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Clean Cities

2004 Roadmap

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

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Acronyms

Acronym	Description
AFV	Alternative Fuel Vehicle
B20	20% biodiesel, 80% petroleum diesel
CAFE	Corporate Average Fuel Economy
CMAQ	Congestion Mitigation and Air Quality (Program)
CNG	Compressed Natural Gas
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
E10	10% ethanol, 90% gasoline
E85	85% ethanol, 15% gasoline
EERE	Office of Energy Efficiency and Renewable Energy
EIA	Energy Information Administration
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act of 1992
FFV	Flexible Fuel Vehicle
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GHG	Greenhouse Gas
GSA	General Services Administration
HOV	High Occupancy Vehicle (lane)
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MOU	Memorandum of Understanding
NASEO	National Association of State Energy Officials
NGA	National Governor's Association
NREL	National Renewable Energy Laboratory
OEM	Original equipment manufacturer
OPEC	Organization of Petroleum Exporting Countries
ORNL	Oak Ridge National Laboratory
NOx	Oxides of Nitrogen
NRCAN	Natural Resources Canada
R&D	Research and Development
SUV	Sport Utility Vehicle
USDA	U.S. Department of Agriculture
VMT	Vehicle Miles Traveled

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Introduction

Since its inception in 1993, the U.S. Department of Energy's (DOE) Clean Cities has developed a national, voluntary activity with community-based Clean Cities coalitions that create public/private partnerships to increase the use of alternative fuels. While alternative fuels remain a strong focus, growing economic, security, and environmental costs of petroleum dependence are catalyzing Clean Cities to explore new ways to achieve additional impacts. Toward that end, a working group of Clean Cities coalitions, local and state governments, federal agencies, and private industry took a fresh look at what Clean Cities can do to slow U.S. dependence on imported oil. The result of the process is the new Clean Cities Roadmap. The changes in the scope and function of Clean Cities described in this document will serve to position Clean Cities as a primary deployment arm for all DOE Energy Efficiency and Renewable Energy (EERE) transportation activities.

MISSION STATEMENT

U.S. Department of Energy (DOE)

DOE Strategic Plan 2003: Avoiding dependence on imports is the "…heart of our national energy policy."

Energy Efficiency and Renewable Energy (EERE)

EERE Mission Priority 1: "Dramatically reduce or even end dependence on foreign oil."

Clean Cities

Clean Cities Mission: "To advance the energy, economic, and environmental security of the Untied States by supporting local decisions to adopt practices that contribute to the reduction of petroleum consumption in the transportation sector."

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After examining the victories and challenges Clean Cities has faced during the past decade and analyzing market forces likely to define the next 25 years, the working group set out to develop a portfolio redesign that would allow an overarching strategic framework that will produce even greater results. The mission of the new Clean Cities portfolio is to significantly contribute to EERE's number one mission, which is to "dramatically reduce, or even end, dependence on foreign oil." The core of the Roadmap is an expanded portfolio that builds on the Clean Cities work with alternative fuels. Clean Cities national efforts will now focus on petroleum displacement through:

- Continued progress on alternative fuels,
- Increased use of lower fuel blends, such as 10% ethanol and 2% biodiesel,
- Enhanced acceptance of fuel economy practices,
- Increased market penetration of hybrid vehicles, and
- Promoting the use of idle reduction technologies in heavy-duty vehicles.

Clean Cities New Portfolio

- Further Increase Alternative Fuel Use
- Advance the Use of Fuel Blends
- Champion Fuel Economy Practices
- Increase the Use of Hybrids
- Promote Idle Reduction Technologies

Clean Cities

The portfolio is built upon Clean Cities successful history, which has emphasized a federal role of providing technical assistance to local coalitions composed of public and private stakeholders devoted to oil displacement and air quality improvements.

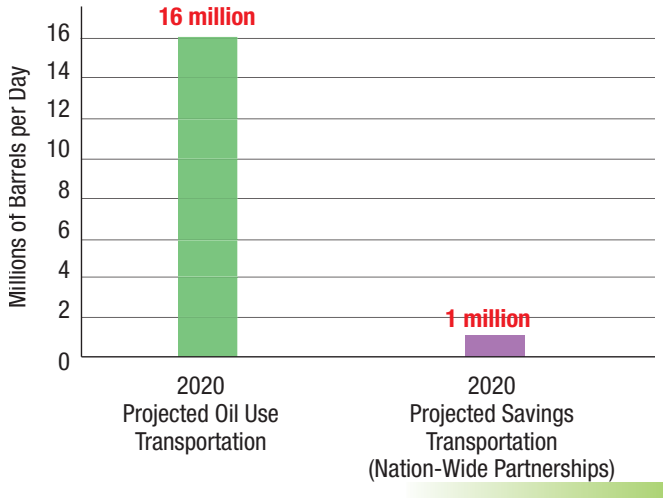
Financial assistance through grants is an important element of the portfolio, but is not the cornerstone of Clean Cities and would have little impact if not delivered in tandem with robust technical assistance, training, and information activities.

The following three principles are at the core of the Roadmap:

1. **Accelerating Oil Import Reduction:** Clean Cities can significantly reduce oil imports in the near term and position the transportation system for the hydrogen transition, while achieving other critical environmental and economic benefits from this expanded technology portfolio.

   Clean Cities has already achieved significant U.S. petroleum displacement through its alternative fuel vehicle (AFV) activities. Departmental analysis shows that through the expanded portfolio, Clean Cities will work to increase the rate of petroleum displacement, thereby contributing to a national vision that the transportation sector might reduce its petroleum use by more than 1 million barrels of oil per day by 2020. Clean Cities will contribute a portion of this savings, alongside other government and industry activities. Through rigorous analysis and data collection, Clean Cities will track and document its contribution to petroleum displacement gains in designated communities throughout the country. This portfolio represents a comprehensive strategy to combine energy efficiency with an aggressive fuel diversification approach that includes ethanol, biodiesel, natural gas, hydrogen, and propane. The energy efficiency strategy will combine near-term fuel economy improvements with initiatives that will commercialize current and near-term fuel and vehicle technologies. Departmental analysis indicates that per dollar spent, Clean Cities is currently EERE's best investment in petroleum displacement in the near term.

FIGURE 1. National Vision: Reduce Transportation Oil Consumption by 1 Million Barrels/Day by 2020



* Source: *Energy Information Administration, Energy Consumption by Sector an* www.eia.doe.gov/oiaf/aeo/excel/aeotab_2.xls. Accessed Sept. 2004.

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2. **Tapping the Strength of Clean Cities as a Highly Effective Deployment Activity:** Clean Cities is a highly effective deployment activity that is well suited to accelerate the expanded portfolio.

   Clean Cities is considered in the communities it serves to be a highly effective transportation deployment activity for the U.S. government. Clean Cities offers several important assets to advance this technology portfolio. The program's successful 10-year investment in alternative fuels has resulted in more than 80 Clean Cities coalitions throughout the country and 4,800 stakeholders.

   The most noteworthy accomplishment is Clean Cities success in meeting activities goals. Under the current (FY04) Clean Cites portfolio that concentrates only on the AFV contribution to petroleum displacement, a goal was set to displace 1 billion gallons of petroleum annually by 2010, which would require a 17% annual growth rate in the number of AFVs. The portfolio has documented success in meeting that goal in recent years.

   Building on those successes, coalitions will have the opportunity to select and promote technologies from the new portfolio to achieve real life applicability in their communities' marketplaces. Coalition members understand their communities, and, consequently, many have already begun the work of imparting information about hydrogen and advanced technologies. The work of Clean Cities is to change purchasing

behaviors and attitudes now, so as technologies improve, many of the barriers will have already been overcome. Clean Cities will continue to draw on its demonstrated strengths in:

- Leveraging modest DOE funding with other federal, state, and local funding, and industry investments;
- Providing technical assistance and information to address key market barriers;
- Influencing state and local policies and plans; and
- Brokering public/private partnerships.

3. Applying and Expanding Strategic Partnerships: Clean Cities is positioned to work with existing partners and develop new strategic partnerships that will help achieve the new portfolio goals.

Clean Cities and EPAct

Clean Cities (CC) was originally formed to help meet the requirements for mandated fleets (federal, state, fuel provider and utilities) established by the Energy Policy Act of 1992 (EPAct). These fleets serve as anchors in the communities with CC often funding infrastructure projects that lead to the expansion of non-regulated fleets within the Clean Cities community.

Partnerships form the cornerstone of the Clean Cities activities. These partnerships occur at the state and local levels through coalitions composed of state and local officials, industry, and community organizations. The partnerships also occur at the national level through Clean Cities' close relationship with original equipment manufacturers (OEMs), fuel providers, and other private sector representatives, along with other federal agencies and national associations. Coalitions are designated after meeting several criteria, one of which is demonstrated stakeholder support. Coalitions are technology and fuel neutral, and position themselves to be credible players, to attract strong project partners. Partnerships are even more critical to advance the expanded portfolio, as the activities at every level must leverage resources with like-minded organizations in order to augment funding. In addition to strong industry support, DOE is exploring expansion of its partnerships with the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Transportation (DOT) to harness the collective resources of all three agencies in supporting this portfolio. Cooperative efforts across the agencies may include joint education and outreach, technical assistance, research and analysis, market development, and project co-funding.

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What makes the Clean Cities activities unique is the technical knowledge and commitment of the men and women who comprise Clean Cities coalitions. The heart of the reinvented Clean Cities activities is the need and ability to shift the activities emphasis and focus as the needs of the nation change. What will distinguish activities into the foreseeable future is their role in promoting competitive energy markets that result in significant and quantifiable displacement of petroleum. This is the Roadmap vision that will take us into that future.

FIGURE 2. Coalition Stakeholders

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Goals and Strategic Benefits

The core value of Clean Cities is to reduce petroleum consumption in the transportation sector. A national, community-based effort will result in greater energy security, improved air quality, and enhanced economic security. The new mission of Clean Cities is:

To advance the energy, economic, and environmental security of the United States by supporting local decisions to adopt practices that contribute to the reduction of petroleum consumption in the transportation sector.

The goal of the expanded Clean Cities portfolio is to contribute to accelerated market penetration of technologies that will help to reduce U.S. reliance on petroleum imports. The Department of Energy has developed initial estimates of the impact the Clean Cities portfolio can have on reducing petroleum use through these four new technology elements (fuel blends, fuel economy, hybrids, and idle reduction), along with continued efforts to advance the use of alternative fuels. Based on the best projections at this time, Clean Cities estimates that its contribution through this expanded portfolio to the broader national potential could be up to 0.14 million barrels/day by 2020 (Figure 3). Estimates of the contribution of each of the technologies toward this goal are shown in Figure 4.

