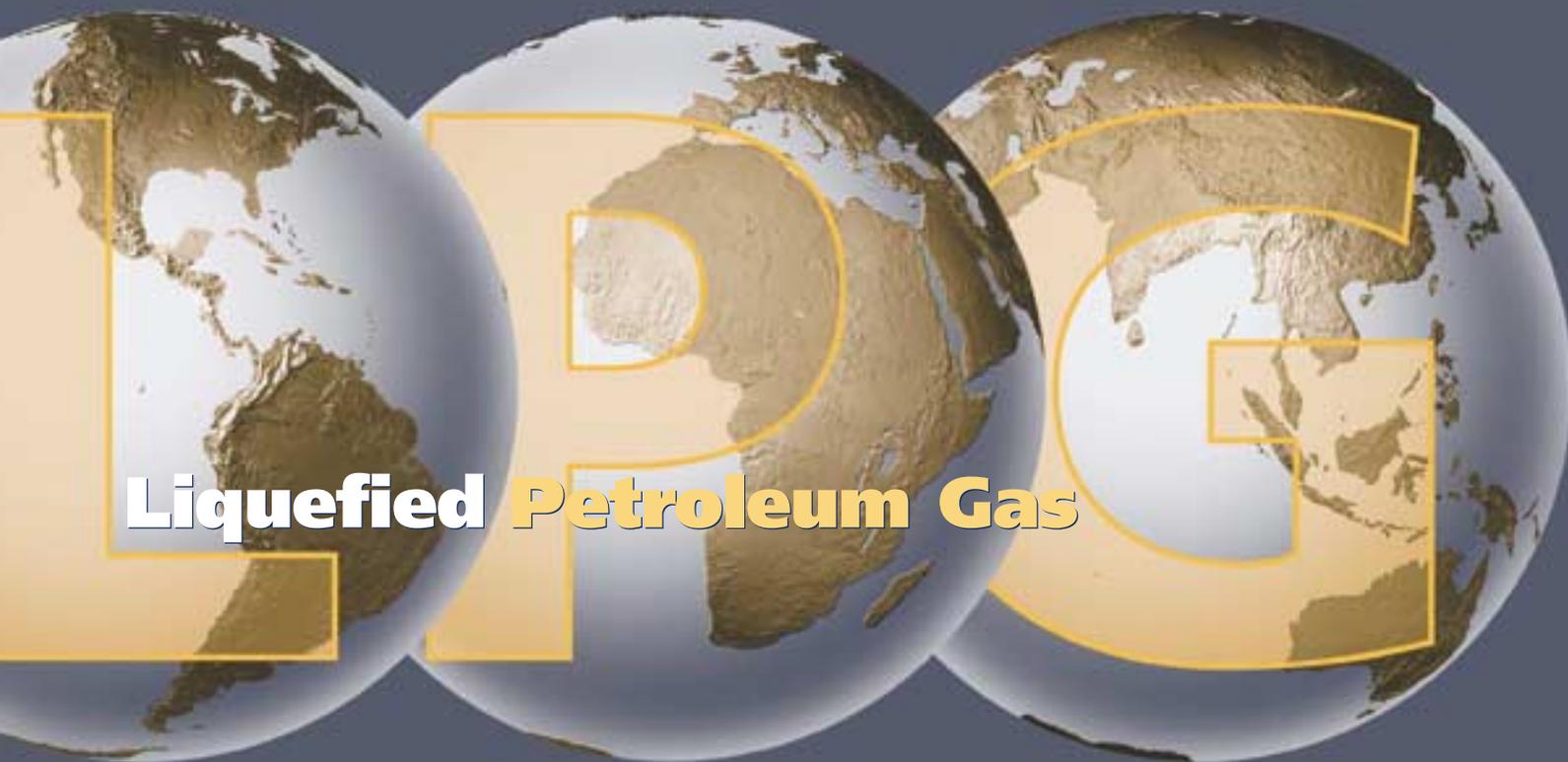


U.S. DEPARTMENT of ENERGY

ALTERNATIVE FUEL NEWS

An Official Publication of the Clean Cities Network and the Alternative Fuels Data Center

From the Office of Energy Efficiency and Renewable Energy



Liquefied Petroleum Gas

Around the World



PLUS:

AFVs in National Parks

Future AFV Conversions

INSIDE:

**Fuel Economy
Guide for '03**



Dear Readers:

Last Friday was a bittersweet day. I visited my nearest natural gas refueling site for the last time and said goodbye to several friends who frequent the refueling site. I said goodbye to the commuter who drives his CNG Crown Vic into the city from Ashburn, Virginia, 50 miles away. He refuels every day on his way to work, because, as a driver of a clean fuel vehicle he is able to use the HOV lanes in Virginia and significantly reduce his commute time. He can't understand why everyone wouldn't want to drive an alternative fuel vehicle.

