, because they are one of the most condensed sources of urban air pollution, and because, to date not one of the thousands of such trucks traveling the streets of New Jersey's cities and towns is powered by the cleanest real alternative fuel, natural gas. An Autocar natural gas demonstration truck, like many of those in service in Smithtown, gave attendees a chance for a first hand look at this new technology—now commercially ready to provide one of the most crucial public services to communities coast to coast.

It has been said (fortunately more and more frequently) that the shift away from high carbon petroleum-based fuels in transportation is as critical and exciting as the goal of going to the moon was in the 1960s. While this is certainly true, today we have much more at stake. While getting to the moon just required pointing one spacecraft in the right direction and shooting it up into space, the transition to the clean transportation fuels of the future requires new vehicles, new fuels, the infrastructure to fuel them, the trained operators to maintain and repair them, and the customers (individual or institutional) to buy them.

The good news is that many of the alternative fuels and electric vehicles that pave the way to a sustainable future are here now. Energy Vision is undertaking to spread the word and to show communities and states how they can be part of shaping that future.

## EV ON THE ROAD...

**San Diego, CA:** In the opening speech at the Nov. 11, 2007 San Diego Regional Clean Fuels Coalition conference, Joanna Underwood encouraged attendees to "Pick up the Pace." The time for heavy duty fleets to shift to clean petroleum-free fuel technology is here and now.

**Bangkok, Thailand:** At the 26<sup>th</sup> annual Asian Natural Gas Vehicle Association annual meeting on Nov. 28<sup>th</sup> in Bangkok, Jim Cannon, consultant to EV, previewed findings of EV's report, *Greening Garbage Trucks: Vol. 3*, (release in late Spring)

**South Dartmouth, MA:** At the October Massachusetts Bioneers Conference at UMASS Dartmouth, EV Editor Carola Lott shared information on the environmental leadership course that EV is teaching at Bryn Mawr College (PA), giving students field-based experience in tackling real-world problems—a course geared to inspire similar courses at other colleges.

**New Jersey Statewide Conference:** At this Jan 24, all-day event, co-sponsored by EV and Rutgers University – "Alternative Fuels and Refuse Trucks: Leading the Way to Energy Independence and a Cleaner Environment," 120 municipal leaders, refuse fleet operators, environmentalists and students engaged in a debate on alternative fuels. Guests also got a look at a new natural gas refuse truck. Videos of speakers from the conference are available from EV. Contact Joseph Lacey for information.

*"As you are all aware, our country is in an energy crisis. Not only are we dependent on foreign interests for the energy that our country and economy needs, but we are also faced with the most serious environmental threat we may ever face: Climate Change....I applaud your efforts in working to promote alternative fuels by hosting this important conference"*

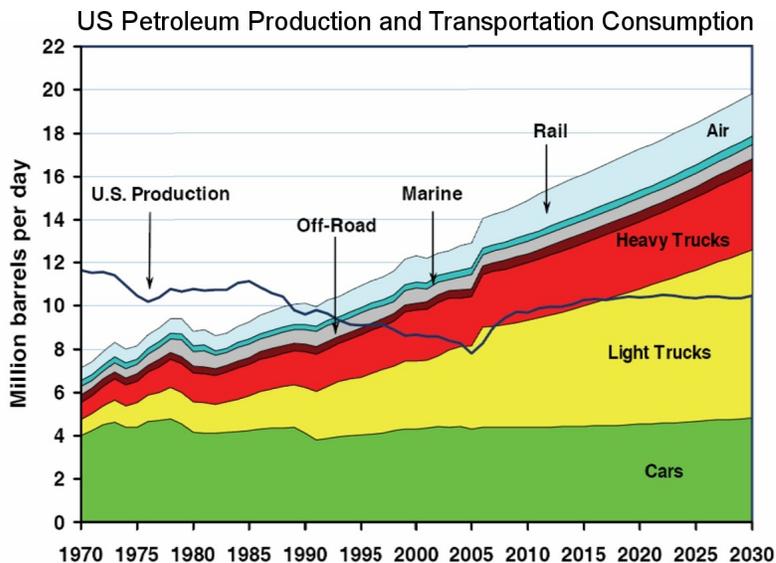
NJ Senator Frank R. Lautenberg

## AN EXPLODING WORLD MARKET...(CON'T)

Petroleum Council, cited by Demers, buoyantly predicts that supply will rise steadily to meet demand until at least 2030, when daily production and consumption will equal 120 million barrels. Not so, claims the Energy Watch group in Germany, which projects that by 2030 production will fall to 40 million barrels per day and be able to satisfy only one-third of global demand. Whenever “peak oil” occurs, transportation will be more drastically affected than residential, industrial, or commercial end users of energy, Demers explained, because transportation is almost “100% dependent” on petroleum-based liquid fuels whereas sectors that use electric power can use many sources to generate current including flowing water, coal or gas-burning plants, wind farms, and nuclear reactors. In Demers’ words, “There are lots of ways to move electrons around to generate electricity. But we don’t have that much choice for transportation.”