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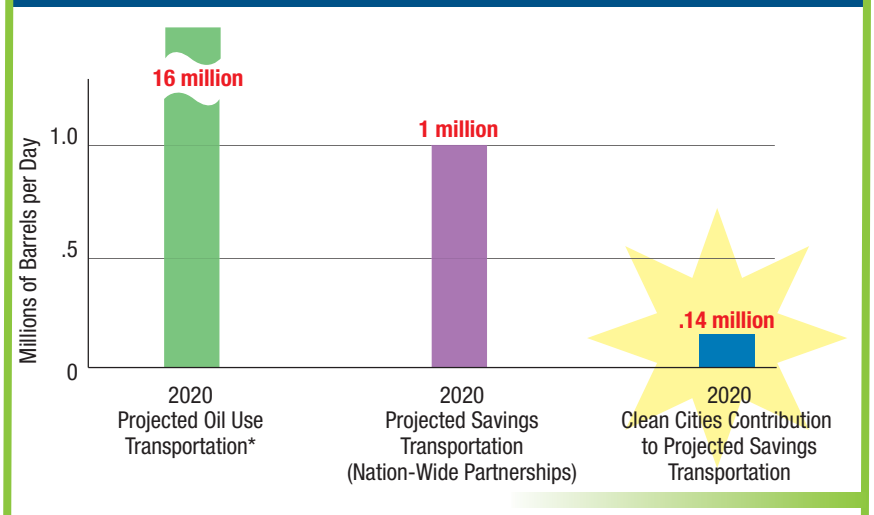
Further analysis will determine the activities that individual Clean Cities coalitions will undertake, and associated contributions that coalitions will make, to meet these petroleum displacement impacts. Achievement of these impacts through implementation of the activities outlined in this Roadmap will require increased funding levels commensurate with portfolio successes in meeting oil reduction/displacement goals. Analysis will also determine potential Clean Cities impacts at other funding levels.

The contribution of alternative fuels represents an extension to 2020 of the Clean Cities vision for AFVs. The contribution of blends reflects additional ethanol that will become competitive in the marketplace based on estimates developed by the DOE Biomass Program and available biodiesel market estimates from the U.S. Energy Information Administration (EIA). Clean Cities can help achieve these levels of market penetration through work to expand state and local programs and to foster broader awareness and support for the use of blended fuels.

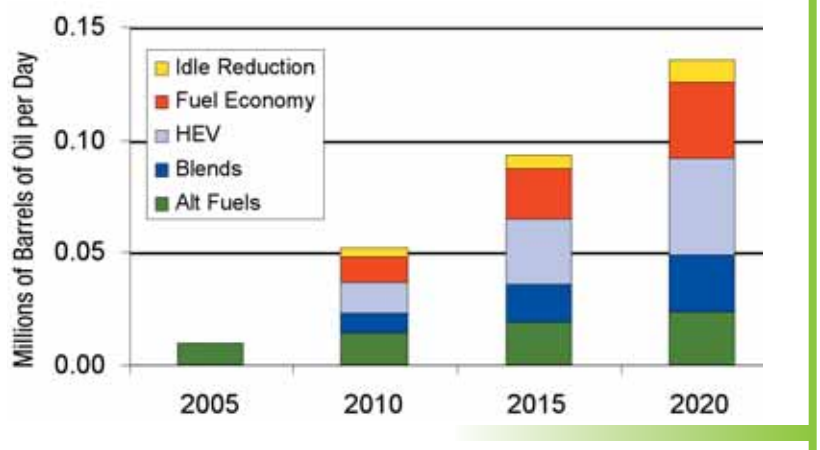
The contribution of hybrid vehicles reflects estimates of potential market penetration that models estimate could be achieved if

FIGURE 3. Clean Cities' Contribution to Reduction in Oil Consumption by 2020



* Source: *Energy Information Administration, Energy Consumption by Sector and Source* online, www.eia.doe.gov/oiaf/aeo/excel/aeotab_2.xls. Accessed Sept. 2004.

FIGURE 4. Substantial Petroleum Savings Potential with Expanded CC Portfolio



Clean Cities coalitions were able to cause additional state and local policy incentives for light and heavy duty hybrids while also working with fleets and consumers to increase their knowledge, acceptance, and ultimately, the purchase of hybrid vehicles. Fuel economy contributions reflect vehicle purchasers placing a slightly higher value on fuel economy due to Clean Cities education and outreach efforts. The idle reduction estimate is based on 70% of the long-haul truck market using idle reduction technology, and attributing a small share of that change to Clean Cities. Clean Cities will partner with FHWA, EPA, and others to decrease idling within long-haul trucking and other vehicle fleets.

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Energy Security Benefits

EIA recently projected that the United States will become increasingly dependent on imported oil in the next two decades, citing an increase in oil imports from 54% today to 70% by 2025. According to DOE, the transportation sector accounts for 69% of total U.S. petroleum use (DOE/EIA, Annual Energy Outlook, 2003), and the United States relies on petroleum for 95% of our transportation fuel.

The United States accounts for only 9% of oil production (DOE/EIA, International Petroleum Monthly, 2003c, Table 4.1c). Two-thirds of the world's crude-oil reserves are in the Middle East–the region the United States relies on for 41% of its imported oil (DOE/EIA, International Petroleum Monthly, 2003c, Table 1.1a). Oil imports from unstable countries and regions pose significant problems in terms of oil availability, oil price fluctuations, and international security. Saudi Arabia controls the largest share of the world's oil and serves as the market regulator for the global petroleum industry. The United States and the rest of the industrialized world are dependent on Saudi Arabia's oil reserves and those of other Organization of Petroleum Exporting Countries (OPEC) regions and will be for decades to come. As it is, no country consumes more oil than the United States, which produces about 10% of the world's oil, but consumes more than 25% of the global oil production annually.

DOE's 2003 strategic plan stated that avoiding dependence on imports is the "…heart of our national energy policy." By improving conservation and efficiency and providing an array of technology and fuel alternatives from which local coalitions can choose, the new portfolio emphasis will realize greater energy security through reducing reliance on imports. Clean Cities is positioned to support deployment of fuel cell and hydrogen vehicles and technology, but the immediate emphasis is to show petroleum reductions today and in the near term.

Health and Environmental Benefits

Highway transportation vehicles contribute significantly to our country's air quality problems. Motor vehicles emit pollutants from tailpipes and produce ambient emissions from fuel tanks and engines; the extraction, production, and marketing of gasoline also contribute to air pollution, water pollution, and oil spills. These pollutants include reactive organic gases, carbon monoxide, oxides of nitrogen (NO_X), particulate matter, and oxides of sulfur. Alternative fuel use combined with fuel economy measures can reduce emissions of many of

these pollutants, including greenhouse gases (GHGs). GHGs include water vapor, carbon dioxide, nitrous oxides, and methane that are transparent to short-wave radiation but opaque to long-wave radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.

As a result of a series of environmental laws and the introduction of new technologies, emissions per vehicle mile have been reduced by more than 90% since the 1960s. However, because of the dramatic increase in the number of vehicles and vehicle miles traveled (VMT), transportation still remains a major contributor to U.S. emissions of criteria pollutants (EPA, "Air Quality Criteria for Carbon Monoxide," June 2000). The effects of breathing unhealthy air contribute to chronic respiratory illnesses. EPA claims that the deaths of more than 64,000 Americans annually are hastened by air pollution. The California Air Resources Board's 2002 Staff Report claimed that attaining the California particulate matter standards would prevent about 6,500 premature deaths annually, or 3% of all deaths. These premature deaths shorten lives by an average of 14 years. The transportation sector also is a major source of emissions of GHGs, which contribute to global climate change. The Clean Cities emphasis on cleaner burning fuels and fuel economy, is an important strategy to address both urban air pollution problems and the reduction of GHG emissions.

Economic Benefits

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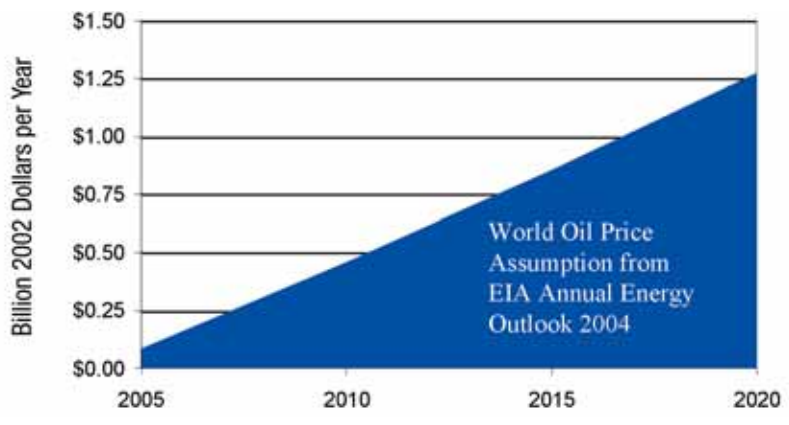
Our increasing use of foreign sources of oil, strong economic growth in lesser-developed areas of the world (such as Asia) that stimulate demand for oil, and the unpredictability of oil supply and price, make the United States economically vulnerable. The OPEC cartel allows it to keep oil prices above competitive levels. Its market power, according to a 2000 study by David Greene of Oak Ridge National Laboratory (ORNL), cost the U.S. economy $4–$14 trillion in the past 30 years, roughly the same as total payments on the national debt during that time. In 2000, net oil imports cost the United States $109 billion and are forecast to cost $160 billion by 2020 (EIA, Annual Energy Outlook, 2002). Americans pay more than one-quarter-trillion dollars per year for retail oil products (EIA, Annual Energy Review 2001). Our dependence leads to oil price shocks and price manipulation. Each oil price shock in the last three decades has been followed by an economic recession (1973–1974, 1979–1980, 1990–1991).

The Clean Cities goal has been, and continues to be, focused on efforts to lessen the potential future severity of economic impacts due to oil import restrictions and/or price increases through a portfolio that attempts to reduce our reliance on oil use in the transportation sector. Figure 5 shows the potential value of reduced expenditures on petroleum that could occur through the expanded Clean Cites portfolio saving .14M bpd by 2020.

FIGURE 5. Dollar Value of Petroleum Displaced by Expanding CC Portfolio Scenario



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Overview of Clean Cities

Federal, state, and alternative fuel provider fleets are currently mandated by the Energy Policy Act of 1992 (EPAct) to purchase a high percentage (75-90%) of AFVs, based on fleet type, when making fleet purchases. Through EPAct, the U.S. Congress directed DOE to promote ways to increase the use of alternatives to gasoline and diesel fuels. Section 505 (42 U.S.C. 13255) of EPAct requires DOE to seek sufficient voluntary commitments from fuel and vehicle suppliers and fleet owners and operators to form the partnerships necessary for the successful commercialization of AFVs and the development of alternative fuel infrastructure. Clean Cities is charged with implementing Section 505 for DOE. Clean Cities efforts also contribute to the clean air goals of the Clean Air Act Amendments, as more than half of the Clean Cities coalitions are located in ozone non-attainment areas with populations of 250,000 or more.

In 1993, DOE introduced the Clean Cities initiative to the mayors of the 125 consolidated metropolitan areas covered by EPAct. Each mayor was encouraged to support the use of alternative fuels and AFVs. The first activity was launched in Atlanta, Georgia, on September 8, 1993, as a voluntary, public/private partnership. Public/private partnerships remain the core value of Clean Cities today. Since 1993, the number of Clean Cities coalitions has grown to more than 80, as shown in Figure 6.

