

Action Strategy Paper: Alternative Fuels and Advanced Vehicle Technologies

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center

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Acronyms

AFDC	Alternative Fuels and Advanced Vehicles Data Center	ICE	Internal combustion engine
AFV	Alternative fuel vehicle	IL EPA	Illinois Environmental Protection Agency
ARRA	American Recovery and Reinvestment Act	IPGA	Illinois Propane Gas Association
AVT	Advanced vehicle technology	IPWA	Illinois Petroleum Marketers Association
CACC	Chicago Area Clean Cities	LNG	Liquid Natural Gas
CAFE	Corporate average fuel economy	LPG	Liquefied Petroleum Gas
CA LEV	California Low-Emission Vehicle Phase II	L RTP	Long Range Transportation Plan
CCSC	Climate Change Steering Committee	MAG	Maricopa Association of Governments
CDCC	Capital District Clean Communities	MPO	Metropolitan Planning Organization
CDTC	Capital District Transportation Commission	MGA	Midwestern Governors Association
CMAP	Chicago Metropolitan Agency for Planning	MWCOG	Metropolitan Washington Council of Governments
CMAQ	Congestion Mitigation and Air Quality Improvement Program	MMTCO ₂ e	Million metric tons carbon dioxide equivalent
CNG	Compress Natural Gas	MTA	Metropolitan Transportation Authority
CNT	Center for Neighborhood Technology	NAL	National Agricultural Library
CRADA	Cooperative Research and Development Agreement	NBB	National Biodiesel Board
CTA	Chicago Transit Authority	NCTCOG	North Central Texas Council of Governments
CTG	Clean Technology Group	NGV	Natural gas vehicle
DCEO	Illinois Department of Commerce and Economic Opportunity	NREL	National Renewable Energy Laboratory
DFW	Dallas-Forth Worth	NYMTC	New York Metropolitan Transportation Council
DOE	U.S. Department of Energy	NYSDOT	New York State Department of Transportation
DOT	U.S. Department of Transportation	ODOE	Oregon Department of Energy
DPF	Diesel Particulate Filters	PHEV	Plug-in hybrid electric vehicle
EEPS	Energy Efficiency Portfolio Standard	PPP	Public private partnerships
EERE	Energy Efficiency and Renewable Energy	RFS	Renewable fuel standard
EIA	Energy Information Administration	SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users
EISA	Energy Independence and Security Act of 1997	SANDAG	San Diego Association of Governments
EPA	Environmental Protection Agency	TIP	Transportation Improvement Program
EPAct	Energy Policy Act of 1992	TPB	Transportation Planning Board
EV	Electric vehicles	USDA	U.S. Department of Agriculture
FFV	Flex-fuel vehicles	UST	Underground storage tank
GIS	Geographic information system	VMT	Vehicle miles traveled
GHG	Greenhouse gas		
H-GAC	Houston-Galveston Area Council		
IANGV	International Association for Natural Gas Vehicles		

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Executive Summary

This paper supports the Chicago Metropolitan Agency for Planning's (CMAP's) *GO TO 2040* regional planning effort by offering recommendations on how to encourage the use of alternative fuels and advanced vehicle technologies (AVT) in the region. For MPOs, there are no specific mandates for the development of alternative fuels or AVT. This absence presents an opportunity for CMAP. Working closely with partners, CMAP can significantly influence the success of investment in and deployment of alternative fuels and AVT—both of which support CMAP's strategic goals to improve the region's transportation system; air and environmental quality; energy efficiency; and land use and economic development activities, including the creation of green jobs. CMAP can bolster its role as a regional leader by establishing key partnerships through its work on alternative fuels and AVT, which in turn would further its strategic goals.

Perhaps most importantly, pursuing alternative fuel and AVT can help CMAP achieve its greenhouse gas (GHG) reduction goals. As discussed in the Volpe Center's Action Strategy Paper on Climate Change and Energy, developed for CMAP, the reduction of GHG emissions in the transportation sector can be accomplished in one of three ways: reducing the carbon content of fuel, increasing the efficiency of vehicles, and reducing the number of vehicle miles people travel.¹ Experts have said that action must be taken on all three of these fronts to realize GHG reduction goals.² This Action Strategy Paper addresses the first method as well as the second method, albeit to a lesser extent.

The Volpe Center's research on related activities of peer metropolitan planning organizations (MPOs) indicates that the development of alternative fuels and AVT is a relatively new area for many MPOs. Although fostering the development of alternative fuels and AVT are not statutorily defined responsibilities of MPOs, examples from select peers suggest that MPOs are well-positioned to play important roles in the regional development of alternative fuels and AVT. By integrating alternative fuel considerations into its on-going planning processes, CMAP has the opportunity to be at the forefront among MPOs recognizing how strategic energy and vehicle technology choices support a sustainable regional transportation system.

The opportunities for CMAP to be at the forefront of advancing alternative fuels and AVT in the region – and nationally as an MPO – are divided into three areas: technological, planning, and programmatic. As a planning entity, most of CMAP's opportunities involve its on-going planning processes. Each opportunity is also categorized as on-going, near-term, or longer-term. Choosing to pursue several of these opportunities, or a few of the more significant opportunities, would require hiring new or dedicating existing staff to work full-time on alternative fuel and AVT use and deployment.

Technological opportunities involve both tapping CMAP's existing capabilities and developing new expertise. Existing capabilities that could be used to further the deployment of alternative

¹ At the Transportation Research Board's 2009 Annual Meeting, a fourth method was articulated: reducing GHG emissions through operational efficiencies in the transportation system, which can reduce congestion and related detours.

² See primarily the work of Steve Winkelmann at the Center for Clean Air Policy: www.ccap.org.

fuels and AVT include conducting emissions modeling to evaluate the impact of alternative fuels and AVT on the emissions in the region and mapping the region to identify gaps and impacts of alternative fuel infrastructure in the region. New expertise could be developed to provide technical assistance to its local government members and other partners, to evaluate and publicize alternative fuel use, and to participate in and support technology demonstration projects throughout the region.

Planning opportunities involve CMAP's integrating alternative fuels and AVT into its transportation planning process. This integration could happen from the top down, starting with articulating CMAP's support for the deployment of alternative fuels and AVT in *GO TO 2040*. In line with this plan, CMAP can then create or participate in an alternative fuel and AVT program and, drawing upon its technical capabilities, establish a lead education, outreach, and coordination role in the region. In this role, CMAP can work with the support of its members and other partners to develop incentives for alternative fuels and AVT use, tie alternative fuel and AVT use in with local and regional climate action planning processes, and use land use planning to further alternative fuel and AVT deployment.

Programmatic opportunities involve CMAP's integrating alternative fuels and AVT into its funding processes. To do that, CMAP can develop criteria for selecting or screening projects for its long-range transportation plan or transportation improvement program that advance alternative fuels use, create a grant program specifically for alternative fuel and AVT innovation, and dedicate funding for alternatively-fueled public vehicles, fleets, and/or supporting infrastructure.

Section 1: Introduction

The Chicago Metropolitan Agency for Planning (CMAP) can assume a leading role in promoting and funding alternative fuels and advanced vehicle technology (AVT) projects in the Chicago region. While there are no specific federal or state mandates for MPOs regarding alternative fuels or AVTs, a handful of MPOs promote and fund alternative fuels and AVT in their regions to achieve air quality and greenhouse gas (GHG) emission reduction goals. By actively promoting alternative fuels and AVT in the region, CMAP has the potential to be at the forefront of MPOs working with alternative fuels and AVT nationwide.

The Energy Policy Act of 1992 (EPAct) defines alternative fuels as compressed natural gas (CNG), liquefied natural gas (LNG), propane, biodiesel, methanol, ethanol, electricity, and hydrogen. AVTs include hybrid-drive systems, including plug-in electric hybrid systems.

Nearly all programs involving the development and deployment of alternatively fueled vehicles and AVTs stem from guiding legislation at the Federal and state level. The most applicable Federal legislation includes the Safe, Accountable, Flexible, Efficient Transportation Equity Act – a Legacy for Users (SAFETEA-LU), EPAct, President Bush’s “Twenty-in-Ten” initiative, the Energy Independence and Security Act of 2007 (EISA), the Food, Conservation, and Energy Act of 2008, and more recently the Emergency Economic Stabilization Act, which enacted the Energy Improvement and Extension Act of 2008, as well as the American Recovery and Reinvestment Act (ARRA) of 2009.