### A World on Fire

Internationally, transportation-propelled growth in oil demand, especially in developing countries, is “setting the world on fire,” with dire implications for the future of the planet, according to Demers. “China is a fabulous economic story, but a disastrous environmental story,” he said, referring to the poisonous air quality in Beijing that China hopes to curtail in time for the Summer 2008 Olympics Games, in part, by removing tens of thousands of vehicles from its roads.



Source: Transportation Energy Data Book 26; US Department of Energy, <http://cta.ornl.gov/data/index.shtml>

Although many people believe that cars are at the root of the transportation-linked energy and emissions issues, Demers asserted, even in the US “trucks are the real challenge.” He said that over the next 20 years, trucks will use twice as much fuel as cars. Los Angeles is the only place so far that is actually getting serious about controlling vehicle emissions, Demers claimed. But other regions and countries—hit hard by issues of supply, cost, competition, security, climate change, and health—are starting to muster the political commitment to change.

### Buying Time and Saving Money

“Natural gas, a depletable fossil fuel, can never be the complete answer as an alternate transportation fuel,” said Demers, “but it is far cleaner than diesel and can buy us some time until other options are available.” It is also much cheaper, as data from Clean Energy, displayed by Demers, showed: At late-2006 prices, in California, natural gas currently costs so much less than diesel that a fleet owner buying a natural gas powered garbage truck would realize between \$10,000 and \$18,000 per year in fuel savings, compared to buying a diesel truck meeting 2007 EPA standards. A fleet owner who also took advantage of the US Vehicle Tax Credit, could recover within one year the incremental cost of purchasing the natural gas truck.

Demers concluded his remarks by asserting that we are living in an “exciting time for innovators.” He

added, referring to the opportunities that lie ahead for companies developing alternative fuels for transportation, “Change is exciting if you are the change agent,” and it’s “not that scary once you go down the path.”

## DAWN OF BIOMETHANE ...(CON'T)

Producing biomethane from waste neither destroys forests nor diverts food crops, and its cost is unaffected by price swings in world energy markets. Moreover, the production of biomethane from waste removes a potent greenhouse gas before it escapes into the atmosphere and turns it into a clean fuel. Identical to natural gas chemically (although renewable), biomethane contains less carbon dioxide than is associated with diesel and avoids the risk of cancer associated with diesel emissions of particulate matter and nitrous oxides.

In any country adopting natural gas for a large number of its vehicles, according to Boisen, an infrastructure, including fueling stations and pipelines, is needed that can handle a gas fuel under pressure. But such an infrastructure can then be used to deliver other gaseous fuels—biomethane, hydrogen-natural gas blends, and probably pure hydrogen in the longer term.

However, policy incentives are needed to propel that transition according to Boisen, who praised the foresightedness of Germany in requiring oil companies doing business in that country to invest in a network of 1,000 natural gas fueling stations.

Fueling stations that invite competition in providing gaseous fuels are now spurring the growth of new biomethane technologies and production and putting Germany as well as Sweden, on the cutting edge of alternative transportation fuels development.

Boisen noted that time is of the essence because natural gas supplies won’t last forever. While they are still plentiful, policy makers should create incentives for using natural gas as a transportation fuel rather than to generate electricity for home heating, for which there are many other options.

One of the luncheon guests, Brendon Sexton, former NYC sanitation commissioner and member of the Energy Vision Board, agreed. “Heating your house with natural gas,” he said, “is like washing your car with champagne.”



### The Technology Is Here Today

“We have the technology today to turn urban workhorses into energy revolutionaries,” said EV president Joanna Underwood, as she convened a landmark conference on January 24, 2008, around the vision of converting municipal refuse fleets from diesel to natural gas fuel to achieve oil independence, clean air, and financial benefits and putting them on the path to hydrogen.

*Joanna Underwood, President, Energy Vision*



### Conference Partners

The Rutgers University NJ Agricultural Experiment Station and the Rutgers EcoComplex teamed up as partners with Energy Vision in urging NJ policy makers and waste haulers to consider carefully the many advantages of natural gas fuel.

*David Specca, Acting Director, Rutgers Eco-Complex*

### A “Purely Financial Decision” with a Big Clean Air Bonus



In 2006, stunned by spiraling diesel prices, Russell Barnett, the environmental director of Smithtown, L.I., required that waste haulers bidding on new contracts use only natural gas trucks. Savings on fuel will soon offset the purchase cost of the trucks—and the environmental payoff is big: lower emissions of greenhouse gases and particulates, and quieter streets.

*Russell K. Barnett,  
Director of Environment and Waterways, Smithtown, LI*



*Conferees examine a natural gas truck from Smithtown, L.I.*

### Transportation a Key in NJ Energy Plan

In the NJ Energy Plan to be released later this year, the transportation component is “an enormous issue to be addressed,” according to Kenny Esser, who spoke about the energy crisis in NJ caused by rising prices, growing demand, and an uncertain future supply. He said that culture change is what is required.