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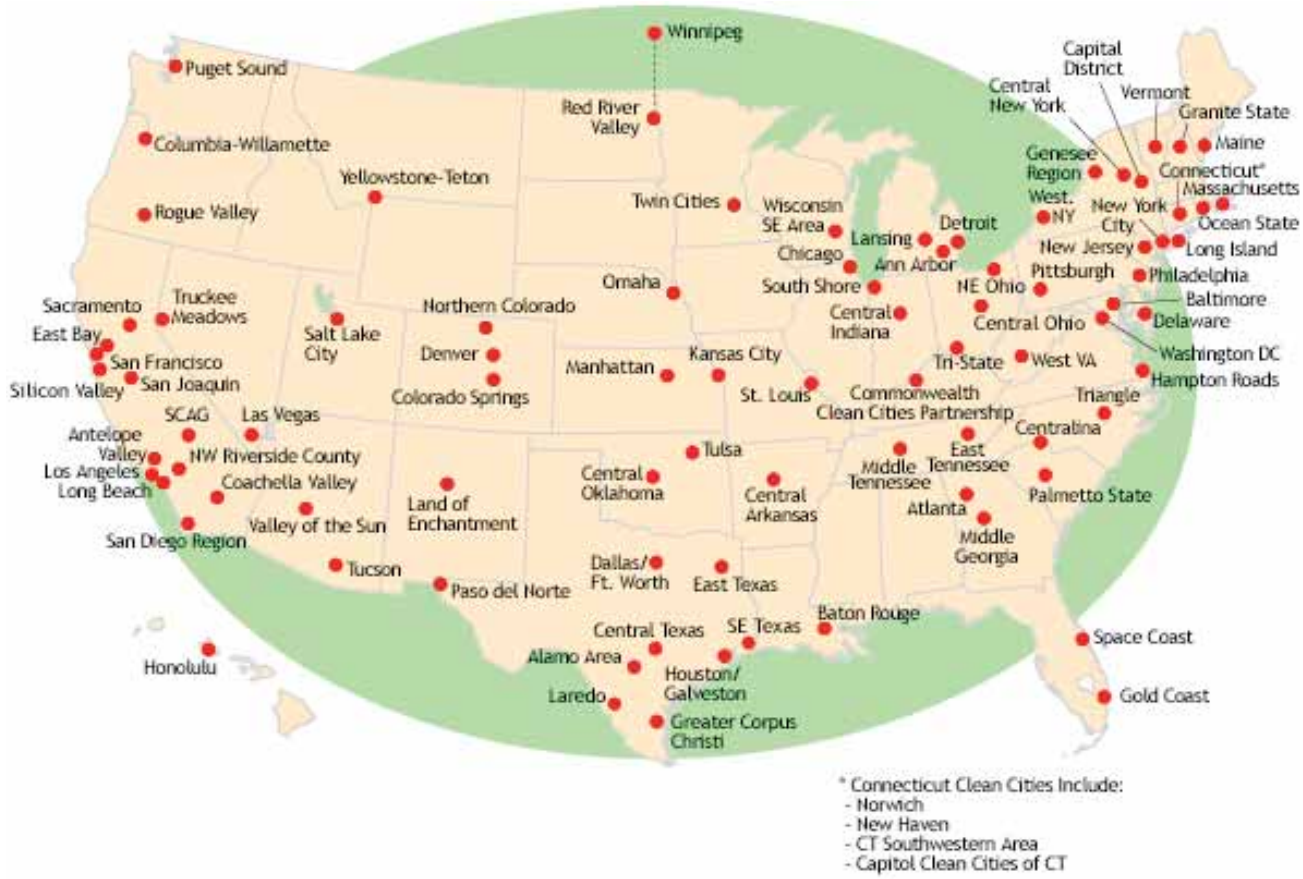
FIGURE 6. Designated U.S. Clean Cities (July 2004)



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Goals and Accomplishments

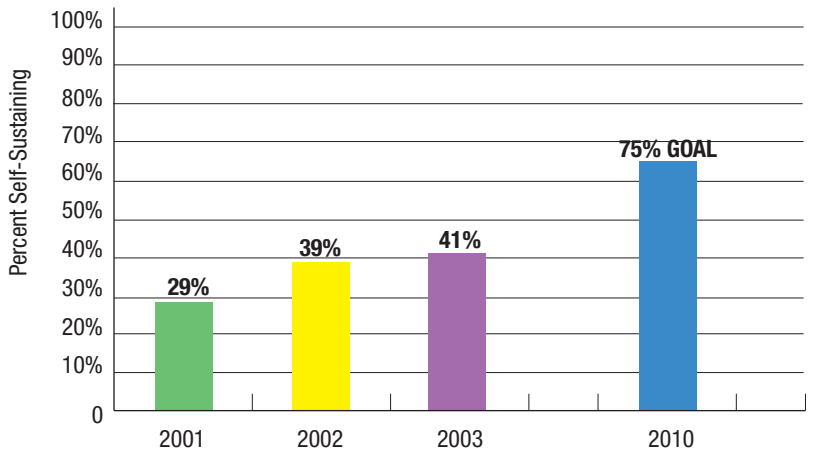
Clean Cities has measured its success in recent years by progress toward meeting the goal of having 1 million AFVs on the road using 1 billion gallons gasoline equivalent of alternative fuels annually by 2010. An additional goal was to have 75% of coalitions be self-sustaining in the same timeframe. The accomplishments of Clean Cities have been significant and Clean Cities AFV populations are on track to meet the annual growth required to achieve the 2010 goal.

Measuring a "self-sustaining coalition" is still a work in progress, but in 2002 coordinators evaluated their coalitions based on:

- Coalition survival without significant DOE financial support;
- Strong leadership; and
- Strong stakeholder commitments and successful AFV projects.

In 2001, 29% of coalitions claimed to be self-sustaining, with that number growing to 39% in 2002, and 41% in 2003. Although the measurement tool is imprecise, the increase in perception of self-sustainability is still a positive for the Clean Cities.

FIGURE 7. Self-Sustaining Coalitions



Source: Colition Annual Reports 2003.

Coalition Operations

A Clean Cities coalition is composed of stakeholders and a coordinator. Stakeholders are people from the public and private sectors who are dedicated to strengthening the alternative fuel market. Stakeholders typically come from the transportation, energy, and environmental sectors. The most effective coalitions maintain a balance of industry and government stakeholders who represent anything from state energy offices and fuel suppliers to public and private fleet managers. The coordinator serves as executive director of the coalition and ideally is a professional with access to community decision makers, which may include the mayor's office, city manager, metropolitan planning organization, department of environmental protection, or state energy office. The coordinator is the primary contact with the regional DOE leader, who is available to assist with identifying Clean Cities resources, outreach, project implementation, ongoing operations, Technical Assistance (Tiger Team) support, and funding sources.

A coalition must follow a rigorous application process before it is officially designated. Coalitions establish their own activities and operational procedures and do not receive guaranteed funding from DOE. However, they are accountable for implementing their plans, complying with reporting requirements, and renewing their memoranda of understanding with DOE each 5 years following the original designation.

FIGURE 8. Coalition Operations

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Range of Activities

Clean Cities coalitions successfully perform a wide range of tasks, including stakeholder recruitment, vehicle purchases, infrastructure development, and public information campaigns. Their work has resulted in significant petroleum displacement. The breadth of coalition activities is exemplified by those that received recognition in 2003 as winners of coordinator awards. Sacramento, California, and Baltimore, Maryland, were honored for their fundraising successes. Sacramento brought in $16.5 million for a variety of projects including transit, school bus, and infrastructure projects, and for building electric vehicle markets. Baltimore's $10.6 million was applied to incremental costs of compressed natural gas (CNG) transit buses and fueling sites.

These partnerships work because of stakeholders, and in 2003 Phoenix, Arizona, and the state of Massachusetts were honored for adding a combined 110 stakeholders. The organizations they attracted are diverse, and include America West Airlines, SuperShuttle, Massachusetts State Police, and Harvard University. Stakeholders and coordinators worked together in Houston, Texas, to realize great gains in the use of a variety of fuels. Their vehicle numbers included 439 liquefied natural gas (LNG), four biodiesel, 17 light-duty CNG, 18 propane (liquefied petroleum gas or LPG), 12 ethanol, and 77 hybrid vehicles.

In Salt Lake City, Utah, efforts focused on legislative initiatives. Successes included legislation to legalize neighborhood electric vehicles on low-speed streets and utilization of resources to monitor state initiatives. Salt Lake City's efforts also resulted in simplifying an AFV tax credit requirement and incorporating AFV road tax collection into vehicle registration fees instead of a separate tax certificate. A successful initiative passed in Missouri, too, that requires all state vehicles that run on diesel to use B20 (20% biodiesel) at all times.

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This sampling of recent activities is indicative of the types of changes that can result from leadership in Clean Cities coalitions.

2003 Award-Winning Coalitions

- Sacramento, California – brought in $16.5 million for transit, school bus, and infrastructure projects.
- Baltimore, Maryland – brought in $10.6 million for CNG transit buses and fueling sites.
- Phoenix, Arizona, and the state of Massachusetts – added a combined 110 stakeholders including America West Airlines, SuperShuttle, Massachusetts State Police, and Harvard University.
- Houston, Texas – realized gains in fleet AFV use including 439 LNG, four biodiesel, 17 light-duty CNG, 18 propane, 12 ethanol, and 77 hybrid vehicles.
- Salt Lake City, Utah – contributed to legislation and other efforts to legalize neighborhood electric vehicles on low-speed streets, simplify AFV tax credit requirements, and incorporate AFV road tax collection into vehicle registration.
- Missouri – helped pass an initiative that requires all state vehicles that run on diesel to use B20.

Coordinator Constraints

Clean Cities coordinators are key to the success of the activity. Without them and their efforts on behalf of the coalitions, there would be no Clean Cities. The activity can succeed only if coalitions receive targeted technical assistance, training, and technical information; and if the coalitions are able to leverage limited DOE funding with other funding sources. DOE funding to coalitions is performance-based and tied to Clean Cities goals. Perhaps the greatest funding disparity among coalitions is their access to DOT's Congestion Mitigation and Air Quality (CMAQ) Improvement Program funds, which are available to non-attainment areas only. In addition, the coordinators are most successful where they find suitable host agencies. Coalitions work for a variety of organizations ranging from city, state, and county governments to lung associations and transit agencies. Many coordinators also need to balance their time between Clean Cities and other programs for which they have responsibility. They also need to develop an effective network of stakeholders and other volunteers to complete their work.

The following are resource observations about coordinators:

Time: The time coordinators have to devote to their Clean Cities work is variable depending on their employers. Some coordinators have five hours per week, while a few have the luxury of devoting most of their time to Clean Cities.

Volunteers: Coordinators typically do not have staff and therefore rely on their stakeholders or other volunteers to help them complete their work.

Project Expansion: The federal budget for Clean Cities has remained flat for the past several years, holding at approximately $10–$11 million. The success of the new portfolio is dependent on federal partnerships that will bring new resources to the activity. Coalitions are not able to take on new projects without partner resources to cover their time.

National Clean Cities

The Clean Cities team is composed of staff at DOE headquarters and Regional Offices, staff at DOE National Labs (NREL, ORNL, Argonne National Laboratory), and a variety of private companies who round out the work of Clean Cities. This team provides a strong, integrated core that supports the activities in the coalitions. The team focuses on understanding market barriers through analysis and information gathering, building partnerships at the national level to leverage resources, and providing tools, resources, and assistance to allow coalitions to be successful.