At the state level, Illinois has strong initiatives, targets, policies, mandates, and programs already in-place. The Illinois State Energy Plan³ established a target of a fifty percent reduction in foreign fuel consumption to be replaced with domestically produced fuel from the State of Illinois. In support of this plan, several tax exemptions on biofuels production and distribution, biodiesel blend use requirements and alternatively fueled fleet incentive programs are already in place. While MPOs might not be eligible to apply directly for all funds available under the legislation referenced above, they may be able to assist or partner with agencies that are.

To date, only a handful of MPOs have been involved in alternative fuels and AVT beyond funding alternatively-fueled transit vehicles in their Transportation Improvement Programs (TIP). This report examines the activities of these MPOs, describes opportunities for CMAP to support alternative fuels and AVT in the region, and concludes with suggested roles and next steps for CMAP to consider and pursue.

1.1 Benefits of Strategies to Promote Alternative Fuels and AVT

Motivations for the nation’s recent turn toward alternative fuels for transportation include a desire to improve price stability in the face of fluctuating fuel costs, enhance energy supply security, and provide reductions in local air pollution and greenhouse gas (GHG) emissions.

³ Gov. Blagojevich unveils ambitious energy independence plan to reduce Illinois’ reliance on foreign oil. www.illinois.gov/PressReleases/ShowPressRelease.cfm?SubjectID=18&RecNum=5200. August 22, 2006.

This trend is likely to continue as evidenced by the passing of the Emergency Economic Stabilization Act in 2008⁴, the ARRA of 2009, and on-going discussions regarding climate change-related national legislation. For the Chicago region, the benefits of strategies to promote alternative fuels and AVT are similar. Increasing their use can be a means to help meet GHG emissions reduction targets, reduce fuel consumption, and promote economic development – all directly related to the Regional Vision that CMAP adopted to guide *GO TO 2040*.

GHG Emissions Reductions and Reduced Fuel Consumption

Since vehicle miles traveled (VMT) are not projected to decrease significantly in the near or long-term in the Chicago region, CMAP's strategies to promote alternative fuels and AVT are important to help save energy and mitigate GHG and criteria pollutant emissions.⁵ The federal government has passed legislation supporting alternative fuels and has made policy-level commitments to reduce GHG emissions.⁶ The new Administration and Congress are in the process of generating a broad range of legislation and executive orders related to energy and climate change policy (including approximately \$19 billion for green transportation in the ARRA), some of them linked to alternative fuels and AVT.

In *GO TO 2040*, CMAP has the opportunity to contribute to climate change mitigation significantly by broadening public discussion to include alternative fuels and AVT as part of their GHG reduction plans. Box 1 contains the top recommendations and conclusions from the Volpe Center's Climate Change and Energy Action Strategy Paper for CMAP. Promoting alternative fuels and AVT in the region is in line with each of these recommendations, many of which have been implemented. CMAP is currently working on a regional GHG inventory and a regional energy profile, among other related efforts that will incorporate the strategy of alternative fuels and AVT. In addition to reducing GHG emissions, increased use of alternative

**Box 1: Climate Change and Energy Action Strategy Paper for CMAP:
Recommendations and Conclusions**

- Integrate climate change and energy throughout vision/scenario planning
- Connect climate change and energy directions in the vision plan to on-going transportation planning
- Pursue and engage in key partnerships
- Model CO₂ emissions when constructing and using scenarios
- Focus on CO₂
- Approach CO₂ emission reduction as a co-benefit
- Develop and apply climate change and energy specific indicators
- Communicate about climate change and energy
- Engage in state and multi-state level climate change planning activities
- Build on supportive national trends and policies

⁴ Section 202 of the act amends the existing tax credit of \$1.00 per gallon for all biodiesel. Section 205 creates a new tax credit for plug-in hybrid electric vehicles purchased prior to the end of 2014.

⁵ See Appendix 1 for more information.

⁶ See section 1.4 for a summary of this legislation.

fuels and AVT results in reduced use of imported oil, which is a national security goal.⁷

Promote Economic Development

The current global economic downturn provides an opportunity for increased development and investment in alternative fuel production, distribution, and increased investment and development of AVT. Many see a “green economy” of domestically produced fuel and advanced technologies for transportation as a means to spur significant creation of jobs and economic development. This is evident in the newly passed ARRA of 2009. National reduction targets for imported petroleum-based fuels, as well as Illinois state targets for the increased development and use of locally produced biofuels, provide an opportunity for CMAP to encourage the use of alternative fuels and AVT while promoting regional economic development:

- Illinois is the second largest corn producer in the nation.⁸ Given the challenges facing ethanol distribution by pipeline,⁹ production and distribution (via tank truck, rail tank car, and tank barge) hold significant potential for economic growth in the Chicago region.
- The next generation of all-electric vehicles and plug-in hybrid electric vehicles (PHEVs) planned to be on the market between 2010 and 2014 will likely require coordination with local utilities and stakeholders to construct a network of plug-in stations and associated infrastructure, potentially creating new jobs.
- Depending on the range of some technologies and the expense of constructing filling stations, particularly for hydrogen vehicles, shorter distances between destinations enable more destinations to be reached within a single charge or fill-up. Over time, this may drive more infill and compact developments, which could produce additional jobs in construction and development fields.

1.2 CMAP’s Unique Position

Six major reasons stand out for CMAP to be more actively involved in promoting alternative fuels and AVT:

1. **CMAP covers the entire region, not just Chicago.** The 7-county northeastern Illinois region has a population of 8.5 million living in 4,071 square miles. The City of Chicago has a population of 2.8 million living in approximately 230 square miles and on average, its residents often drive fewer miles over shorter distances than suburban residents whose destinations may be further apart and may have limited access to alternative modes of transportation. There is an important opportunity for CMAP to broaden its role as a regional planning agency, coordinating alternative fuels and AVT activities to target those in the region who drive more miles over longer distances.
2. **CMAP’s work bridges modal and agency boundaries.** Through planning and programming funds for infrastructure that supports all modes, CMAP collaborates with a

⁷ See section 1.4 for more information, particularly on the Energy Independence and Security Act of 2007.

⁸ Corn is a popular feedstock, or crop source, for producing ethanol.

⁹ Ethanol Distribution, US DOE. www.afdc.energy.gov/afdc/ethanol/distribution.html.

variety of groups. By organizing and managing planning across modal and agency boundaries, CMAP can ensure adequate and abundant coordination and economies of scale in the use of alternative fuels in the region.

3. **CMAP works across and between municipal and county boundaries.** CMAP has established relationships with municipality and county contacts throughout the region while conducting its day-to-day work. The successful penetration of alternative fuels and AVTs into the region depends on a network of infrastructure that is seamless throughout the region. By tapping its existing local government contacts to work across municipal and county boundaries, CMAP has the opportunity to help ensure that there is a seamless regional alternative fuel network.
4. **CMAP has well-established lines of communication with state officials.** CMAP is able to coordinate regional alternative fuel and AVT initiatives with state efforts. By building upon its contacts and channels of communication, CMAP can help ensure that the Chicago region's alternative fuel and AVT initiatives are integrated with similar work at the state and Midwest levels. The Midwest Governors Association (MGA) recently stated that, "Under its new leadership, the MGA will focus on strengthening state and federal efforts to build and maintain our transportation network. This effort will center on using energy produced in the Midwest to fuel the vehicles that use our roads and rails, helping businesses move their products more efficiently, and improving travel for Midwestern residents and visitors."¹⁰
5. **CMAP has a long-range planning horizon.** CMAP is uniquely positioned to take an active role because its plans cover a long-range time horizon. Optimal use of alternative fuels and AVTs in the Chicago region will likely take many years. With CMAP's long-range planning horizon – 20 years or more – CMAP can plan for full (or partial, if necessary) penetration of alternative fuels and AVTs and monitor progress. Using simple and transparent performance measures, CMAP can ensure that deployment of alternative fuels and AVT support the regional vision. As part of its regular metropolitan planning update cycles, CMAP can revisit investment decisions for alternative fuel and AVT technologies as they evolve.
6. **CMAP has established key partnerships and is positioned to build more.** By coordinating and supporting partners' initiatives, CMAP can ensure that organizations involved in alternative fuel and AVT initiatives communicate and complement rather than duplicating each other's work.