I said goodbye to the Pentagon limo driver who never could quite figure out why he had to inconvenience himself each time he refueled, by going to an out-of-the way site. And the Arlington Regional Transit (ART) driver who is happy to be doing the right thing, as long as he gets a good fill. All these and more are part of a special club that refuel with natural gas. We commiserate when the compressors are down and give the thumbs up when things are going right. But Friday I resigned from the club.

Now I am really part of an elite group, because I can refuel in my own driveway. Thanks to installation efforts by Washington Gas, my new FuelMaker unit hums in the evening so I can set off in the morning knowing that I am about as energy secure (barring a power outage) as any U.S. driver can be. And if you think that's alarmist thinking, take a look at the graph on the back cover.

In 2000, we imported 53 percent of the petroleum we used, mostly to fuel our transportation sector—and this amount continues to grow dramatically. To return imports just to that level by 2020 would take a major effort. Specifically, we'd need to increase the average fuel economy of new cars and light trucks on the road from today's average of 24.4 miles per gallon (mpg) to approximately 61 mpg.

Alternative fuels can help reduce that number to something more closely within reach. With a 10 percent AFV penetration among all on-road vehicles, the needed fuel economy average for conventional vehicles would fall from 61 mpg to a more achievable 49.4 mpg. By hitting both targets together, our daily petroleum consumption would return to year 2000 levels by 2020.

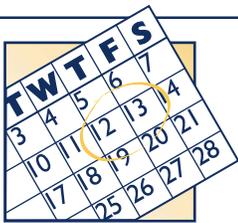
Nobody says that would be easy. With more than 286 million vehicles expected on U.S. roads in 2020, a 10 percent AFV penetration obviously would require giant steps forward from today's AFV population. Nor does returning to year-2000 petroleum consumption levels seem like energy nirvana, compared to the more optimistic scenarios we've heard for future transportation technologies.

But the reasons for alternative fuels are more compelling than ever. One is the fact that approximately 14 percent of our petroleum comes from the Middle East. With energy security so high on the list of national priorities, increasing BOTH fuel economy and alternative fuel use is critically important.

Small steps must precede big ones. All Clean Cities stakeholders deserve credit for what they've already done—and what they continue doing—to help move our nation to a cleaner, more secure energy future. And kudos to the commuter from Ashburn, the ART drivers, and all the other AFV drivers nationwide.

Shelley Launey, Director

Clean Cities Program
U.S. Department of Energy



Upcoming Conferences and Events

2002 Fuel Cell Seminar

November 18, 2002
Palm Springs, California
Contact: Courtesy Associates
202-973-8671
www.gofuelcell.com/shortCourse.html

Natural Gas Fuel Station Operation

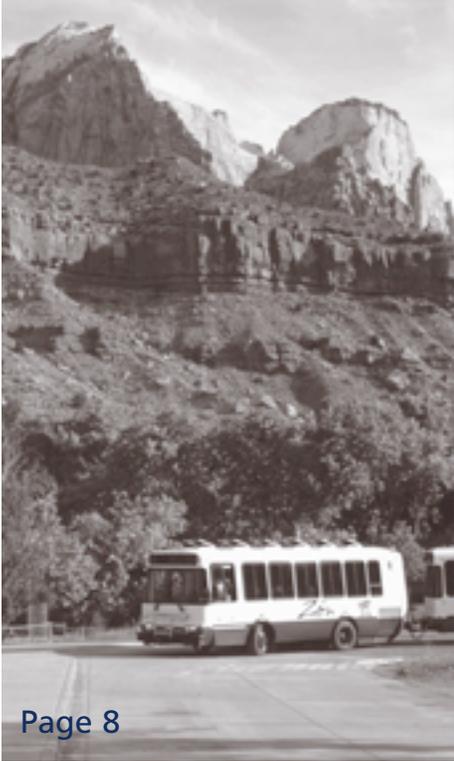
December 2–3, 2002
Las Vegas, Nevada
Natural Gas Vehicle Institute
702-254-4180
www.ngvi.com