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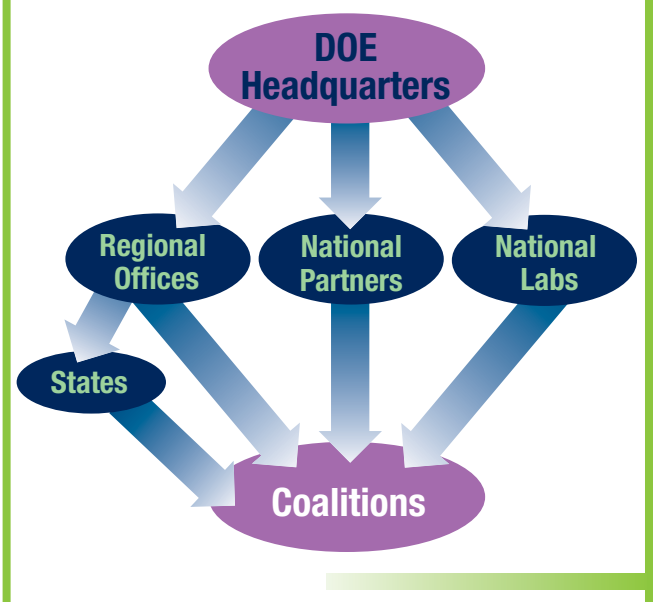
FIGURE 9. National Clean Cities Team



Clean Cities activities include:

Market and Technology Analysis: In partnership with industry, coalitions, and state and local governments, Clean Cities identifies market barriers, goals to overcome those barriers, and measurable impacts. This analysis is made available to partners to help inform their activities.

Tools and Information: Accurate and easy access to information is a top priority of stakeholders. Clean Cities collects data about vehicles and fuels. Fueling infrastructure locations are updated regularly. State policies and incentives are tracked. Fleet managers who represent various niche markets are provided with tool kits that contain practical information about alternative fuels and vehicles. Success stories representing a range of geographical locations, niches, and fuel type are updated regularly. Access to this information is available through the Web (the Alternative Fuels Data Center and the Clean Cities Web sites) and the National Alternative Fuels Hotline.

Technical Assistance (Tiger Teams): The Technical Assistance Project facilitates deployment of AFVs into the market using the Clean Cities network to help with implementation issues or problems. The first objective of the Tiger Teams is to resolve problems by dispatching teams of technical experts who can solve operational problems encountered by stakeholders. The second objective is to identify medium- and heavy-duty vehicle platforms that can be modified to incorporate alternative fuel engines and complete the modifications as required. Tiger Teams also provide assistance with other technical and analytic issues that are barriers to national/regional/local project development and implementation.

Funding: Clean Cities grant programs provide project cost sharing and coalition support through partnerships with states. Grants are awarded to projects that are consistent with Clean Cities goals and that have measurable results.

Partnerships and Alliances: Clean Cities serves as a catalytic force in initiating and developing partnerships with state and local governments, other agencies, vehicle manufacturers, fuel providers, transportation associations and groups, and other non-government organizations. The activity brings these

groups together regularly to provide a "think tank" on how to best advance our common goals.

Training and Events: Throughout the year meetings are held to provide technical information, coordinator training on operating and running a nonprofit organization, business opportunities, and showcasing vehicle and technology availability to prospective customers. The meetings take the form of Advancing The Alternative Fuel Choice events, coordinator training, special workshops, national conferences, and regional meetings.

International: Modeled after National Clean Cities, Clean Cities International is successfully using its experience in North America to help develop markets abroad for U.S. suppliers. Understanding that economic security is a global interest, Clean Cities International works with governments, organizations, and individuals to help them establish foundations for viable alternative fuel markets.

Strengths

Clean Cities deployment activities to reduce U.S. petroleum use have no equal on a national level. Clean Cities can demonstrate petroleum reduction successes today. Clean Cities success is directly attributable to national, regional, state, and local partnerships between government and business. The 10-year investment in Clean Cities has resulted in a national cadre of thousands of dedicated people who carry the message of the activity. The asset of this national network has made Clean Cities the catalyst for bringing together national and international entities that understand the value of locally-based deployment activities.

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Clean Cities has strong credibility. Because it is voluntary, its success is tied to the commitment of the coordinators and stakeholders. That, combined with the orientation to technological neutrality, garners a trust among potential stakeholders, because there is not bias toward a particular product or fuel. The community-based nature of the activity allows for a variety of perspectives from the public and private sectors. Coalition credibility is further enhanced because their knowledge of technologies and applications is unique to the industry.

In addition, Clean Cities has developed considerable experience in accelerating the use of advanced transportation technologies and overcoming technical, market, information, and policy barriers. This experience will be of great value as the activity expands its scope. The lessons learned throughout the 10-year history of Clean Cities are invaluable. The experience has been used to continuously improve the activity, and will be instrumental in the development of hydrogen infrastructure and the deployment of fuel cell vehicles.

Challenges

Ten years of experience have resulted in an understanding of key factors that influence voluntary purchases and a willingness to change behavior. Decision makers will not participate if it's inconvenient or perceived to be risky. Primary examples of what they view as inconvenient or exposing them to risk include inadequate fueling infrastructure, maintenance or safety issues, range issues, inconsistent product development or availability, and the full range of uncertainties associated with the AFV market. They also won't participate if it's not cost effective. The industry depends upon government legislation and incentives to invest in new, more costly technologies. Additionally, purchasing decisions are often made on life-cycle costs, including resale value.

The economics of alternative fuels have proven challenging for numerous reasons. Size and scale matter, and diversity in the alternative fuels market is at odds with the benefits of scale. The incremental benefits of alternative fuels are small, requiring significant efforts to get consumer buy-in on the social benefits. To realize immediate term gains in petroleum displacement, significant investments in alternative fuel (including hydrogen-compatible) infrastructure are needed now to ensure that alternative fuel solutions are available today and hydrogen-ready infrastructure is in place for the future.

Finally, although the greatest successes for introducing alternative fuels have been in niche market fleets, there have been numerous barriers that resulted in a lack of widespread acceptance, not the least of which is the relatively low cost of petroleum products in the United States. Additionally, EPAct has posed many challenges, including its:

- lack of alternative fuel use requirements for most covered fleets, and
- exclusive focus on light-duty vehicles.

Auto manufacturers and fuel providers are hesitant to make investments until they are sure there are markets. Product availability is an uncertainty and without product, infrastructure growth has been slow. All these challenges have resulted in an inability to make the economies of scale attractive enough to bring the costs down.

Summary

Over time, Clean Cities focus has shifted from growth in the number of coalitions to the development of tools to ensure coordinators have the resources they need to be successful. Today there are more than 80 Clean Cities coalitions, representing 4,800 stakeholders, reaching from Hawaii to Maine. At the conclusion of 2003, there were 172,000 AFVs in participating Clean Cities; 6,350 alternative fuel refueling sites throughout the United States, and 181 million gallons of petroleum a year have been displaced. Annual emission reductions include criteria pollutants at 24,000 metric tons, carbon emissions at 127,000 metric tons, and GHGs at 439,000 tons of carbon equivalents.

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Clean Cities at a Glance

- 80+ Coalitions
- 4,800 Stakeholders
- 172,000 AFVs
- 6,350 AFV Refueling Sites
- 181 million gallons/year of petroleum displaced
- 24,000 metric tons/year of criteria pollutants avoided
- 127,000 metric tons/year of carbon emissions avoided
- 439,000 tons/years of carbon equivalent GHGs avoided

Clean Cities

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Portfolio Plan

Clean Cities targeted 2003 as the year to begin a process designed to assess alternative fuels and the broader transportation market and to determine the most effective ways to have greater impacts on petroleum displacement. A team from DOE, NREL, and other national laboratories and institutions analyzed coalition trends, recent fuel displacement numbers, transportation and alternative fuels market trends, and funding sources before starting the work of developing a new model for the Clean Cities.

Hundreds of people from government and industry were involved along the way, assisting with analysis and making recommendations. The new, reinvented Clean Cities concept was formally presented to a Clean Cities Industry Steering Committee and the DOE Regional Office staff and then to David Garman, DOE's Assistant Secretary of EERE. With encouragement from those parties, a Roadmap meeting was convened in November 2003 with key stakeholders to develop strategies for the expanded portfolio.

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More than 70 representatives from industry, Clean Cities coalitions, state and federal government agencies, national laboratories, universities, non-government organizations, DOT, EPA, and DOE participated in this meeting. The working groups identified primary market opportunities, market penetration barriers, actions that Clean Cities could pursue to overcome these barriers, and the roles of stakeholders in working with Clean Cities on these actions. A synthesis of all these recommendations is the core of the Clean Cities Portfolio Plan. The recommendations from the Roadmap meeting have been refined through further analysis and consultations with key stakeholders.

Below we review the current status, market activity, challenges and barriers, and near-term Clean Cities plans for each of the technologies in the expanded portfolio.

Alternative Fuels

EPAct has been a major catalyst for the development of the alternative fuels industry. Under EPAct, federal, state, and alternative fuel provider fleets are required to purchase AFVs as part of their annual acquisitions. EPAct set up information programs that formed the basis of Clean Cities and stimulated significant growth in the sale of AFVs and alternative fuels.

In the 2004 model year, there are more than 30 models of OEM AFVs available from light-duty vehicle manufacturers. In 2003, according to EIA, AFVs accounted for 0.2% of all light-duty vehicle sales, most of which are sold to fleets. (Note that this estimate does not include most of the non-fleet FFVs sold to private consumers, the greatest proportion of which does not use ethanol.) This is primarily because EPAct regulates state and alternative fuel provider fleets to purchase a certain percentage of light-duty AFVs each year with their annual vehicle acquisitions. Executive Order 13149 requires petroleum use reduction for

Near-Term Plans to Encourage Use of Alternative Fuels

- Expand relationships with fleets and provide enhanced information on life-cycle benefits of AFVs.
- Target niche fleets with emphasis on heavy-duty markets, airport applications, school buses, and locally significant markets.
- Assist with development of infrastructure, and train on ways to transition to hydrogen fueling.
- Longer term: Build relationships that will aid in developing local and state policies that advance the use of alternative fuels.

federal fleets. In addition, some fleets, not covered by EPAct, purchase AFVs to comply with local regulations or voluntarily for local air quality and leadership reasons.

Similarly, regulations and non-regulatory incentives factor into AFV use among heavy-duty fleet operators. California has aggressive fleet regulations that require the use of natural gas engines and vehicles in certain areas with serious air quality problems.

Light-duty AFVs that are capable of running on ethanol, natural gas, and LPG are available. In the heavy-duty sector, the predominant alternative fuel is natural gas, but propane engines are also available. AFVs are generally comparable in performance to their conventionally fueled counterparts, and they may have significant environmental benefits (emission reductions); however, the levels of technology and modification involved in accomplishing this task vary by fuel type. These modifications to accommodate alternate fuels (with the exception of FFVs) generally cause the price of AFVs to be higher than those of conventional vehicles.

Ethanol flexible-fuel vehicles (FFVs), used exclusively in light-duty applications, are capable of operating on any blend of fuel from pure gasoline to E85. Modifications to accomplish this are relatively small, and incremental costs range from very little to none. According to EIA, there are more than four million E85 FFVs on American roads and the number is growing (by about one million annually). There are fewer than 200 ethanol fueling stations nationwide, meaning most FFVs are running on gasoline. However, Clean Cities and industry are working together to expand the E-85 infrastructure each year.