1.3 Activities in the City of Chicago

CMAP's support for diversifying the regional portfolio of transportation fuel sources and expanding the use of new vehicle technologies can be greatly enhanced by parallel and complementary efforts of its state, regional, and local partners. For example, in its Climate

¹⁰ www.midwesterngovernors.org/Publications/Newsletter/MGA%20Newsletter%202-08.pdf

Action Plan, the City of Chicago identified strategies to reduce overall GHG emissions.¹¹ The overall transportation strategy includes ten actions (see Appendix 2), including several related to promoting alternative fuels and AVT.

Similarly, due to the success of a pilot program, the Chicago Transit Authority (CTA) – which offers commuter rail, subway, and bus service to nearly two million riders per day – acquired over 170 hybrid buses in efforts to improve its fleet average fuel economy in 2008. It is expected that this heavy-duty fleet application of hybrids will incur increasingly lower repair and maintenance costs, freeing scarce resources for investments in alternative technologies.

1.4 State and Federal Policy Context

The state of Illinois has several targets in place for renewable fuel development, non-foreign fuel production and distribution, overall energy consumption reduction, and air quality improvements. For a list of Illinois' incentives and laws related to alternative fuels and AVTs, see www.afdc.energy.gov/afdc/progs/state_summary2.php/IL.

The Illinois Sustainable Energy Plan incorporates the U.S. Environmental Protection Agency's (US EPA) Renewable Fuel Standard (RFS) Program, which for 2009 includes a volumetric requirement of 10.25 percent renewable fuel use nationwide;¹² and the Energy Efficiency Portfolio Standard (EEPS), which for 2009 mandates that renewable fuel sources generate at least 5 percent of the total electricity supplied to Illinois customers.¹³

The Illinois Sustainable Energy Plan expands the RFS and EEPS standards by providing:

- Revolving loan funds for energy efficiency,
- A new residential energy efficiency building code,
- Increased biofuels capacity and access,
- Funding to invest in coal gasification and enhanced oil and gas recovery, and
- Targets for reduced vehicle emissions and alternatives to driving.

The Illinois Environmental Protection Agency (IL EPA) runs the Chicago Emissions Reduction Market System program, which is a cap and trade market system in which participating sources must hold “trading units” for their actual volatile organic material emissions.¹⁴ IL EPA also operates the Illinois Green Fleets and Alternate Fuels Rebate Program, which provides rebates to any resident, business, local government or organization in Illinois using E-85 or biodiesel fuels, and for acquiring vehicles that run on alternative fuels.¹⁵

¹¹ www.chicagoclimataction.org

¹² U.S. Environmental Protection Agency, Standard Program, Renewable Fuels. www.epa.gov/OMS/renewablefuels/.

¹³ Illinois Sustainable Energy Plan. www.commerce.state.il.us/NR/rdonlyres/26A736D5-6B18-46CC-90DA-FB900EBA3DDF/0/IllinoisSustainableEnergyPlan.pdf. February 11, 2005.

¹⁴ Illinois Environmental Protection Agency, Emissions Reduction Market System Overview. www.epa.state.il.us/air/erms/overview.html.

¹⁵ Illinois Green Fleets, Alternate Fuels Rebate Program. www.illinoisgreenfleets.org/fuels/index.html

On the federal side, the Intermodal Surface Transportation Efficiency Act, enacted in 1991, authorized the Congestion Mitigation and Air Quality (CMAQ) Improvement Program. The CMAQ program administers funds for surface transportation and related projects that contribute to air quality improvements and reduce congestion. The 2005 update of this legislation, SAFETEA-LU, provides an alternative fuels tax credit on purchases (by gallon or volume).

The Clean Air Act, which was last amended in 1990, requires the U.S. EPA to set National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment. These pollutants, termed “criteria” pollutants, are carbon monoxide, lead, nitrogen dioxide, particulate matter 10, particulate matter 2.5, ozone, and sulfur dioxide. Metropolitan areas can be found to be in attainment, nonattainment, or maintenance with regard to the standards for these criteria pollutants. The northeastern Illinois region is in nonattainment for the Clean Air Act. Therefore, CMAP, as the MPO, must ensure that the funded system of projects in the transportation plan do not make the region’s air quality worse. The use of alternative fuels and AVT can help CMAP meet attainment standards.

The EPA Act of 2005 created tax credits for the purchase of hybrid electric and other advanced technology and AFVs. It also created tax credits for the purchase of alternative fuels (by the gallon).

In 2007, President Bush’s “Twenty-in-Ten” initiative called for reducing gasoline consumption and expanding consumption of alternative fuels, including biofuels, by 20 percent in 10 years (from 5 billion gallons in 2007 to 35 billion gallons in 2017). Also in 2007, the President signed the EISA. EISA, designed to improve vehicle fuel economy and help reduce the U.S.’ dependence on oil, mandates that the nation increase the use of renewable fuels to 36 billion gallons by 2022, 15 billion of which may be corn-based ethanol. This act also requires that the U.S. DOT set tougher than current fuel economy standards.

In 2008, Congress passed the Food, Conservation, and Energy Act. This act is aimed at accelerating the commercialization of advanced biofuels, including cellulosic ethanol, encouraging the production of biomass crops, and expanding the current Energy Efficiency and Renewable Energy Program. Section 9003 provides for grants covering up to 30 percent of the cost of developing and building demonstration-scale bio-refineries for producing “advanced biofuels,” which essentially include all fuels that are not produced from corn kernel starch. This Act also allows for loan guarantees of up to \$250 million for building commercial-scale bio-refineries to produce advanced biofuels.

On October 3, 2008, the Emergency Economic Stabilization Act was signed, enacting the Energy Improvement and Extension Act of 2008. Relevant provisions applying to alternative fuels include:

- Section 202 amends the existing biodiesel mixture and agri-biodiesel production tax credits by extending the tax production credits and qualifying all biodiesel, regardless of biomass feedstock, for a \$1.00 per gallon tax credit incentive.
- Section 205 creates a new tax credit for qualified PHEVs purchased between December 31, 2008, and December 31, 2014. The credit amount is based on vehicle weight and

battery capacity. A phase-out period will be initiated once 250,000 qualified PHEVs have been sold in the United States.

- Section 207 extends the current alternative fuel infrastructure tax credit by one year and adds electricity to the list of qualified alternative fuels.

Finally, the ARRA, signed February 17, 2009, is intended to stimulate the U.S. economy. The bill includes, among other things, significant domestic spending in the infrastructure and energy sectors. Billions of dollars have been set aside for sustainable transportation projects, including:

- \$11 billion funding for an electric smart grid and \$4.5 billion for the Office of Electricity and Energy Reliability to modernize the nation's electrical grid and smart grid,
- \$2 billion for manufacturing of advanced car battery (traction) systems and components,
- \$400 million for electric vehicle technologies,
- \$300 million for federal vehicle fleets to cover the cost of acquiring electric vehicles including plug-in hybrid vehicles,
- \$300 million for reducing diesel fuel emissions, and
- \$300 million for state and local governments to purchase energy efficient vehicles.

Section 2: Peers and Partners

2.1 MPO Peers

This section provides an overview of the roles, strategies, and actions of MPOs that have incorporated alternative fuels and AVT into their regional transportation planning processes. MPO involvement with alternative fuels and AVT ranges from taking no action to administering a regional alternative fuels program. A scan of 30 of the country's largest MPOs (Table 1) shows that about half mention alternative fuels in their long-range transportation plans (LRTP), which date from 2004 to 2008. This scan does not include the large number of MPOs that program funds for transit agencies' alternative fuel projects in their TIPs or lists of obligated projects, such as CNG buses. Even fewer MPOs have formal alternative fuel programs. The information below is meant to inform and provide a context for CMAP as it shapes its role with alternative fuels and AVT within the greater Chicago region.

Of the 14 MPOs that mention alternative fuels in their LRTP:

- Eight MPOs mention it as a strategy to further an environmental objective or goal (Baltimore, Boston, Cincinnati, Denver, Las Vegas, Orlando, Philadelphia, and St. Louis);
- Four mention it as programs that they support or run (Houston, Kansas City, New York City, and San Diego);
- One mentions it as part of their Congestion Management Process (Dallas/Ft. Worth); and
- One mentions it as a criterion in its grant program (San Francisco).