Electric Transportation Industry Conference

December 10–13, 2002
Hollywood Beach, Florida
Electric Vehicle Association of the Americas
202-508-5995
www.eticonference.com

For more conference and event information, visit www.cities.doe.gov/events_cgi.shtml

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BR-540-32463

October 2002



Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 20% postconsumer waste

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Tracking the growth of liquefied petroleum gas



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LPG

Liquefied Petroleum Gas

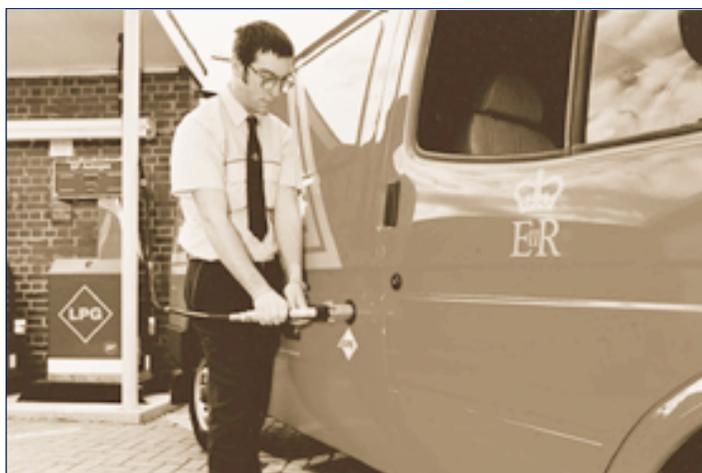
Fueling Vehicles Around the World

Alternative fuels strive to succeed on many scales including emission levels, economic costs, availability, and the potential to reduce oil consumption. Ranking highly by all such measures, particularly worldwide, is the fuel commonly called propane in United States.

Propane, liquefied petroleum gas, and LPG are interchangeable names for the same commodity. (Technically, however, propane is just one, predominant component in LPG, which often contains smaller amounts of butane, propylene, and butylenes.) Autogas is yet another label for the same fuel, used in Europe, Australia, and much of the rest of the world.

By whatever name, it is a fuel increasingly recognized worldwide as a clean, safe, and practical alternative to petroleum. According to the World LP Gas Association (WLPGA), some 29,000 automotive LPG fueling stations were operating worldwide in 2000. More than 7 million vehicles in 40 countries were LPG-fueled at that time, representing a 46 percent increase from two years earlier.

Such claims are difficult to verify, however, even in the United States. One reason is the lack of universal definitions. "Automotive use" may include off-road and industrial equipment such as forklifts. "Fueling stations" may serve only small domestic uses such as barbecue grills.



"Autogas" is sold alongside petroleum in the United Kingdom and much of Europe. Other top LPG-consuming countries include Italy, Poland, and the Netherlands.

LPG is a by-product of natural gas processing and crude oil refining. Worldwide, about 60 percent of LPG comes from gas processing, while crude refining produces 40 percent, according to the WLPGA. But the proportions vary widely among regions. More than 90 percent of worldwide LPG consumption is for cooking, heating, and other non-automotive purposes.

Leading Nations

Countries leading the way in the use of automotive LPG include South Korea, Japan, Australia, Turkey, and Italy. Also ranking in the top ten, according to the WLPGA, are Mexico, the United States, Poland, the Russian Federation, and the Netherlands. Nearly 6 percent of cars in the Netherlands run on LPG.

Australia imported its first LPG cylinders in the late 1930s, and it secured a domestic supply from oil and gas production in the late 1960s. With only 19 million people, Australia has become a world leader in automotive LPG. Its 550,000 LPG vehicles represent 4 percent of the country's fleet and account for approximately 8 percent of total fuel consumption.