Vehicles fueled with gaseous fuels require significant modifications. Not only are changes necessary to use a gaseous fuel in the engine's combustion chamber, but onboard fuel storage also requires significant modification. Gaseous fuel tanks are pressurized, with tanks generally being cylindrical, not the form-fitting engineered shapes usually used by liquid-fueled vehicles that take advan-tage of appropriate available space on the vehicle to store fuel. Because of these modifications, incremental costs can reach $6,500 or more for some light-duty CNG vehicles. Heavy-duty natural gas engines can cost roughly 30% more than a similar conventional engine. There are currently several heavy-duty engine manufacturers that sell heavy-duty natural gas and propane engines.

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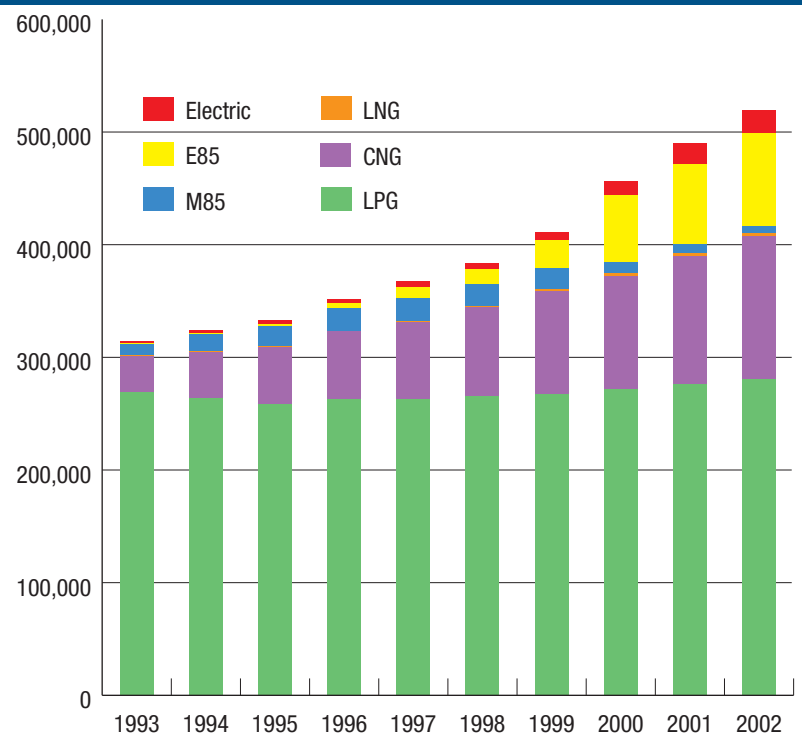
As defined in EPAct, alternative fuels include, among others, hydrogen, ethanol, natural gas, biodiesel, and propane. Because of the broad array of alternative fuels, the first step for fleets is to identify which fuel or fuels make the most sense for their applications. For economic and other local reasons, one fuel may make more sense in certain geographic areas than another. For example, because of its abundance in Texas, propane or natural

FIGURE 10. AFVs in the U.S. 1993–2002



Source: Energy Information Administration, *Alternatives to Traditional Transportation Fuels 2000* online, www.eia.doe.gov/cneaf/alternate/page/datatables/table1.html. Accessed March 2004.

gas may be a good selection, whereas fuels produced from farm crops, such as biodiesel or ethanol, may make more sense in the Midwest. Selection of the best fuel or fuels is not an easy task, because it means comparing fuel price, incremental vehicle costs (which vary by fuel type), vehicle and fuel availability, and fuel properties.

Consistent availability and supply of alternative fuels is a challenge because alternative fuels are not transported and distributed through conventional channels. There is currently no pipeline for liquid fuels such as ethanol and biodiesel. They are currently transported via truck or rail car. For fuels that have an extensive network, such as natural gas, specialized equipment is necessary at vehicle fueling sites to pressurize the gas for use in vehicles (natural gas used in vehicles is pressurized to 3,600 psi).

Fueling stations can vary significantly in cost, from $10,000 to $50,000 for an E85 station, to several hundred thousand dollars for a large CNG station. There is as yet no good cost estimate for hydrogen fueling stations. Largely because of production and transportation issues (a result of supply and demand), alternative fuels generally cost more (on an equivalent energy basis) than conventional fuels. A gallon of pure biodiesel can cost roughly $1 more than conventional diesel. Until recently, natural gas has had a price advantage over conventional fuel. However, recent supply issues have greatly increased natural gas prices, and forecasts do not show those prices going back down soon. And the market fluctuations of imported oil may increase the attractiveness of domestic fuels that may be currently more expensive than their petroleum counterparts.

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Analysis of Current Market Activity

Maintaining a market large enough to sustain large OEM participation in the AFV industry is critical. In general, OEM representatives target sales of an individual vehicle model of around 10,000 per year for the AFV sector of their businesses to be sustainable. Except for FFVs, these targets are not being met. The purchase of AFVs is also important to developing a market for alternative fuels and driving an increase in fueling stations and fuel availability.

Most current federal government activities to broadly promote alternative fuels and AFVs are managed by DOE. These activities include EPAct implementation, such as the State & Alternative Fuel Provider and Federal Fleet regulations and Clean Cities. These initiatives have both a regulatory component, through the EPAct fleet regulations, and a voluntary/educational component through Clean Cities. These initiatives, as is true with most major programs promoting alternative fuels, focus on on-road vehicles and engines, both light- and heavy-duty. In alternative fuels R&D, DOE is working with industry and other agencies on Fischer-Tropsch diesel fuels that can be made from natural gas, coal, or renewable sources.

DOT encourages the use of alternative fuel transit busses as part of the Federal Transit Administration (FTA) and the Federal Highway Administration's (FHWA) CMAQ Program. Under these programs, transit agencies are eligible to receive significant funding for the purchase of alternative fuel transit buses. In addition, under the National Highway Transportation Safety Administration's program to establish Corporate Average Fuel Economy (CAFE) standards, light-duty OEMs must meet a minimum standard for average fuel economy of all their vehicles sold each year. Incentives are given for AFVs under this program.

Although not focused on petroleum displacement, but rather air quality, the EPA supports activities to promote fuels that provide benefits for reducing local air pollution. In addition EPA may support efforts in mass transit through State Implementation Plans.

Some state and local governments have programs to promote alternative fuels. These have generally been developed to support local clean air initiatives, and are often catalysts for local Clean Cities coalitions. Examples

include significant incentives in New York and Texas, where a combination of regulation and funding is used to promote the use of alternative fuels and AFVs.

Technology Challenges and Barriers

Even with mandates, vehicle purchase and other incentives, the introduction of alternative fuels and vehicles into the marketplace has not come close to meeting EPAct expectations. Some of the major challenges and barriers include:

Lack of economic case for switching to and using alternative fuels: Alternative fuels and AFVs generally have an incremental cost over the cost of conventional fuels and vehicles. Ethanol flex-fuel vehicles have little or no additional cost, but have been plagued by lack of owner information on vehicle fuel capability, and, most importantly…

Infrastructure availability: Although the 6,350 alternative fuel refueling stations nationwide seems like a large number, it is small in comparison to the 170,000 gasoline stations across the country. Building additional infrastructure is costly, and some minimum level of infrastructure must be in place to claim fuel availability and viability for public acceptance–perhaps 10% of the existing infrastructure (in our example, 170,000 for gasoline) might be a sustainable starting point for a new fuel, or 17,000 stations to effect a national impact. In addition, fuel distribution is a challenge, because it does not use conventional distribution channels.

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Vehicle availability: The wide array of vehicles available in conventional fuels is not currently available in AFVs, where only around 30-35 specific fuel/vehicle model combinations are available. OEMs have a difficult time selling enough AFVs of any one model, so they are reluctant to add more choices because they believe it will detract from established, profitable markets instead of building new markets.

Near-Term Clean Cities Plans

The primary emphasis with regard to coalition efforts includes the following:

- Continue to expand relationships with fleets and provide them with enhanced information on the life cycle benefits for AFVs.
- These activities will identify target niche fleets, with emphasis on heavy-duty markets, airport applications, school buses and other locally significant niche markets such as transit, municipalities, shuttles and taxis, etc.
- Infrastructure development remains a priority and will ultimately include training on ways to transition to hydrogen fueling.
- Longer-term efforts will focus on local and state policy making and nurturing the relationships that will aid in developing policies to advance the use of alternative fuels.

National activities will support local coalition efforts and will include some of the following:

- Develop multi-year plan for work on airports, school buses, and other target fleets in collaboration with DOT/FAA, DOT/FHWA and EPA.
- Continue to maintain resources such as the AFDC, Clean Cites Web site and associated hotline, etc.
- Continue to support infrastructure projects through grants and other leveraged funding.
- Develop information on life cycle costs and benefits AFVs and associated fuels.
- Further develop FreedomCAR, Fuel Cell and Hydrogen program partnerships.
- Continue work to enhance AFV resale market.

Blends

Blending relatively low levels of alternative fuels with conventional fuels is an important option for reducing petroleum use. Examples include 10% ethanol/90% gasoline blends (E10 or gasohol), and 2% biodiesel/98% diesel blends (B2). B20 is also a blend increasing in popularity within the diesel user community. For purposes of Clean Cities, B20 use will be considered under the alternative fuel portfolio element because of the EPAct credits that can be obtained for every 450 gallons of biodiesel used in B20. However, because it is viewed by most as a blend, it will also be given consideration in this discussion. Hydrogen/natural gas blends are being evaluated, but are experimental at this time. Work has been initiated on these blends, and initial results indicate a significant reduction in NO_X emissions from even low-level blends.

Near-Term Plans to Advance Fuel Blends

- Provide information to prospective users on procurement specifications including details on feedstock type, minimum performance standards, and environmental impacts.
- Train coordinators on which blends make sense locally or regionally.
- Work with state and local governments to expand incentives, mandates, and other programs to encourage use of fuel blends.
- Longer term: Form partnerships to establish fuel standards for blends.

EIA estimates that more than 1.1 billion gallons of ethanol were sold in low-level blends in the United States in 2002. Currently, 11 states have some type of policy or regulation related to low-level ethanol blends (5%–10%) at the gasoline pump. In these cases, ethanol is used as a fuel oxygenate to improve air quality. Many states have regulations that require the use of alternative fuel blends. For example, Iowa requires E10 blends at every unleaded gasoline pump and B20 in its state-owned diesel vehicles. Practices like this are common in Midwestern states, where local farmers often grow the feedstock for the fuel, so there is a local economic benefit to the use of renewable fuel blends.

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According to EIA, approximately 26 million gasoline gallon equivalents (GGEs) of biodiesel were used in 2003, primarily in blends. Because B20 qualifies for EPAct credit, covered fleets increasingly use it to comply with EPAct regulations. Farmers frequently use low-level biodiesel blends (2% to 5%) for off- and on-road equipment to demonstrate support for local crops and economies. Some states are exploring the possibility of a new policy or regulation for low-level biodiesel blends at the pump.

A few restricted-access hydrogen stations are in place. At some of these stations, hydrogen is produced by reforming natural gas at the fueling site. Therefore, it is relatively simple to configure the pump to dispense a hydrogen/CNG blend. Although this is purely experimental at this time, relatively small vehicle modifications appear to be necessary to use as much as 20% hydrogen in CNG vehicles, and emission benefits are dramatic: as high as 50% reduction in NO_X emissions.