As an example of incorporating alternative fuels into a LRTP, the Baltimore Regional Transportation Board mentions alternative fuels in several of their air pollution reduction strategies (Table 2). These strategies are divided into technologies, behavioral strategies, and capital improvements.

Additionally, seven of the MPOs scanned have alternative fuel programs or have undertaken alternative fuel studies. Three of these MPOs administer their metropolitan areas' U.S. Department of Energy (DOE) Clean Cities initiatives (Albany, Dallas/Ft. Worth, and Washington, DC). Administering a Clean Cities initiative requires hosting periodic meetings and dedicating staff time to organize meetings and events, conduct research, and develop materials. Box 2 contains more information about Clean Cities. One MPO, the Maricopa Association of Governments, formerly administered the Phoenix area's Clean Cities initiative, but is no longer involved with that program, which is now run independently.

The other four MPOs have taken a variety of approaches to working with alternative fuels and AVT. The alternative fuels work of each of the seven MPOs – Albany, Dallas/Ft. Worth, Houston, New York City, Orlando, San Diego, and Washington, DC – and Phoenix is described in detail below.

Table 1. Scan of MPO Alternative Fuel Activity

Metropolitan Area	Alt. Fuels Program?	If yes, how mentioned?	Mentioned in LRTP?	If yes, how mentioned?
Albany	Yes	Administers Clean Cities	Yes	Environmental Action and "Big Ticket Initiative"
Atlanta	No		No	
Baltimore	No		Yes	Environmental Strategy
Boston	No		Yes	Environmental Policy Statement
Charlotte	No		No	
Cincinnati	No		Yes	Environmental Objective
Cleveland	No		No	
Columbus	No		No	
Dallas/Ft. Worth	Yes	Administers Clean Cities	Yes	Part of Congestion Management Process
Denver	No		Yes	Environmental Policy
Detroit	No		No	
Houston	Yes	Clean Vehicles Program	Yes	As a funding program
Kansas City	No		Yes	Mentions Clean Cities
Las Vegas	No		Yes	As objectives, measures, and funded projects
Los Angeles	No		No	
Memphis	No		unk.	
Miami	No		No	
Milwaukee	No		No	
Minneapolis	No		No	
New York City	Yes	Alternative fuel and AVT project funding	Yes	As a regional program
Orlando	Yes	Clean Air Team and Alternative Fuel Task Force (no longer active)	Yes	Part of environmental sensitivity goal
Philadelphia	No		Yes	Environmental strategy
Phoenix	No		No	
Portland	No		No	
Raleigh	No		No	
Salt Lake City	No		No	
San Diego	Yes	Alternative Fuel Infrastructure Study	Yes	Describes ways SANDAG is promoting alternative fuels in the region
San Francisco	No		Yes	Consideration in Climate Grants Program
St. Louis	No	Description of and link to Clean Cities	Yes	Sustainable development strategy
Seattle	No		No	
Washington, DC	Yes	Administers the Metropolitan Washington Alternative Fuels Clean Cities Partnership	No	

Table 2. Baltimore Regional Transportation Board’s Air Pollution Reduction Strategies

TECHNOLOGIES	BEHAVIORIAL STRATEGIES	CAPITAL IMPROVEMENTS
Alternative fuel infrastructure	Car share programs	Bicycle and pedestrian improvements
Bus replacement (non-hybrid and hybrid)	Clean commute marketing (Clean Air Partners outreach - Air Quality Action Days; Commuter Challenge Program)	Bike racks on MARC cars and MTA/LOTS buses
Clean fuel shuttles	Commuter Choice tax benefit program	Electronic toll collection
Clean fuel vehicles and hybrids	Emergency ride home	MARC enhancements: additional or replacement rail cars
Electrified parking for tour buses	Free parking for hybrid cars	Minor transit enhancements; new or expanded bus service
Encourage hybrid use in public fleets	Live Near Your Work	Neighborhood shuttles
Energy-efficient highway construction and maintenance practices	Parking cash out	Park and ride lots/ transit center parking
Enhanced enforcement of smoking vehicles	Preferential parking for carpools, vanpools	Signal systemization
Gas cap replacement program	Real-time bus schedules	Traffic flow enhancements (Coordinated Highway Action Response Team, roundabouts)
Low-NOx diesel fuel	Reduced idling marketing campaign	Truckstop electrification
Multi-model Traveler Information System	Rideshare	
Retrofit highway construction and maintenance equipment	School course on transportation-related air pollution	
Smart cards for transit modes	Sell Clean Air license plates	
Technologies to improve truck fleet efficiency (auxiliary power units (APU’s), automatic tire inflation, single-wide tires, trailer fairings, plug-in cabin equipment)	Telecourses at colleges and universities	
Voluntary diesel retrofits	Telework Partnership with Employers	
	Transit fare reduction/episodic free transit programs	

Source: Baltimore Regional Transportation Board, “Transportation Outlook 2035.” 2007, p. 147.
www.baltometro.org/downloadables/Outlook2035/TO2035_Final_All.pdf

Capital District Transportation Committee (CDTC, Albany, NY)

Schenectady County spearheaded local efforts to participate in the federal Clean Cities program in early 1996. The Capital District Clean Communities (CDCC) coalition became a designated member of Clean Cities in April 1999. Schenectady County supported the CDCC coordinator position for several years, but since it was mostly staffed by interns, the program had little consistency. The Capital District Transportation Committee (CDTC) was asked to assume the coordinator role in 2001. According to their website, CDTC agreed to administer the CDCC program since the goals of the program fit well with the planning and investment principles that CDTC adopted as part of its LRTP.¹⁶ CDCC’s coalition group meets quarterly to work on the program plan and to implement the national Clean Cities goals. The CDCC is also involved in local events that promote alternative fuels. CDCC’s MOU and group members are listed in Appendix 3.

¹⁶ www.cdtempo.org/cdcc/cdcc.htm

Box 2: U.S. Department of Energy's Clean Cities Program

Clean Cities is a government-industry partnership designed to reduce petroleum consumption in the transportation sector by advancing the use of alternative fuels and vehicles, idle reduction technologies, hybrid electric vehicles, fuel blends, and fuel economy measures.

Sponsored by the U.S. Department of Energy's Vehicle Technologies Program, Clean Cities contributes to the energy, environmental, and economic security of the United States by supporting local decisions to reduce our dependence on imported petroleum. Established in 1993 in response to the EPAct of 1992, the partnership provides tools and resources for voluntary, community-centered programs to reduce consumption of petroleum-based fuels.

In almost 90 coalitions, government agencies and private companies voluntarily come together under the umbrella of Clean Cities. The partnership helps all parties identify mutual interests and meet the objectives of reducing the use of imported oil, developing regional economic opportunities, and improving air quality.

Source: U.S. Department of Energy, "Clean Cities Fact Sheet." Jan. 2009:
www1.eere.energy.gov/cleancities/pdfs/44929.pdf

The goals and objectives are detailed in Appendix 3, and include:

- Increase local alternative fuel vehicle counts;
- Help New York State to implement the mandated AFV acquisition plans;
- Create partnerships for AFV refueling infrastructure;
- Encourage private sector stakeholders to take advantage of the New York State tax incentives for AFV and infrastructure acquisition;
- Assist in the creation of a "Clean Corridor" from Albany to Buffalo and from New York City to the Canadian border making it possible to link Clean Cities within the state;
- Expand use of blended fuels (e.g., B20, E10, and hydrogen/compressed natural gas blends);
- Accelerate sales of hybrids;
- Promote informed consumer choice on fuel economy;
- Encourage use of idle reduction technologies; and
- Increase use of alternative fuels.

According to its LRTP, CDTC plans to continue its strong involvement in the Clean Cities program. One of CDTC's environmental actions listed in its LRTP is to support the deployment and use of clean fuels and clean fuel technology in the capital region.¹⁷ CDTC does not, however, estimate expected results from this measure in terms of energy savings or CO₂ reductions. With more sophisticated models, this kind of estimation will be more feasible in coming years.