Australia's automotive LPG industry has flourished largely because of the fuel's exemption from an excise tax that applies to gasoline and diesel. LPG conversion kits were tax exempt until 2000, and the commonwealth and state governments have offered grants for conversion or purchase of LPG vehicles. If its tax advantage over gasoline and diesel is maintained, according to the WLPGA, demand for automotive LPG is expected to continue growing by 4 percent per year.

Italy, with a population of about 60 million people, is home to more than 1.2 million LPG vehicles and accounts for 45 percent of Europe's automotive LPG consumption. Italy is also a leading producer and marketer of LPG-related equipment.

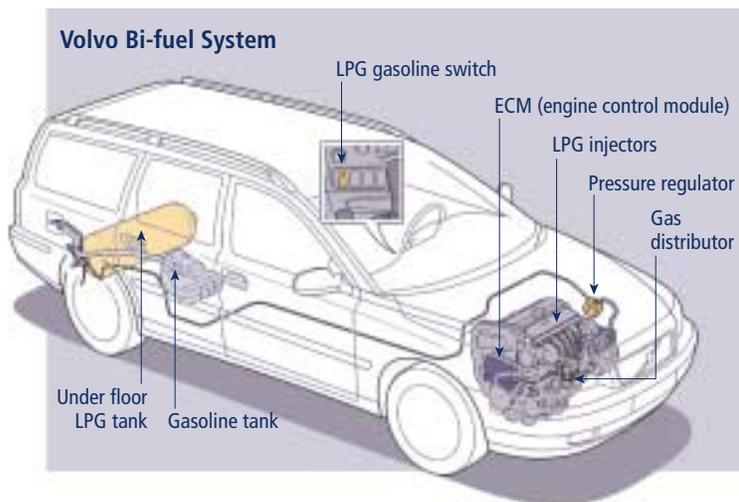
Regulations and fiscal policy make LPG an attractive option in Italy. In an effort to reduce harmful emissions, gasoline and diesel have been restricted. LPG vehicles, meanwhile, are allowed to operate during smog alerts that limit operation of conventional vehicles. Automotive LPG has an excise tax advantage over gasoline and diesel. The government subsidizes LPG conversion of buses, taxis, and some private vehicles.

LPG—A liquid gas?

Sometimes it is a liquid, and sometimes it is a gas. The benefits of LPG stem largely from its ability to change between the two phases. LPG is a gas at normal temperatures and pressures (the boiling point of propane at atmospheric pressure is about -45°C , for butane it is about -2°C). When subjected to modest pressure or cooling it becomes a liquid. The pressure in a storage tank keeps LPG liquid, and it becomes gas when released from the tank. The liquid form has an energy density 270 times greater than the gaseous form, making it efficient for storage and transportation as a liquid, while giving the benefit of a clean, gaseous fuel when burned.

A World of Options

LPG vehicles can be designed as such by original equipment manufacturers (OEMs), or converted from other fuel systems. A typical aftermarket conversion includes installing a new fuel tank, fuel pressure regulator, electric or vacuum-operated switches, and electronics. Until recently, the cost of an aftermarket conversion in the U.S. ranged roughly from \$2,000 to \$4,000. Such costs are rising, however, because of tougher emission certification requirements (see story, page 10).



Many OEMs offer LPG as an option—installed at the factory or converted at the time of purchase. In Europe, Volvo offers fully factory-assembled bi-fuel cars with equipment specifically designed and tested for Volvo. (Some of those cars also come with a compressed natural gas option.) Vauxhall Motors in the United Kingdom offers three models with a bi-fuel option. In the United States, a Ford bi-fuel pickup truck is available. Mitsubishi offers LPG passenger cars in Japan, where they are used primarily as taxis (95 percent of taxis in Japan use LPG).

More common than dedicated LPG vehicles are bi-fuel vehicles, storing gasoline and LPG in two separate tanks. Fuel is pressurized to about 300 pounds per square inch in

the tank—about twice the pressure as in an inflated truck tire. LPG's lower pressurization requirement is sometimes cited as an advantage over other alternative fuel designs.

Filling an LPG vehicle is similar to filling a gasoline vehicle, except that a tighter connection is made between the hose and vehicle tank to prevent the pressurized fuel from escaping. In most countries where LPG is a vehicle fuel, it is sold alongside gasoline and diesel at traditional fueling stations. LPG is also available at dedicated LPG fueling stations.