There are many advantages to blending alternative fuels. Not only are the changes to infrastructure and vehicles minimal, blends can sometimes enhance fuel properties. However, there are still technical challenges for blends. For example, blended at B20 or lower, biodiesel is relatively robust, but above 20% blends, biodiesel may pose cold weather and stability challenges. There has been recent speculation of environmental benefits of low-level ethanol blends, and although current data are unclear, there is concern that blends like E10 and low-level biodiesel blends could increase NO_X emissions when used in gasoline/diesel vehicles. Also, although heavy-duty diesel engines are increasingly using B20, individual diesel engine manufacturers generally won't give a blanket approval for the use of biodiesel blends higher than 5%. However, individual fleets have been increasingly able to negotiate warranty terms (case by case) with their engine suppliers to use blends as high as B20. Fuels research and in-use data could help settle warranty concerns of engine manufacturers.

Analysis of Current Market Activity

A large segment of the blend market–low-level ethanol blends–has been developed through EPA's Fuel Oxygenate Rules, which require oxygenates in gasoline to help reduce local air pollution. This accounts for the significant use of ethanol each year. The Renewable Fuels Standard, which has not passed as of this writing, may make an even bigger impact in ethanol use, by as much as 3 to 5 billion gallons per year.

Currently more than 125 biodiesel stations offer B20 blends, and hundreds of biodiesel distributors nationwide sell a wide range of biodiesel blends from B2 to B100. In 2001, 11 states had some type of ethanol use requirements.

Although it is not directly focused on deployment of alternative fuel blends, DOE's Bioenergy Program does significant research on the production of alternative fuels used in blends and the properties of blends and blending. It also supports activities of the ethanol and biodiesel industries related to standards development. An ASTM specification has recently been approved for B100.

Although the Department of Defense (DOD) does not directly engage in specific programs to promote alternative fuel blends outside its own organization, internally DOD is an important user of alternative fuels. In the 2003–2004 DOD contracting period, DOD contracted for 5.2 million gallons of pure biodiesel, which was used in blends. Clearly there is a strong interest in alternative fuels and energy security within DOD, and widespread use by such a large organization goes a long way toward establishing and sustaining a market for AFVs and alternative fuels.

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Technology Challenges and Barriers

As the price of oil continues to rise and the turmoil in the Middle East abounds, the use of blends may become even more attractive, not only as a savings on oil imports, but as a reduction in oil product prices. If the Renewable Fuels Standard becomes enacted, then a mandated stimulus would drive the market. Some of the current challenges and barriers are:

Higher incremental fuel price: Currently, fuel blends typically cost more than conventional fuels, largely because of distribution issues and smaller volume consumption relative to gasoline/diesel. However, if the price of oil continues to rise, there will be a crossover point where blends could reduce the price of the petroleum product.

Fuel distribution and infrastructure: Because some fuel blends are not widely used at this time, their distribution and blending are not done in the same manner as conventional fuels. The fuel cannot be transported by pipeline, so it is delivered by tanker truck or rail car. In many cases fleets or distributors must do the blending on site in small batches. These factors contribute to increased cost and increased time and coordination for the use of fuel blends.

OEM warranty concerns: Many heavy-duty manufacturers will not honor diesel engine warranties when using biodiesel blends higher than B5 for system or component failures that can be traced to the use of biodiesel. Fuel warranty issues are not a problem for light-duty gasoline vehicles, as all manufacturers have approved blends of up to 10% ethanol for use in their vehicles.

Near-Term Clean Cities Plans

Initial work on fuel blends will focus on:

- Research and information dissemination to prospective users. Information needs include procurement specifications that provide details on feedstock type, minimum performance standards, and environmental impacts.
- Coordinators will receive training and information on which blends make sense locally or regionally.
- Efforts will also be directed to working with state and local governments to explore opportunities to expand incentives and mandates and other programs for increasing the use of blended fuels.
- Longer term goals include forming partnerships for establishing fuel standards for blends.

More specifically, Clean Cities coalition activities may include:

- Review of market, policies, and feedstock availability and identification of opportunities for work on policies and local fuel production, with a target of having a plan for policy and/or production work by the end of FY05 or determination that no opportunities exist.
- Develop and initiate plans for outreach to heavy-duty fleets.
- Hold Advancing the Choice Events on blends in each region.

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In support of the fuel blend initiative, national/regional activities may include:

- Development of information on model policies and incentives.
- Creation of improved partnership with Bioenergy Program, including disseminating and filling gaps in regional assessments of feedstock availability and opportunities for enhanced production.
- Creation of fact sheets on blends' performance and impacts.
- Development of model procurement specifications.
- Conduct of coalition training on blends.
- Development of plans for promoting blend use for off-road and heavy-duty vehicles.

Fuel Economy

The value that fleets and the general public place on fuel economy and efficiency of fleet operations influences vehicle purchase decisions, maintenance decisions, VMT, and driver behavior. In promoting fuel economy, Clean Cities envisions an emphasis on fleets.

Aggressive measures to motivate fleets to achieve higher fuel economy are not yet well developed. Executive Order 13149 mandates increases in fuel economy and reductions in petroleum fuel consumption for federal fleets by 2005. Proposals have been made at the federal and state levels to allow fuel-efficient, advanced technology vehicles to fulfill AFV purchasing requirements. Some cities (Denver, Los Angeles, Portland, and several smaller communities) have procurement policies that require the purchase of fuel-efficient vehicles. Very few states

Near-Term Plans to Promote Fuel Economy

- Educate fleets about cost-saving benefits of fuel-efficient vehicles.
- Work with FHWA's "It All Adds Up to Cleaner Air" campaign and other groups to educate the public about the benefits of fuel-efficient vehicles and making changes in driving behavior.
- Longer term: Explore voluntary rating or labeling campaigns.

have plans in place to promote fuel economy. However, there are some examples of changing attitudes such as the State of Oregon's recent decision to phase out the use of sport utility vehicles (SUVs) because of cost. A national grassroots effort by the Interfaith Climate and Energy Campaign to push for fuel economy might be indicative of increased public awareness.

Vehicle fleets play a significant role in Clean Cities strategies for influencing petroleum displacement because they are managed in groups and positive results are easier to achieve than through influencing the purchasing habits of individual consumers. Fuel economy does not require any special attributes like central fueling, which is why if fleets become early adopters of fuel efficiency, the transferability into the retail market will be easier than it has been for AFVs. Fuel economy is important in assessing the environmental performance of the vehicle. Many conventional improvements to current vehicle technologies can be packaged to raise a vehicle's fuel economy without significantly affecting the purchase price. As fleets are always interested in the bottom line, demonstrated cost savings through fuel economy may be a major factor in influencing their purchase decisions.

Government fleets, because of mandates or the need to purchase vehicles with good environmental performance, are easier to reach than commercial fleets. Clean Cities can make inroads into those fleets, as there are almost no coordinated efforts among them to promote fuel economy. In the private sector, factors that affect purchasing behavior must consider the corporate values and include purchase and operating costs, resale value, OEM loyalty, and any applicable laws or company policies. Clean Cities has the potential to not only raise awareness of fuel efficiency among its fleets, but targeting commercial fleets in this area can open up new markets for all the portfolio elements.

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In addition to promoting fuel economy in fleets, there are also opportunities to better inform consumers of the benefits of purchasing fuel efficient vehicles and of operating vehicles in a manner that will improve fuel economy. Clean Cities may explore opportunities to team with others to help educate consumers about the benefits of vehicle fuel economy.

Analysis of Current Market Activity

In support of DOT's CAFE program, the Federal Trade Commission oversees perhaps the most prominent fuel economy program with its fuel economy label. The sticker, which is required on all new vehicles, describes the vehicle's fuel economy and anticipated annual fuel use based on average mileage per year. These stickers are good sources of consumer information because they have a consistent format (regardless of make and model) and are prominently posted on the side window of all new vehicles at dealerships.

There are various other federal activities in the area of fuel efficiency. Currently, EPA and Clean Cities publish the Fuel Economy Guide and distribute it to 28,000 dealerships nationwide; nearly 2 million people accessed it online last year. EPA and Clean Cities also maintain a Web site, www.fueleconomy.gov, which provides gas mileage, emissions, pollution, and safety information on new and used cars and trucks. In addition, EPA produces the Green Vehicle Guide, which is available on the EPA Web site. This guide compares vehicle emissions and fuel economy within vehicle classes.

A joint program of the DOT/FHWA and EPA, "It All Adds Up to Cleaner Air," conducts a variety of educational activities designed to encourage regional and local efforts to reduce traffic congestion and air pollution. The program helps consumers make educated decisions about care and maintenance of their vehicles and tells them how this translates into fuel economy and air quality benefits. It includes public outreach in selected cities through posters, printed materials, and television ads (in partnership with the Ad Council).

Fuel economy issues are important to several non-governmental organizations. The American Council for an Energy Efficient Economy publishes The Green Guide to Cars and Trucks, which ranks vehicles on how "green" they are, regardless of vehicle class.

Technology Challenges and Barriers

Activities that will most influence increased fuel economy and vehicle operation efficiency will likely center on vehicle performance, price, and model availability. While hybrid vehicles are treated separately in this Roadmap, their market penetration success will be based on fuel economy, escalating cost of conventional fuels, and vehicle purchase costs and incentives. The increasing emphasis on fuel economy and efficient vehicle performance could become a compelling factor in fleet and consumer acceptance of the importance of fuel economy. Current challenges and barriers include:

Purchasers place little value on fuel economy: There is little understanding of the connection between fuel economy, air quality, cost-savings, and energy security. So even among consumers who claim to be concerned about these issues, vehicle choice is rarely based upon them.

There are misperceptions about fuel-efficient vehicles: There is a sense that improved fuel economy translates into a sacrifice in performance, safety, and/or utility because it means purchasing a compact car. In reality, it means flexibility to match the right vehicle for the intended use. As with any purchase, there are trade-offs, such as price and style. Consumers need more information and assistance in making these choices.

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Regulations and policies have not kept pace with advancing technologies: OEMs have few incentives to produce and market more fuel-efficient vehicles.

Near-Term Clean Cities Plans

Clean Cities will begin work on fuel economy by

- Reaching out to established and new fleet segments to educate them about cost savings in fuel-efficient vehicles.
- Additionally, Clean Cities hopes to work with FHWA's "It All Adds Up to Cleaner Air" campaign and other groups to educate the public about the benefits of fuel-efficient vehicles and technologies and about changes in driving behavior that will improve fuel economy.
- Longer term considerations are to explore voluntary rating or labeling campaigns.

More specific Clean Cities Coalition activities might include:

- Development of fleet outreach plan and initiate outreach to fleets by end of FY05.
- Identification of opportunities for consumer outreach and education in partnership with others and identify whether outreach activities that consider fuel economy should be pursued by end of FY05.

Activities that might occur at the national level:

- Development of outreach and education materials.
- Creation of partnerships with DOT and EPA on "It All Adds Up To Cleaner Air" campaign and other national outreach activities.
- Creation of a Motor Week segment of fuel economy with distribution to coalitions for local use.
- Promotion and expansion of the DOE/EPA-produced Fuel Economy Guide and the associated Web site.

- Exploration of potential labeling and rating activities for vehicles relative to fuel economy, such as Energy Star.
- Sharing of information on new products from Hydrogen and Fuel Cells Program and related R&D efforts.

Hybrids

Hybrid vehicle technology is emerging with the potential to significantly penetrate the light-duty market. Heavy-duty hybrids are gaining momentum as well, particularly in the transit bus sector. Hybrids operate on gasoline, diesel, or alternative fuels and use electric motors and batteries in conjunction with smaller conventional internal combustion engines to extend the range or improve the power, and improve operational efficiency. Hybrids offer good fuel economy, low emissions, an ability to use the current fueling infrastructure, and eligibility for near-term tax incentives, while providing comparable performance to conventional vehicles.