Further, one of CDTC's unfunded "Big Ticket Initiatives" outlined in its plan is to create a clean and efficient vehicle program that would apply to public transit fleets and private vehicles. This program would provide an incentive with the goal of doubling hybrid sales in the region. Specifically, this program would offer a 30 percent purchase price incentive in 2010 to double

¹⁷ www.cdtempo.org/rtp2030/summary.pdf

current hybrid sales in the region to 2,800 per year.¹⁸ The incentive would decline as the hybrid market expands. For transit, CDTC estimates a \$100,000 price increase for 300 transit vehicles of varied sizes. CDTC estimates that this program would cost \$550 million.¹⁹

North Central Texas Council of Governments (NCTCOG, Dallas-Fort Worth, TX)

Dallas-Fort Worth (DFW) Clean Cities Technical Coalition is the DFW Metroplex chapter of the U.S. DOE's National Clean Cities Program. DFW Clean Cities Technical Coalition is administered and supported by the NCTCOG. Started in 1995, the coalition is a locally based, private and public partnership group that works to advance the economic, environmental, and energy security goals of the U.S. by supporting local decisions to adopt practices that contribute to the reduction of petroleum consumption in the transportation sector.²⁰ The coalition's members support increased use of alternative fuels, more prevalent refueling infrastructure, and the education of the public to the benefits of using alternative fuels. The coalition supports the use of hybrid vehicles, fuel blends, fuel economy practices, and idle-reduction technology.

The objectives of the DFW Clean Cities program are to:

- Facilitate the deployment of AFVs;
- Support the installation of an alternative fuel refueling infrastructure throughout the DFW Metroplex;
- Increase the use of fuel blends (i.e., diesel/biodiesel and ethanol/gasoline);
- Accelerate sales of hybrid electric vehicles;
- Promote informed consumer choice on fuel economy; and
- Encourage the use of idle reduction technologies for heavy-duty trucks and other vehicles.

The coalition is comprised of over 200 fleet administrators, fuel providers, automobile manufacturers, and other members and interested parties. The coalition meets on a regular basis every two to three months and periodically hosts special events. Three NCTCOG staff support the coalition. NCTCOG staff members develop a monthly one-page newsletter and maintain a sub-section of the NCTCOG website for the coalition. NCTCOG's website also has several webpages and resources on clean vehicle technologies, alternative fuels in general, alternative fuel vehicle incentives, clean vehicles, and Clean Cities local success stories.

The coalition also holds annual "Advancing the Choice" events. The events held each of the last four years were:

- Alternative Fuel Vehicle Success Stories in Dallas-Fort Worth and How They Can Be Applied to You (2008);²¹
- Advancing the Choice Beyond Regulations: Greening Regulated Fleets (2007);²²

¹⁸ It should be noted that the Albany region nearly attained the 2,800 mark in 2007, mainly due to high gas prices: www.bizjournals.com/albany/stories/2008/05/05/story4.html?q=hybrid%20registrations%20in%20albany

¹⁹ As a "Big Ticket Initiative", funding sources are not identified.

²⁰ www.nctcog.org/trans/clean/cities/index.asp

²¹ www.nctcog.org/trans/clean/cities/advancing_choice_08/atc2008.asp

²² www.nctcog.org/trans/clean/cities/advancing_choice_07/atc2007.asp

- Advancing the Choice Event: Hybrid and Neighborhood Electric Vehicle Ride and Drive (2006); and
- On the Right Track: Advancing Alternatives to Idling (2005).

NCTCOG also staffs a Transportation and Air Quality Marketing Program Area, which promotes the use of clean vehicle technologies via the Dallas-Fort Worth Clean Cities, Clean Vehicles, and DFW Clean School Bus programs. This program area also promotes general air quality awareness marketing and outreach throughout the North Texas region. NCTCOG's Air Quality Public Relations Task Force advises on this program area and has quarterly conference calls and meetings, which results in bi-monthly communications.

Houston-Galveston Area Council (H-GAC, Houston, TX)

While Houston's Clean Cities program is independent of its MPO (the Houston-Galveston Area Council, H-GAC), the MPO administers a Clean Vehicles program that is marketed together with the Clean Cities program.²³ The Clean Vehicles program, which is for corporate or government vehicle fleets, is a fuel/technology-neutral grant program that funds cost-effective engine retrofits, repower, replacement, conversion to alternative fuels, or the establishment of publicly accessible alternative fuel infrastructure. Overhead and administrative costs are not eligible for funding.

Eligible entities include any public or private fleets that primarily operate within the 8-county ozone non-attainment area. While both light- and heavy-duty vehicles are eligible, off-road vehicles are currently ineligible. Eligible vehicles must spend at least 75% of their operating hours within the 8-county ozone non-attainment area, and travel more than 12,000 miles/year. As a general rule, the replacement of the heaviest, oldest, and most used diesel engines qualify for the most funding.²⁴ Clean Vehicles works through a three-phase process consisting of the application analysis, contract implementation, and emissions accounting phases²⁵ and has funded many projects since 2003.²⁶

H-GAC also devised an emissions calculator to help determine if it is cost-effective to replace or retrofit a company's older diesel engines. The calculator estimates both emission reductions and cost-effectiveness associated with diesel engine replacement or retrofit.²⁷

On July 16, 2008, the H-GAC held a Clean Vehicles and Clean School Bus workshop for potential and current program participants. The presentations and agenda from this workshop can be found at www.houston-cleancities.org/overview.htm.

²³ www.houston-cleancities.org/overview.htm

²⁴ *Ibid.*

²⁵ *Ibid.*

²⁶ www.houston-cleancities.org/projects.htm

²⁷ www.houston-cleancities.org/calculator.htm

New York Metropolitan Transportation Council (NYMTC, New York, NY)²⁸

The New York metropolitan area is an air quality non-attainment area for ozone and for particulate matter (PM) 2.5. Also, Manhattan is in non-attainment for PM 10. NYMTC's work to reduce emissions in the greater New York City region has been on-going for several years. As part of this work, NYMTC directly funded several alternative fuel, but mainly AVT projects and has catalyzed other alternative fuel and AVT investments in the region as well.

As is the case with other MPOs, NYMTC funds Clean Cities Coalition projects through its CMAQ program. The Greater Long Island Clean Cities Coalition is one of the most active Clean Cities Coalitions in the nation. NYMTC worked with the coalition to change all garbage trucks in Huntington, NY, to CNG.

In 2002, NYMTC partnered with the New York State Department of Transportation (NYSDOT) to evaluate the cost-effectiveness and practicality of a number of potential emission reduction strategies. The study identified the retrofitting of construction equipment as the best strategy for the region since it is highly cost-effective. One strength of the strategy is the ability to add the retrofit requirement to the construction contract. The World Trade Center reconstruction in Lower Manhattan in 2002 marked the first time that government construction contracts required the retrofit of diesel construction equipment with the best available technology. New York City expanded this requirement to all city construction projects through the adoption of Local Law 77 in 2003. Suburban counties adopted this requirement through an EPA-sponsored Agreement in 2006.

From 2002-2004, NYMTC collaborated with key environmental groups and government agencies to identify strategies for reducing emissions. These groups included Environmental Defense, the Northeast States for Coordinated Air Use Management, EPA, New York State Department of Environmental Conservation, and NYSDOT. Early in this same period (2002), NYMTC convened an Emission Reduction Sub-Committee to obtain MPO Board member agencies' recommendations for the development of future emission reduction strategies. This ongoing sub-committee shares research among the members and selects potential implementation strategies. In 2008, the sub-committee proposed to the full MPO Board to start a program similar to one in Long Beach, CA, to trade in old trucks for newer trucks (2007 or later). This program would focus on Hunts Point Market, a location in the Bronx with a high density of people and truck movements. A current project retrofits trucks with diesel particulate filters and switches others to CNG. NYMTC's next step is to reach out to the private sector to determine if the truck trade-in program would be feasible.

NYMTC established a Clean Technology Group (CTG) in 2005 to prepare new actions for potential implementation and to reach out to private sector fleets. CTG studied a range of potential steps including accelerated replacement and scrapping of older model diesel trucks and school buses, retrofitting of remaining fleets of diesel trucks and school buses, as well as

²⁸ Information from Larry McAuliffe, Manager, Research Unit, Planning Division, New York Metropolitan Transportation Council, from conversation on January 26, 2009, and his TRB presentation from January 2008.

regional idling reduction, including enforcement, public education, and supporting equipment. The CTG is currently suspended until funding becomes available again.