Critical Mass

According to the WLPGA, successful automotive LPG market depends on achieving critical mass in the LPG market. Critical mass is defined in several ways. The number of vehicles must be large enough to show fuel providers that LPG is a viable business. The fuel must be widely available and convenient to consumers. The market must be large enough to ensure an adequate supply of equipment and mechanics trained to convert and maintain LPG vehicles. And the market must be sustainable so that OEMs are willing to develop LPG vehicles.

In many countries with large automotive LPG markets, government policies have been key to creating a market. France, for example, is one of Europe's fastest growing LPG markets. That country allows LPG vehicles to operate during periods of high air pollution when driving restrictions are imposed on other vehicles. South Korea is the world's largest automotive LPG consumer. According to the Korea Gas Safety Corporation, more than 10 percent of all registered vehicles in Korea are LPG-fueled. LPG's recent rapid market growth in South Korea resulted from a large excise tax advantage over gasoline and diesel (which the government recently decided to reduce).

Japan, the world's second largest automotive LPG market, offers grants for conversion or purchase of LPG vehicles and installation of filling stations.

For more information...

World LP Gas Association: www.worldlpg.com. World organization provides information on worldwide LPG use and links to world LPG organizations. The Global Autogas Industry Network provides information specific to automotive LPG.

Propane Education & Research Council: www.propanecouncil.org. U.S. organization provides information on LPG use, including use as automotive fuel.

Propane Vehicle Council: www.propanegas.com/vehicle/. U.S. membership organization promotes automotive LPG use.

Clean Alternative Fuels—Propane: EPA fact sheet provides information on LPG availability, emission characteristics, affordability, performance, safety, and maintenance. Available online at www.epa.gov/otaq/consumer/fuels/altfuels/propane.pdf.

Q&A:

John Millhone



Clean Cities is now under the Weatherization and Intergovernmental Program umbrella. John Millhone hopes to see alternative fuels integrated with other important DOE initiatives.

DOE's Office of Energy Efficiency and Renewable Energy (EERE), led by Assistant Secretary David Garman, was reorganized in July. Among the results is a new home for the Clean Cities Program. It is now part of EERE's Office of Weatherization and Intergovernmental Program (OWIP)—a diverse portfolio of entities that also includes the Energy Star Program, ReBuild America, and the Inventions and Innovation program.

John Millhone heads OWIP. He has a diverse background as a journalist, director of the Iowa and Minnesota state energy offices, and manager of the buildings and international programs in EERE. The staff of Clean Cities has not changed. Millhone spoke recently with AFN about the Clean Cities Program.

Why is Clean Cities part of the Weatherization and Intergovernmental Program? Can you explain the reasoning behind this change?

The goal of Assistant Secretary David Garman is to streamline EERE, reducing the management overhead and creating a closer, more responsive connection with our customers. Most of the EERE programs focus on research and development. The mission of OWIP is to take the products of these other offices such as alternative fuel vehicles and deploy them to our state, local, and public and private customers. By bringing these deployment activities together, we believe we can strengthen their impact.

How will this affect Clean Cities funding and direction?

I expect the direct funding support by DOE for Clean Cities will continue as it has in the past. The basic direction also will remain steady. Our strategy will be to strengthen these efforts by attracting additional allies through closer coordination between Clean Cities and our other outreach programs with states and communities and the private

sector. For example, if we're talking to a group of cities about the ReBuild America program, we can say, "While you're considering actions that will make a difference to your environment, you really ought to also consider our Clean Cities Program."

Clean Cities stakeholders have invested a lot in the program. Should they expect DOE to continue supporting them?

The Clean Cities stakeholders should expect a broadening of DOE's support. OWIP is launching a coordinated effort to package DOE's efficiency and renewable programs to the American people. ReBuild America and Energy Star in the buildings sector, the Inventions and Innovation Program is in the industrial sector, and Clean Cities is in the transportation sector. Clean Cities will be an essential element in this campaign to connect through our Regional Offices with states and communities. A specific objective will be to strengthen the state and community support for the Clean Cities coalitions to enable them to become more self-supporting and a permanent part of our transportation systems.

Please compare Clean Cities to other OWIP programs, or to grant-giving government programs in general, in terms of purpose, scope, and effectiveness.