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EPAct programs do not currently recognize available light-duty hybrid vehicles as AFVs since they do not meet the criteria in the definitions. Congress is, however, considering partial credit for hybrids as part of the comprehensive energy legislation because they may significantly reduce petroleum consumption. Clean Cities already provides basic information about hybrid vehicles and available models and allows coali-tions to include hybrids in their annual reports of coalition vehicle acquisitions. There are additional opportunities for Clean Cities to help support informed purchases of these vehicles through coalition activities.

Near-Term Plans to Increase Use of Hybrids

- Test and demonstrate effective approaches for increasing purchases of hybrids by fleets.
- Educate consumers about the benefits of hybrid technologies.
- Determine where and how Clean Cities can have the biggest impact.
- Document life cycle cost and benefits of hybrids, funding sources, federal and state incentives, and case studies.
- Longer term: Develop demonstration projects for medium and heavy-duty hybrids.
- Assess Clean Cities' potential role to strengthen resale and develop new markets through leasing and rental cars.

Three gasoline hybrid passenger cars are available to consumers at this writing. Additionally, Toyota has announced that all its vehicles will include a hybrid offering by 2010. Ford, General Motors, DaimlerChrysler, and Nissan plan to offer gasoline hybrids in the near future. Heavy-duty manufacturers of hybrid systems currently include BAE SYSTEMS, Allison Transmission, Oshkosh Trucks, and Eaton.

There are several types of hybrid systems. The amount of hybridization can vary widely, and thus the efficiency improvement over the base vehicle can be 6%–8% (for a "mild" hybrid, which primarily focuses on idle shutoff) to 50% or more. Initially gasoline hybrid vehicles had slightly lower horsepower than their conventionally fueled counterparts, but are roughly comparable in performance. However, new models expected out soon claim no compromise in performance, and may even enhance performance.

In the heavy-duty sector, many operators enjoy driving the hybrid vehicles because they offer high torque at low speeds, improving initial acceleration performance. Both parallel and series hybrids are available in the heavy-duty sector. Series hybrids are typically designed more like electric vehicles, and thus do not have a mechanical connection between the engine and the drive wheels. Instead, the engine is used as a generator set, developing electricity for use by the electric motor or to recharge the batteries. This allows the engine to be operated in a

much smaller range of speeds (usually optimized for a single point of operation), resulting in significantly higher efficiencies and much lower emissions. Heavy-duty parallel hybrids operate in much the same manner as light-duty parallel hybrids.

In the medium-duty and heavy-duty sectors, hydraulic hybrid technology is also being researched. Hydraulic hybrids operate similar to parallel electric hybrids, except that instead of an electric motor and batteries, the energy transfers are handled by a hydraulic pump and pressurized hydraulic tanks. Several companies in the United States and abroad are researching this technology, and a variety of niche applications (including applications for DOD) have been identified.

Incremental costs for currently available light-duty hybrids are $3,500–$4,000 per vehicle, but can often be substantially offset by federal and state tax incentives. Economies of scale are expected to cause these prices to drop as the technology matures and vehicles are produced in large enough numbers to justify full assembly line production. Maintenance costs will also decrease as technicians become more familiar with the technology and replacement parts become more widely available.

Hybrid transit buses have a wide range of incremental costs–anywhere from $110,000 to $160,000 for a 40-ft bus, above the conventional 40-ft transit bus price of around $280,000 to $290,000; other heavy-duty hybrid vehicles are expected to reflect similar incremental costs. On-going research, development, and demonstration in hybrid transit buses will hopefully yield fuel economy and maintenance results that will lead to a positive business case for transit fleets.

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Analysis of Current Market Activity

To date, approximately 150,000 light-duty gasoline hybrids have been sold worldwide. Honda's Insight and Civic Hybrid are together achieving cumulative sales of approximately 20,000 units annually, about the same as the Toyota Prius. Toyota's 2004 Prius had record advance orders before its October debut, which prompted Toyota to increase its sales targets to 35,000 units per year. The technology research firm ABI expects that hybrid sales could grow to almost 500,000 by 2007.

The market is also growing in popularity among heavy-duty hybrids. There have been numerous demonstrations on transit applications, and several fleets have large orders for new hybrid transit buses. Research and demonstration projects are underway in delivery and long-haul trucks.

From a deployment standpoint, tax incentives are the most important market influence for hybrids. The federal government and some state governments offer tax deductions or credits for purchasing gasoline hybrid vehicles. These incentives are designed to sunset after a period of time in which hybrid technology and the hybrid marketplace are expected to mature. However, today, tax incentives represent a large driving force in the consumer acceptance of light-duty hybrids. In some areas, HOV lane access use by hybrids has also been an important factor in influencing purchasing decisions.

DOE is leading advancements for hybrid technologies through two specialized initiatives. The FreedomCAR Partnership is a collaborative technical relationship between DOE and the U.S. Council of Automotive Research (representing the major U.S. automakers) to conduct advanced fundamental research on a variety of automotive areas, with an emphasis on development of technologies for hydrogen fuel cell and hybrid-electric vehicles. The 21st Century Truck Partnership is a research partnership among several federal agencies (DOE, DOD, DOT, and

EPA) and major truck, engine, and hybrid system manufacturers to coordinate advanced research in many arenas with a goal to develop safer, more efficient, and cleaner trucks and buses. Development of advanced hybrid technology is a key focus area for this Partnership. Both these initiatives are working to advance technology and address market barriers for hybrid vehicles.

DOT encourages the use of hybrid transit buses as part of the FTA and FHWA CMAQ Program. Under these programs, transit agencies are eligible to receive significant funding for the purchase of hybrid transit buses.

The hybrid technology is a key component in the technology path to the fuel cell vehicle, as it is believed that fuel cell vehicles will probably utilize hybrid technology to be future viable market contenders.

Technology Challenges and Barriers

While there are many challenges and barriers to over come with hybrid vehicles, it is interesting to note that the early adopters of hybrid vehicles have not been deterred from the limited vehicle choice and cost in the hybrid market. The market is growing rapidly and new choices loom on the horizon to spur the market further. Lack of the infrastructure barrier and cost incentive reductions have been key to market development to date. However, there are still some challenges and barriers to consider as the hybrid market develops:

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Lack of vehicle model availability: There are currently only three light-duty hybrids on the market–all of which are passenger cars. OEMs are reluctant to increase the supply or variety of light-duty hybrids until they are sure of the demand. This has limited fleets' ability to purchase hybrids. On the near horizon are hybrid trucks and SUVs, but they will still be relatively limited, with one or two vehicles available in only a few vehicle classes, and they are not expected to offer the same fuel economy benefits. Heavy-duty hybrids are currently available on a limited basis for transit buses. Other heavy-duty applications are under development.

Lack of information on available incentives: Although incentives are available, consumers are not always aware they exist and they can be difficult to understand and not well publicized.

` **Battery pack replacement costs:** Current battery packs for hybrid vehicles have an expected useful life of 7 or 8 years for light-duty and 5-6 years for heavy-duty, making replacement potentially necessary for many drivers. Compounding this challenge is the high price of replacement battery packs.

Other challenges include:

- Ineligibility for EPAct credits.
- Competing hybrid technologies.
- R&D barriers.

Near-Term Clean Cities Plans

Clean Cities will pursue a number of efforts in the hybrid arena that may include:

- Local coalition testing and demonstration of effective approaches for increasing purchases of hybrids by vehicle fleets.
- Exploration of opportunities to educate consumers about the benefits of hybrid technologies. To support this fleet and consumer outreach, the Clean Cities will conduct work to improve understanding of product availability, growth potential, and OEM fleet marketing plans.
- Analysis of where and how Clean Cities can have the biggest market impact.

- Documentation of life cycle costs and benefits of hybrids, funding sources, federal and state incentives, and case studies.
- Development of demonstration projects for medium and heavy-duty hybrids, in the long term. For example, the 21st Century Truck Partnership (21CTP) may be a good building block, as this Partnership works closely with the major developers of HD hybrid technology (BAE SYSTEMS, Eaton, Allison Transmission, and Oshkosh Truck). 21CTP may be able to help Clean Cities with demonstration program development, especially in terms of matching demonstration products with local users.
- Assessment of a potential role to strengthen resale and to develop new markets through activities such as leasing and rental cars.

More specific Clean Cities coalition activities might include:

- Review of hybrid market and initiation of fleet outreach plans.
- Identification and pursuit of opportunities for consolidated procurements.
- Development and initiation of plans for consumer outreach and education, with a goal of developing state or local outreach materials and campaigns in partnership with others by end of FY05.

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National efforts to expand the use of hybrids might include:

- Partnerships with FCVT (including funding for HD demonstrations), with OEMs, and HD engine manufacturers.
- Creation of fact sheets on life cycle costs and benefits.
- Providing coalitions with information on product availability and OEM plans.
- Developing state specific fact sheets (Web pages) on incentives.
- Developing model procurement solicitation.
- Studying opportunities to expand resale, leasing, and rental markets.
- Developing package of consumer education and outreach materials for coalitions' use.
- Exploring and defining national consumer outreach activities with other programs and agencies.

Idle Reduction

Vehicle idling is a problem for trucks and passenger vehicles. DOT requires that a truck driver rest for at least 10 of every 24 hours. Many drivers opt to idle their engines in order to use the heating or air conditioning, or other on-board appliances such as a microwave. Truck drivers will also idle to keep their engines or fuel warm. The EPA defines long duration idling as "…the operation of the truck's propulsion engine when not engaged in gear for a period greater than 15 consecutive minutes, except when associated with routine stoppages due to traffic movement or congestion." Long-haul trucks idling overnight consume more than 838 million gallons of diesel fuel each year, translating into an average of $1,800 per year in fuel costs per truck. Idle reduction strategies help alleviate the need to keep the engine operating at idle by providing access points for plugging into the electric grid for power or using onboard power generation and storage equipment. These strategies also help to reduce air pollution by decreasing the amount of time the engine operates.

There are several technologies for reducing truck idling. Technologies under the heading of truck stop electrification depend on infrastructure connected to the electric power grid to supply power to the truck for cab comfort and other cab needs. Truck stop electrification infrastructure can be a simple electric hookup to supply

electricity to electrically-driven accessories onboard the truck (heating, air conditioning, engine heating, etc.). Alternatively, truck stop electrification systems have been developed to supply heated and cooled air directly to the truck from a stationary unit mounted at the parking site: this unit has an adaptor to mount a control head in the truck window to deliver the conditioned air along with electric power to the truck. There are also onboard systems that can operate independent of the power grid: these can be as simple as an onboard heater using vehicle fuel to provide cab heat, or can be complex auxiliary power units using small diesel engines (or fuel cells) to produce sufficient electric power for engine heating, cab heating and cooling, and appliance loads. Several onboard system products are currently available for retrofit or manufacturer installation on new vehicles.

Near-Term Plans to Encourage Idle Reduction Technologies

- Provide workshops and case studies on idle reduction technologies and associated fuel savings.
- Work with DOT and EPA in key transportation corridors to develop projects to encourage voluntary adoption of idle reduction technologies.
- Longer term: Use information from early projects to build a market penetration plan.