NYMTC and its partners are currently involved in several other regional air quality initiatives:

- Diesel retrofits will be installed on all regional transit fleets by the end of 2009, with the exception of the Long Island Bus fleet, which is already running on natural gas. The Metropolitan Transportation Authority (MTA) converted its fuel to ultra low sulfur diesel fuel in 2003, and installed diesel particulate filters on all diesel buses in 2004. Suburban transit bus fleets are in the process of retrofitting diesel buses now.
- New York City and NYSDOT have committed to retrofits for all on- and off-road diesel vehicles. New York City Council codified this requirement in 2005 and NYSDOT committed to retrofit all of its diesel vehicles in 2007.
- The MTA and Westchester County Bee Line are moving to all hybrid-electric fleets as they replace buses on their regular replacement cycles. The MTA ordered 850 more diesel-electric hybrid buses in December 2007, bringing the MTA hybrid fleet to 1,700 buses (about 50% of the fleet) when delivered in 2009. The Westchester Bee Line completed a demonstration program of four buses, and then placed an order for 84 hybrid-electric buses in 2007.
- The New York Power Authority is developing a prototype for hybrid electric school buses as a member of a nationwide consortium.
- In partnership with the New York State Energy Research and Development Authority, NYMTC funds programs to reduce emissions from delivery vehicles. Manhattan Beer Distributors converted 30 delivery trucks to natural gas, and the FedEx hybrid-electric demonstration in New York City is part of a nationwide program to reduce emissions from delivery vehicles.
- Through CMAQ, NYMTC is funding New York City's program to retrofit its school bus fleet with diesel particulate filters (DPFs).

For the first time, NYMTC programmed CMAQ funds in 2007 for diesel retrofits and the purchase of hybrid electric transit buses for fleets. These projects are outlined in Table 3.

Table 3. NYMTC 2007 CMAQ Funds Programmed for Diesel Retrofits

Project	CMAQ Funds Programmed
NOx absorbing diesel particulate filters for 800 private sector trucks serving the Hunts Point Food Market in the Bronx	\$30 Million
Diesel particulate filters for 900 New York City garbage trucks	\$20 Million
The retrofit of 550 New York City Municipal Non Road Vehicles	\$7 Million
The incremental cost for the purchase of 84 hybrid electric buses for the Westchester County Bee Line	\$8.5 Million
The retrofit of 163 Rockland County Owned Vehicles including transit buses	\$1.7 Million
The retrofit of locomotives at a switcher yard in partnership with CSXT	\$5.8 Million

MetroPlan (Orlando, FL)

Under the direction of MetroPlan, the Central Florida Clean Air Team is a volunteer coalition of government, health, utility, transportation, and business organizations that works on improving air quality in the greater Orlando area and meets quarterly. The region's Clean Cities Coalition – Florida Space Coast Clean Cities Coalition – is a member of the Clean Air Team. The Clean Air Team's goal is to create public awareness of the steps individuals and organizations can take to improve air quality.

To accomplish this goal, the Clean Air Team sponsors an annual awards program to raise awareness of air quality issues by showcasing best practices or new technology being developed or used by companies in the region. Judging for the Clean Air Award is based on innovation and uniqueness, the direct or indirect effort to reduce emissions, provision of a model for others to follow, and sustainability.²⁹ The Clean Air Team also celebrates Clean Air Month by educating the community on ways they can help maintain clean air in Central Florida. The most recent month that they celebrated Clean Air Month, the Clean Air Team partnered with Southern Express Lubes to give customers 50 percent off a fuel and induction system cleaning. The Clean Air Team has also developed a hand-out on the top ten ways individuals can improve air quality.³⁰

MetroPlan had an Alternate Fuel Task Force that held joint meetings in 2005-06 with the Central Florida Clean Air Team. In July of 2006, the task force released a report that summarizes members' experiences with biodiesel and ethanol.³¹ The group is considered a success since it connected group members who wanted to learn more about – and in some cases start using – alternative fuels in their businesses/organizations to people who produced the fuels (primarily biodiesel).

Maricopa Association of Governments (MAG, Phoenix, AZ)

The “Valley of the Sun” Clean Cities Coalition began as the MAG Clean Cities Coalition in June 1995 as a local, public/private partnership supporting the deployment of alternative fuel vehicles and the use of alternative transportation fuels. In October 1997, the MAG Clean Cities Coalition became the 58th coalition nationally to join the U.S. DOE's Clean Cities Program.

In July 2002, after a brief period of inactivity, Maricopa County stakeholders representing local industry and government regrouped and began the process of refocusing the Clean Cities organization. The reorganized “Valley of the Sun” Clean Cities Coalition developed a new strategic plan and vision for cleaner air and a future less dependent on foreign petroleum.

²⁹ Previous winners include Waterford Elementary School and Progress Energy Florida, Orange County Public Schools and Head Start, City of Altamonte Springs, and HUGR Systems, Inc.

³⁰ www.metroplanorlando.com/site/upload/documents/Tenwaysyoucanhelp_web.pdf

³¹ www.metroplanorlando.com/site/upload/documents/BiodieselCaseStudies.pdf

San Diego Association of Governments (SANDAG, San Diego, CA)

SANDAG identifies regional goals for energy use and climate change mitigation, and alternative fuel infrastructure development is seen as a key step towards meeting those goals. In April 2007, SANDAG secured a \$400,000 energy planning contract from the California Energy Commission to undertake a two-year project to address regional energy and climate issues.

As part of this effort, SANDAG is conducting an “Alternative Fuels Infrastructure Study.”³² The spring 2008 draft study of alternative fuel infrastructure needs in the San Diego region recommends areas where new infrastructure could be sited to best leverage geographic and financial opportunities. The draft’s analysis focused on infrastructure to serve the needs of public agency fleets, including those of SANDAG member agencies and partners, rather than on commercial infrastructure to serve the general public. SANDAG’s work on the first draft was completed before the state developed its Alternative Fuels Program (California Assembly Bill 118³³). The California Energy Commission subsequently asked SANDAG to alter the study to identify regional opportunities to use the state program to bring more alternative fuel infrastructure and vehicles to the region. The revision will include assessing whether an alternative fuel vehicle and infrastructure component can augment transportation projects in SANDAG’s regional transportation plan and what opportunities exist for local governments when fleets (such as passenger vehicles, vanpools, and refuse haulers) change over. SANDAG is expected to submit the study to the California Energy Commission in spring 2009.

The final Alternative Fuels Infrastructure Study will guide development of an Alternative Fuel Vehicle and Infrastructure Toolkit for local governments that will contain best practices related to ordinances, analytical tools, financing opportunities, codes, and standards related to saving energy or reducing GHG emissions. SANDAG’s Energy Working Group serves as the advisory committee on this project.

SANDAG will also work with its member agencies to identify opportunities for alternative fuel vehicles both in municipally owned vehicles, as well as those owned by franchisees of these cities, such as trash haulers, green waste haulers, and curbside recycling haulers. A significant shift is already underway in public transit with over half of their bus fleets powered by alternative fuels.

SANDAG also supports the San Diego Gas and Electric Clean Transportation Program³⁴ that is undertaking a variety of alternative electric transportation initiatives. This new program aims to reduce fuel consumption, promote the use of electricity as an alternative fuel, reduce dependence on foreign oil and respond to state environmental priorities. Focus areas range from on-road electric vehicles, like plug-in, hybrid automobiles, to electric idling initiatives like electrification of cruise ship terminals (cold ironing), to non-road electric vehicles like forklifts and airport ground support equipment. As this program progresses, SANDAG will assess ways electrification may reduce and displace fuel use and associated emissions.

³² Draft available at www.sandag.org/uploads/meetingid/meetingid_2018_8199.pdf

³³ “Development of Regulations for the Alternative and Renewable Fuel and Vehicle Technology Program”: www.energy.ca.gov/ab118/documents/ab_118_bill_20071014_chaptered.pdf

³⁴ www.sdge.com/documents/environment/hybrid_fact_sheet.pdf

Metropolitan Washington Council of Governments (MWCOG, Washington, DC)

MWCOG has organized and coordinated the Metropolitan Washington Alternative Fuels Clean Cities Partnership,³⁵ a public private group started in 2004. Membership includes local government and private fleet managers, area utilities and other alternative fuel interests, non-profit environmental and advocacy organizations, federal and state governments, and academia. The primary goal of the partnership is to encourage and accelerate the use of alternatively fueled vehicles in the metropolitan Washington region as a means of promoting energy security and improving environmental quality.