*Kenneth Esser  
Office of the NJ Governor*



### Costly Diesel Retrofits

Several presenters, including David Lynch, reported that the high cost of retrofitting diesel trucks to meet ever more stringent air quality standards makes natural gas trucks an increasingly economical choice for urban heavy duty truck and bus fleets.

*David Lynch, Regional Manager, Cummins Westport*

### A NJ Incentive for Purchasing Natural Gas Trucks?

Global warming is the issue of the day according to Nancy Wittenberg, who monitors air quality in New Jersey, where the transportation sector produces 49% of the greenhouse gas emissions, and where climate change could devastate the populous Atlantic shore. Wittenberg suggests that some of the state's funding currently allocated for pollution-preventing diesel retrofits might be used to help finance the purchase of natural gas trucks.

*Nancy Wittenberg, Assistant Commissioner, Environmental Regulation, NJ Dept of Environmental Protection*



## Main Line Power

Six Bryn Mawr students at the conference included several who are studying the impact of refuse truck emissions on air quality and public health in Montgomery County near Philadelphia, in a course led by EV president Joanna Underwood, a Bryn Mawr Center for Science in Society Fellow.

*Standing: Alexi Ernstoff, Emily McGlynn, Jessica Schie*

*Seated: Emily Flynn, Emily Glick, Camille Jones*



## A Natural Gas Strategy to Reduce Cancer Risk

Because of clean-up efforts in Southern California—including the ongoing conversion of public truck and bus fleets from diesel to natural gas fuel—the risk of developing cancer has dropped more than 15% in the past decade, according to research cited by Dean Saito. However, more aggressive action is needed in the four-county basin, including Los Angeles, where diesel exhaust from trucks and other sources is still responsible for 84 percent of the cancer risk.

*Dean Saito, Manager  
South Coast Air Quality Management District, CA*



## Super Cool Fuel

As president of Acion, Brown and his team of chemical engineers developed a system of supercooling and pressurizing landfill gas to produce vehicle grade methane fuel as well as marketable carbon dioxide.

*William Brown, President, Acion Technologies*

## Landfill Gas: A Waste-d Resource

“We have a lot of equity built up in our solid waste landfills,” Simkins pointed out. “And I ask the question, when a county goes out to bid for solid waste collection, why aren’t we asking the landfill company or the bidders to bid a price for you to buy biomethane?” Simkins headed the demonstration project at the Burlington County Resource Recovery Complex near Trenton, where Acion technology produced the methane fuel that Mack Truck and Waste Management burned in garbage trucks built to run on liquefied natural gas.

*Robert Simkins, Director  
Burlington County Resource Recovery Complex*



## Grants for Natural Gas Customers

Clean Energy, the largest provider of natural gas refueling infrastructure for transportation in the US, helps its customers win grants to finance the cost of putting natural gas vehicles on the road.

*Ray Burke, Vice President Business Development, Clean Energy*

## Community Partnerships to Recover Energy from Landfills

The EPA’s voluntary Landfill Methane Outreach Program (LMOP) helps hundreds of communities recover and use landfill gas (LFG) as an energy resource. By the end of 2006, there were approximately 425 LFG energy projects in the US and 560 landfills that are good candidates for projects, according to the EPA. Vehicle fuel production at landfills is an “emerging area,” according to EPA’s Swarupa Ganguli.

*Swarupa Ganguli, LMOP Midwest Regional Manager, US EPA*



## EV ON THE ROAD... (CON'T)

**Opening New Vistas in New Jersey:** At the December meeting of NJ's Clean Air Council, Joanna Underwood discussed the benefits for municipalities of replacing old diesel trucks with natural gas models. She encouraged members to attend the January EV-Rutgers University Statewide Conference.



Joanna Underwood and Peter Boisen at the NJ AFV Conference

**Honors for EV's President:** In January, Joanna Underwood was named a Center for Science in Society Fellow of Bryn Mawr College.

**New Yorkers learn about one of the most promising fuels of the future – Biomethane:** On January 25, at EV's first lunch in NYC, sponsored by Linklaters LLP, 35 members and friends heard Peter Boisen, a leading Swedish authority on biomethane (see page one article), discuss the rapidly expanding use of biomethane in Europe. He was followed by Robert Simkins, Director of the Burlington Cy Resource Recovery Complex in NJ, a pioneer in the first biomethane project in the US, who described how biogases, extracted from the Burlington Cy Landfill, were successfully refined and used to power two Mack refuse trucks.

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For annual memberships, publications, speakers, and reprint requests, please email [lacey@energy-vision.org](mailto:lacey@energy-vision.org), write EV at 138 East 13<sup>th</sup> Street, New York, NY 10003, call (212) 228-0225 or visit <http://www.energy-vision.org>.

EV is a national non-profit organization that analyzes and promotes ways to make a swift transition to pollution-free renewable energy sources and to the clean, petroleum-free transportation fuels of the future.



## ENERGY VISION

138 East 13<sup>th</sup> Street  
New York, New York  
10003