The benefits of idle reduction actions are many. EPA has estimated a fuel savings of 0.80 gallons per hour through idle reduction. In addition to the reduction of fuel consumption, there are cost savings to truck owners in decreased maintenance costs and a longer engine life. Toxic air pollutants such as formaldehyde and trace metals such as nickel are lowered. There are also reductions in carbon monoxide.

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Costs for idle reduction equipment can range from $1,500 for a small cab heater to more than $7,000 for an onboard power generation unit that can power 110-volt appliances. Efficiencies vary widely for these technologies (33%–80%), but all exceed the efficiency for truck idling (11%–15%).

While the near term focus for Clean Cities is truck idle reduction time, fairly sophisticated efforts in Canada have been launched by Natural Resources Canada (NRCAN) to change consumer idling behavior. Vehicles spend an average of five to ten minutes per day idling. Passenger vehicles idle while warming up, going through drive-through lanes at the bank or fast-food restaurants, or waiting in car wash line. There are also opportunities to reduce school bus idling. All these idling activities contribute to greater use of petroleum and to increased greenhouse gas emissions. NRCAN's national campaign is akin to "It All Adds Up to Cleaner Air" and provides a model for changing consumer behavior.

Analysis of Current Market Activity

More than 450,000 trucks on the road today have sleepers that are used regularly. Idle reduction devices have not yet been widely installed in long haul trucks; however, many large fleets monitor vehicle idling to quantify fuel use while they idle.

DOT and EPA primarily lead current work in the federal government. DOT and EPA are working jointly on programs to reduce truck idling, including efforts targeted at major transportation corridors, as well as broader education and outreach.

Technology Challenges and Market Barriers

Education and cost reductions for idle reduction equipment will be key factors in the more widespread acceptance of idle reduction technologies, for both on-board and truck stop electrification equipment.

Partnerships with DOT and EPA on-going activities in the area will be a contributing factor to ensurance of success in meeting goals for idle reduction. Details of some of the challenges and barriers include:

Deployment of idle reduction hardware: On-board equipment is not generally offered as standard equipment on new vehicles. This presents a challenge to deployment. Lack of standardized equipment makes it difficult for a fleet to select and implement idle reduction technologies. Off-board equipment, which requires a smaller commitment from operators, faces challenges with standardization and availability. Even when their vehicles have electrical ports installed to use off-board equipment, in many cases (sometimes most cases) operators must still idle at night, because stops along their route are not equipped with idle reduction equipment.

Lack of education and training: Operators are not educated on the impacts of idling on fuel consumption. Currently, information about the economics of idling is not widely available, in particular from third party sources. Often operators who engage in practices of unnecessary idling may not be aware of its impacts.

Equipment capital costs: Although costs vary widely, depending on the type of idle reduction technology, these costs can be a deterrent for heavy-duty operators, who are looking for payback periods of less than two years.

Idle reduction equipment weight: Additional weight of equipment offsets the amount of load trucks can carry, while still complying with regulations.

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Excise tax on truck equipment: Any equipment installed on a heavy truck at the time of its manufacture is subject to a significant Federal excise tax: the tax of approximately 12% can add a significant cost to a truck with idle reduction equipment installed from the factory.

Other challenges include:

- The lack of nationwide repair and maintenance networks.
- Local policies and laws restricting idling are sporadically enforced.
- Some regulations governing rest stop vending operations restrict truck stop electrification.

Near-Term Clean Cities Plans

Near term activities related to idle reduction may include the following:

- Understanding idle reduction technologies and the impacts they can have on fuel savings will be communicated through workshops and case studies.
- Coalitions will work with DOT and EPA in key transportation corridors to develop projects to encourage voluntary adoption of idle reduction technologies. The New York State Energy Research & Development Authority (NYSERDA) has been a key player in the Northeast and would be a good collaborative partner for Clean Cities, having committed considerable funding support behind corridor development.
- Information derived from these early projects will be used to build a market penetration plan for the future. National and regional goals will be established and tracked.

More specific Clean Cities coalition activities will likely include:

- Identification of targets for long-haul trucking outreach (e.g. trucking firms, truck stops, distribution sites, etc.), with target of developing outreach plan by end of FY05
- For I-95 and other priority corridors, conduct joint workshops with EPA and DOT on idle reduction and truck stop electrification. This also includes working with state programs such as the exemplary ones on New York and California.

- Coalitions hold Advancing the Choice Events on idle reduction.

National idle reduction activities may include:

- Development of coordinated multi-year plan with DOT and EPA.
- Partnership with 21st Century Truck Program.
- Creation of fact sheets on technology options, costs, and benefits with outreach materials targeted to different users (trucking, other heavy-duty).
- Creation of SEP grant funding idle reduction category.
- Idle reduction technology training for coordinators.

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Clean Cities Actions

Each technology area has priorities that are unique, and they also have activities that are largely crosscutting in that they have relevance to most or all of the technologies. There are five crosscutting areas that emerged from the work of the Clean Cities working groups and from subsequent stakeholder discussions. What follows is a description of the strategies to be employed to advance Clean Cities goals.

Five Crosscutting Coalition Activities

Each coalition will:

- Develop action plans.
- Continue and increase work with fleets.
- Participate in education and outreach efforts.
- Partner with state and local government and associations to identify model policies and incentives.
- Provide access to technical assistance.

Coalition Plans

Clean Cities Coalitions develop goals and action plans that give their organization programmatic direction. These plans are critical to maintain a cohesive national network of Clean Cities. Coalitions will work with their stakeholders and with technical and analytic support provided by National Clean Cities to identify the technologies and strategies under this new portfolio that will have the biggest impact and greatest likelihood of success in their areas. Based on such analysis and stakeholder consultations, coalitions will develop action plans for implementing the expanded portfolio. These plans will identify goals, activities, and partnerships for advancing the portfolio and a process for measuring results over time. The plans developed by the coordinators will reflect the goals and strategies articulated in the Roadmap.

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Fleet Initiatives

Although fleet vehicles represent fewer than 5% of all vehicles (2004 NAFA Reference Book), they have been an important starting point for getting AFVs and new technologies into the marketplace. There are several reasons this emphasis is beneficial:

- Fleet vehicles travel more miles annually than non-fleet vehicles, providing a greater opportunity to displace oil use and realize greater air quality benefits.
- Fleets have more control over obtaining fuel than the general public.
- Fleets must manage safety, maintenance, and fueling issues, so attention is paid to the nuances of AFVs and advanced transportation technologies.
- Fleets are more likely to look at more than just acquisition costs .

The objective of this emphasis is to advance Clean Cities' work with fleets by focusing on delivery, waste management, public transit, airports, and school fleets. To meet this objective, Clean Cities will work with key fleet associations, other industry representatives, and individual fleet managers. Clean Cities will also accelerate coalition efforts to secure voluntary commitments from fleets and develop and implement a strategy to identify resources that will make the acquisition and use of AFVs, hybrids, blended fuels, idle reduction, and fuel economy technologies and practices cost competitive.

National Education and Outreach

The national outreach and education goal is designed to maximize Clean Cities success through partnerships, targeted audiences, educational campaigns, and material development. Clean Cities will use a mix of media, such as electronic newsletters, Web pages, face-to-face presentations, group meetings, regional meetings and conferences, and inquiry response services. Outreach success will be defined by target measures for evaluating outreach effectiveness, such as number of hits on the Web site, attendance at meetings, and demand for educational materials.

State and Local Policies and Incentives

Clean Cities will partner with state and local governments and associations to identify and disseminate model policies and incentives, provide training, deliver technical assistance to coordinators on the design of policies and incentives, and develop information and outreach materials on policies that will enable coordinators to influence public policy. Planning and coordinating activities with State Energy Offices and their Clean Cities counterparts is a priority in setting state goals.

Technical Assistance

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Clean Cities works through coalitions to promote the use of alternative fuels and advanced technologies. Sometimes fleets or coalitions encounter operational and technical problems that can't be solved with local resources and it can be the deciding factor as to whether or not they stay with Clean Cities. Technical assistance (Tiger) Teams provide the technical assistance that fleets or coalitions need for successful implementation of Clean Cities goals. The teams who support the portfolio are composed of technical experts, representing each of the portfolio areas. Technical assistance deployment in one area helps all coalitions through published team reports, presentations at workshops, and sharing results with headquarters and regional office staff, as appropriate.

Clean Cities technical assistance has also included collaborative projects with industry to develop medium- and heavy-duty platforms and increase the number of available products from which Clean Cities stakeholders can choose.

Partnerships

In recognition of the importance of government and industry partnerships, Clean Cities will continue to place emphasis on working with government and industry on mutually beneficial projects. This objective will be met by exploring opportunities to expand partnerships with EPA, DOT, USDA, DOD, the General Services Administration (GSA), and possibly other agencies; by expanding partnerships to cover the new portfolio; by expanding relationships with fleet associations and other key industry partners; by building improved partnerships with state and local associations, individual state agencies, and other key local agencies to enhance state and local support and integration of activities with state and local governments; and by identifying and developing relationships with additional partners, foundations, and associations to assist with Clean Cities resource development.

Performance-Based Planning and Execution

Metrics

The estimated year 2020 performance target for the expanded Clean Cities portfolio was presented earlier in Figure 4. In this initial benchmark, Clean Cities will track progress toward an initial target of achieving petroleum displacement of 0.14 million barrels per day by 2020.

With technology-specific evaluation guidance provided to Clean Cities coalitions by DOE, Clean Cities will continue to require each coalition to establish local performance targets for petroleum displacement and a plan for achieving this target. As is the current procedure, each coalition will continue to be required to conduct a local annual review of progress toward its individual goals. Based on this annual review, necessary refinements to Clean Cities activities will be identified and implemented.

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Planning

Clean Cities will meet its general goals in partnership with Clean Cities coalitions, DOE Regional Offices, and other partnerships that are developed to advance this activity. Clean Cities relies on adequate financial, human, facilities, infrastructure, and technical resources to meet its goals. The activity is committed to improving its metrics to ensure accurate accounting of progress toward meeting technology goals.

Beginning with the budget for 2006, Clean Cities will incorporate its annual performance plan into the budget presentation and justification. In this and subsequent plans, Clean Cities activities will be presented with the next intermediate goals and annual performance targets that may be used to evaluate our performance. Clean Cities will also prepare annual plans that describe specific activities toward achieving its goals. These plans will also describe partnership activities to be implemented with other DOE programs, federal agencies, state and local programs, and industry.

The planning activities and national technology market target links are explained in Figure 11.

Each year, Clean Cities will use this report to evaluate progress toward the intermediate and strategic goals. In an annual review, we will adjust the strategies based on performance, EIA projections, current resources available, and national, energy, and economic outlook.

FIGURE 11: Clean Cities Planning and National Market Targets

Petroleum Displacement by 2020:

In concert with other programs, achieve levels of market penetration for hybrids, fuel economy, alternative fuels, blends, and idle reduction that will displace at least .14 million barrels a day of oil by 2020.

Clean Cities Roadmap:

Defines strategies for achieving national technology market penetration and oil displacement goals in partnership with others.

Annual Clean Cities Action Plans:

Define specific activities that Clean Cities will conduct each year to achieve goals.

Annual Review of Progress toward Clean Cities Goals:

Review Clean Cities progress toward goals and national market penetration targets, and identify potential adjustments necessary in activities to enhance Clean Cities impact.