The partnership, which meets quarterly, has held several events over the past few years:

- “Alternative Fuels Workshop: Regional Ethanol Impacts” (May 2008);³⁶
- “Advancing the Choice Fleet Seminar” (June 2006);³⁷
- “Hydrogen Workshop” (May 2006);³⁸ and
- “Hydrogen Technology Forum” (May 2004).³⁹

In April 2007, the MWCOG Board of Directors adopted a resolution creating a regional climate change initiative. Already underway, this initiative will develop a GHG inventory, set regional goals, identify effective practices for reducing emissions, advocate policies at the federal and state levels, make recommendations on regional climate change policy, and recommend a structure to guide MWCOG’s efforts in the future. The resolution established a Climate Change Steering Committee (CCSC) to guide the initiative. Box 3 outlines the accomplishments of the CCSC.

The CCSC submitted the “National Capital Region Climate Change Report” to the Board of Directors, which adopted it in November 2008.⁴⁰ This report presents recommendations for regional action by proposing broad goals, identifying actions that will begin to reduce regional GHG emissions, and setting in place a process to implement the regional framework crafted in this document. To reduce regional GHG emissions from transportation and land use, the report includes recommendations divided into different types of strategies. Germane to alternative fuels, one of the local and regional strategies for government and business is to increase fuel efficiency and the use of clean fuel vehicles. This strategy is divided into three parts:⁴¹

1. Promote clean-fuel vehicles (cars, trucks, buses).

- Promote/accelerate the adoption of efficient clean-fuel vehicles, including hybrids (cars, trucks, and buses). Identify and implement incentive programs to promote purchase of new high-mileage vehicles.

³⁵ www.mwcog.org/committee/committee/default.asp?COMMITTEE_ID=51

³⁶ Agenda: www.mwcog.org/uploads/committee-documents/115eX11c20080521150521.pdf

³⁷ Flyer: www.mwcog.org/uploads/committee-documents/vVpXXls20060323082714.pdf; agenda:

www.mwcog.org/uploads/committee-documents/vVlcXlc20060613082025.pdf

³⁸ Flyer: www.mwcog.org/uploads/committee-documents/oV1fWlw20060428125208.pdf

³⁹ Agenda: www.mwcog.org/uploads/committee-documents/qV1fXV020040623093536.pdf

⁴⁰ www.mwcog.org/uploads/pub-documents/zldXXg20081203113034.pdf

⁴¹ *Ibid.*, p. 19.

Box 3: Accomplishments of MWCOG's CCSC

The CCSC's initial work focused on examining climate initiatives in Maryland, Virginia, and the District of Columbia, as well as among its 21 member local jurisdictions. Between May 2007 and October 2008 this work included:

- Reviewing the work of the Intergovernmental Panel on Climate Change, as well as local assessments of potential impacts in the Mid-Atlantic region;
- Preparing a report cataloging best practices and greenhouse gas reduction activities already underway in the region;
- Developing an inventory of greenhouse gas emissions, and forecasting the future levels of emissions out to 2050 under a "business as usual" scenario;
- Evaluating a wide range of potential regional greenhouse gas reduction goals, and reaching consensus on an aggressive sequence of reduction targets starting in 2012;
- Examining state and federal legislation;
- Preparing advocacy positions primarily focused on enhancements to local and regional roles and resources to support local and regional initiatives;
- Endorsing the Cool Capital Challenge, a grassroots effort to jumpstart emission reductions in the region;
- Reviewing a wide range of measures to reduce greenhouse gas emissions;
- Preparing a regional Climate Change Report; and
- Recommending a committee structure to guide COG's efforts in the coming years.

- Evaluate options for promoting California Low-Emission Vehicle Phase II (CA LEV-II) standards that reduce greenhouse gas emissions, or extending federal corporate average fuel economy (CAFE) requirements past 2020 and expand to cover heavy trucks.
- Evaluate facilitating adoption of high-mileage vehicles through incentives and tax policies.
- Assess the benefits from a "Cash-for-Clunkers" program and rebates or tax incentives for the purchase of hybrid vehicles.

2. Adopt a regional green fleet policy.

- Establish a regional green fleet policy with measurable goals and timetables. Target public and private fleets, transit, tax cabs, rental cars, and refuse haulers. Evaluate the benefits of specific "green fleet" conversion percentages.
- Evaluate a regional goal for public fleets of accelerating achievement of federal CAFE standards.

3. Promote the use of clean fuels.

- Further explore alternative-fuel vehicles, such as biofuel-, electric-, or hydrogen-powered vehicles.
- Strengthen financial and other incentives (e.g., tax rebates) to encourage residents to purchase alternative-fuel vehicles.
- Conduct planning for alternative-fuel infrastructure needed to support alternative-fuel vehicle technology implementation (e.g., natural gas, hydrogen, electricity).
- Strengthen financial and other incentives to encourage development of alternative-fuel infrastructure.

- Explore a state or regional renewable fuels standard.

Table 4 shows how CCSC assessed these strategy components in terms of emission impact, implementation timing, cost, economic co-benefits, and potential partners.

Table 4. MWCOG Assessment of Increasing the Fuel Efficiency and Use of Clean-Fuel Vehicles

Recommendations	Emission Impact	Implementation Timing	Cost	Economic Co-Benefits	Potential Partners
<i>A. Increase Fuel Efficiency and Use of Clean-Fuel Vehicles</i>					
1. Promote clean-fuel vehicles (cars, trucks, buses).	High	Immediate–Mid-range	Medium–High	High	COG members, state legislatures, fleet managers, auto manufacturers, AFV partnerships
2. Adopt a regional green fleet policy.	Medium–High	Immediate–Mid-range	Medium–High	Medium–High	COG members, state legislatures, fleet managers, auto manufacturers, AFV partnerships
3. Promote the use of clean fuels.	Medium–	Immediate–Mid-range	Medium–High	Medium–High	COG members, state legislatures, fleet managers, auto manufacturers, AFV partnerships

Source: [MWCOG, “National Capital Region Climate Change Report.”](#) Nov. 08, p. 15.

The report also has recommendations for local governments to lead by example by promoting low-carbon “clean” fuels:⁴²

- Promote adoption of CA LEV-II standards for all jurisdictions in the region.
- Promote/accelerate adoption of efficient clean-fuel vehicles, including hybrids (cars, trucks, buses).
- Evaluate the benefits of specific “green fleet” conversion percentages. Provide incentives for purchase of clean-fuel vehicles.
- Assess benefits from a “Cash-for-Clunkers” program and rebates or tax incentives for the purchase of hybrid vehicles.

Finally, the report has recommendations for MWCOG to advocate at state and federal levels to increase fuel efficiency and use of clean-fuel vehicles:⁴³

- Promote CAL LEV-II.
- Extend CAFE past 2020 and include heavy-duty trucks.
- Support incentives for fuel-efficient and alternative-fuel vehicles.
- Support incentives for early vehicle retirement.

The report includes a section on how the MPO, which is a component of the MWCOG known as the Transportation Planning Board (TPB), can integrate the above recommendations into its planning process. According to the report, the TPB is developing a “What would it take?” analysis to assess what combinations of actions would achieve the regional targets for reducing GHG emissions. The TPB is considering strategies, including higher fuel efficiency and alternative fuel use; reducing VMT and congestion through compact growth, pricing, and greater transit mode choice; and evaluating the impacts of more infill and mixed-use development and supportive transit projects and policies. Based on the results of this analysis, which was concluded by February 2009, the TPB will identify regional policies and plans to meet regional GHG emission reduction goals for the transportation sector. This will be followed by public

⁴² *Ibid.*, p. 108.

⁴³ *Ibid.*, p. 65.

outreach and comment on the completed analysis until summer 2009. The results produced by the “What would it take?” study and associated public comment will be factored into TPB’s 2012 LRTP.