OWIP includes both financial assistance and technical assistance activities. A major financial assistance activity is the Weatherization Assistance Program, which provides funds to improve the energy efficiency of low-income housing through 970 local community action agencies. Another financial assistance activity is the State Energy Program, which provides the basic support for state energy offices. Our Gateway programs combine financial and technical assistance. Clean Cities is one of these combined programs. The broad purpose of all of these programs is to

achieve the U.S. objectives of improving energy efficiency and reducing dependence on imported oil. This can be done most effectively if we coordinate these efforts. For example, we intend to use our financial support for the state energy offices to make the states more aware of the Clean Cities Program to build state support for the Clean Cities coalitions. State energy offices need to better understand the benefits that Clean Cities brings to their communities. I intend to encourage the SEOs to contribute to the sustainability of those coalitions that need help in becoming viable organizations.

Your background includes a great deal of international experience. Does Clean Cities have an important role to play beyond the United States?

For the past eight years, I've had international assignments as a senior fellow at Battelle's Advanced International Studies Unit and as director of DOE's Country Studies Program and the U.S. Initiative on Joint Implementation. On these assignments, I've become directly familiar with the severe air quality problems in most of the world's major urban areas. When other countries and cities hear of the U.S. Clean Cities Program, they ask, "How can we get a Clean Cities Program in our cities?" We've tried to help some cities initiate a program. Our funding for international efforts is very limited, but we're exploring ways where we might get the resources to address this international need.

Climate change is a global problem, so all countries should have an interest in controlling greenhouse gas emissions. Based on your work internationally, are developing countries concerned about GHGs?

To be candid, the attitude of many developing countries is that the problem was created by carbon emissions from developed countries. They see efforts to limit their carbon emissions as a means to hold them back economically. In my view, we need to address that issue directly. We should show them that they can leapfrog some of the technology-development processes that developed countries have gone through, and go directly to processes that are more sustainable. For example, they might avoid some of the costs of constructing a petroleum infrastructure if they choose natural gas or hydrogen. To be most cost-effective, alternatives will have to have some kind of carbon-emissions trading process. Developing countries will have something to gain by being leaders in technologies that reduce greenhouse gas emissions. If countries choose to have lower carbon emissions and there is a trading program, they would earn credits that would be helpful to their further development.

Clean Cities is built on a few leaders effectively showcasing new technology with the hope that other users will follow. What makes this process work best, or not work?

I heartily agree that Clean Cities is built on the enthusiasm and commitment of a few leaders. This was vividly apparent to me when I attended the Clean Cities Conference in Oklahoma City. I have great admiration for Shelley Launey, who leads our Clean Cities Program, and her staff and contractors who have a contagious enthusiasm that is shared with the leaders of the Clean Cities coalitions. Good people make good programs and that's the resource we need to build on. My approach will be to support these leaders while also seeking to help create a stronger state and community infrastructure that will sustain this enthusiasm and these programs for the long haul.

Should Clean Cities support hybrid technology?

Clean Cities should have a fairly inclusive approach, to look at transportation systems that are alternatives to the conventional internal combustion engine. I recognize each AFV has unique characteristics, and in terms of efficiency they vary somewhat. But they're all improvements over conventional transportation. I don't want to get into the pattern of trying to include some and not others. That said, it does not appear that hybrids need special support to gain consumer acceptance. We view our role as one of education, helping consumers understand the benefits of hybrid technology. We developed "Technology Snapshots" for each commercial hybrid as it entered the market and we include information about hybrids on our Web-based *Consumer Buyers Guide*. But our grant money is reserved for alternative fuel vehicles where the barriers and challenges for market penetration are steeper.

What have you learned in your first few months on the job?

I've learned that Clean Cities is more complicated than I originally supposed. I had lumped all alternative fuels together and I'm learning that there's a rich diversity of alternative fuels, each with its unique features and applications. My original approach was to think in broad terms about improving the energy efficiency and reducing the dependence on petroleum in our cities and districts. Now I'm more aware of the specific contribution that Clean Cities is making to addressing this challenge. And I've also learned that the people I've met in Clean Cities work hard and have fun working together. I'm looking forward to joining our Clean Cities partners in this important work.