Conclusion

Overall, the MPOs included in this review (except for Orlando) are maintaining or increasing their levels of promoting alternative fuels and AVT in their regions. While some of the MPOs have pursued alternative fuels and AVT primarily for their air quality benefits (particularly H-GAC and NCTCOG), others are pursuing alternative fuels and AVT primarily for their GHG emission reduction potential (particularly SANDAG and MWCOG). Since alternative fuels and AVT are one way to reduce emissions, MPOs in states that are currently at the forefront of GHG emission reduction planning will be more likely to be involved in the promotion of alternative fuel and AVT in the future. San Diego’s recent engagement with alternative fuel and AVT demonstrates this relationship. New federal GHG emission reduction policies could also encourage MPOs to see alternative fuels and AVT as helping them implement their long-range plans and reach GHG emission reduction goals.

2.2 Potential Partners

There are organizations and agencies within the greater Chicago region that are significantly involved with alternative fuels already, with many programs and plans in place to increase the development of alternative fuels and AVT in the near-term. These activities appear to complement consumer sentiment in and around Chicago: the region has ranked in the top six in number of hybrid registrations nationally,⁴⁴ which could indicate a high level of acceptance to new vehicle technologies regionally.

Partnerships will be pivotal to CMAP as it pursues the successful implementation of alternative fuels and AVT in the Chicago region. Partners provide complementary insight, skills, and knowledge, essential for providing the physical environment – whether it is land or vehicles – and political support necessary for the use of alternative fuel. Table 5 summarizes the importance of engaging various partners for technological, planning, and programmatic reasons.

To determine on which organizations CMAP should focus its efforts, it is helpful to define the ideal roles that potential partners can play when working with CMAP. These roles include technological, planning-related, and programmatic roles. These roles are not mutually-exclusive, since partners could play multiple roles:

- CMAP’s ideal **technological partner** on alternative fuels and AVT would supply data to CMAP for its modeling and analysis as well as work with CMAP to implement technology demonstration projects.
- CMAP’s ideal **planning partner** on alternative fuels and AVT would work with CMAP to:

⁴⁴ Chicago Sun-Times, “Chicago In Top Fives for Hybrid Cars.” www.huffingtonpost.com/2008/08/25/chicago-in-top-fives-for_n_121242.html. August 24, 2008.

- Educate and reach out to stakeholders and the public;
- Identify needs and opportunities to enable alternative fuels and AVT to be more widespread in the region and conduct studies if necessary; and
- Pull relevant stakeholders together to commit to ensuring that existing infrastructure is compatible with alternative fuels and AVT, constructing additional alternative fuel infrastructure, and to using AVT.

Table 5. Relative Importance of Engaging Various Partners

✓ = Very Important

	Potential Partner	Technological	Planning	Programmatic
Local/ Regional	Municipalities and counties	✓		✓
	Regional Transportation Authority	✓		✓
	Chicago Area Clean Cities	✓	✓	
	Chicago Department of Aviation	✓		✓
	Illinois International Port District			✓
	Clean Air Counts	✓	✓	
	CREATE			✓
	Academia	✓		
State	Office of the Governor		✓	✓
	Department of Commerce and Economic Opportunity		✓	✓
	Department of Transportation	✓	✓	✓
	Environmental Protection Agency		✓	
	Department of Agriculture	✓	✓	✓
Multi- State	Environmental Protection Agency (Region 5)		✓	✓
	Midwest Governors Association		✓	✓
Federal	Department of Agriculture	✓	✓	✓
	Department of Energy	✓	✓	✓
	Department of Transportation		✓	✓
	Environmental Protection Agency		✓	✓
Other	Private sector	✓		✓
	Non-profit organizations (including state and national associations)		✓	

Source: U.S. DOT/Volpe Center

- CMAP's ideal *programmatic partner* on alternative fuels and AVT would fund or help fund projects that CMAP and other stakeholders determine are viable.

Tables 6 to 10 show how potential partners can fill aspects of each of these roles when working with CMAP on alternative fuels and AVT. These tables represent a rough representation of the roles that these partners can fill based on the activities in which they are currently engaged. Any of these partners could expand or otherwise change their roles over time. Partners that are not as well known in the context of alternative fuels and AVT are described below each table.

Local/Regional Partners

- *Chicago Area Clean Cities (CACC)*. CACC is a voluntary organization dedicated to encouraging the use of clean fuels and clean vehicle technologies in the Chicago metropolitan area. www.chicagocleancities.org/index.shtml
- *Clean Air Counts*. Clean Air Counts is a northeastern Illinois regional initiative to reduce ozone-causing emissions, thereby improving air quality and enabling economic development. It is a collaborative effort between the Metropolitan Mayors Caucus, City of Chicago, U.S. EPA Region 5, and Illinois EPA. www.cleanaircounts.org/index.aspx
- *CREATE*. CREATE is a first-of-its-kind partnership between U.S. DOT, the State of Illinois, City of Chicago, Metra, Amtrak, and the nation's freight railroads to invest in critically needed improvements to increase the efficiency of the region's rail infrastructure and the quality of life of Chicago-area residents. www.createprogram.org/
- *Academia*. Area universities, such as the University of Chicago, DePaul University, Loyola University, University of Illinois, and Northwestern University, can be important partners in conducting research and data analysis and implementing alternative fuel and AVT fleets.

State Partners

- *Illinois Department of Commerce and Economic Opportunity (DCEO)*. DCEO is the lead state agency responsible for improving Illinois' competitiveness in the global economy. Using a regional approach, DCEO administers a wide range of economic and workforce development programs, services, and initiatives designed to create and retain high quality jobs and build strong communities. DCEO's Division of Energy promotes the efficient use of energy resources – including renewable transportation fuels – through a variety of technical, demonstration, and grant programs.
- *Illinois Department of Transportation*. The Illinois Department of Transportation's mission is to provide safe, cost-effective transportation for Illinois in ways that enhance quality of life, promote economic prosperity, and demonstrate respect for the environment. www.dot.state.il.us/default.asp
- *IL EPA*. The mission of the IL EPA is to safeguard environmental quality, consistent with the social and economic needs of the State, so as to protect health, welfare, property and the quality of life. IL EPA helps administer Illinois Green Fleets and the Alternate

Table 6. Local/Regional Partners

	Municipal- ities and counties	Regional Transportation Authority	Chicago Area Clean Cities	Chicago Department of Aviation	Illinois International Port District	Clean Air Counts	CREATE	Academia
Technological Attributes								
Gather/supply data	✓	✓	✓	✓		✓		✓
Implement technology demonstration projects	✓	✓	✓	✓		✓		
Planning Attributes								
Educate/perform outreach			✓			✓		
Identify needs/opportunities and conduct studies	✓	✓	✓	✓		✓		✓
Bring together stakeholders			✓			✓	✓	
Programmatic Attributes								
Fund/leverage funding for alternative fuels and AVT	✓	✓		✓	✓		✓	

Table 7. State Partners

	Office of the Governor	Illinois Department of Commerce and Economic Opportunity	Illinois Department of Transportation	Illinois Environmental Protection Agency	Illinois Department of Agriculture
Technological Attributes					
Gather/supply data		✓	✓	✓	✓
Implement technology demonstration projects			✓		✓
Planning Attributes					
Educate/perform outreach	✓	✓	✓	✓	✓
Identify needs/opportunities and conduct studies	✓	✓	✓	✓	✓
Bring together stakeholders	✓	✓	✓	✓	✓
Programmatic Attributes					
Fund/leverage funding for alternative fuels and AVT	✓	✓	✓		✓

- Fuels Rebate Program, which provides rebates for businesses, local governments, organizations, and individuals in Illinois who acquire an alternate fuel vehicle, convert an existing conventional vehicle to an alternate fuel vehicle, or purchase domestic renewable fuel to operate an alternate fuel vehicle. www.illinoisgreenfleets.org/fuels/index.html

IL EPA also administers the Illinois Clean School Bus Program, which provides funding to assist schools and school districts to reduce emissions from diesel-powered school buses through emission control retrofits; bus replacements; implementation of cleaner fuels, including biodiesel, propane, and natural gas; and support for emissions reduction policies, including those related to idle reduction. www.epa.state.il.us/air/cleanbus

In the past, IL EPA has also conducted various outreach activities to educate ethanol production companies, farmer co-ops, financial institutions and design and building consultants on the steps to constructing, operating and maintaining successful ethanol plants. www.epa.state.il.us/agriculture/building-an-ethanol-plant.pdf

- *Illinois Department of Agriculture.* The Illinois Department of Agriculture is an advocate for Illinois' agricultural industry, including the development of feedstock-based, renewable fuels. The department provides the necessary regulatory functions to benefit consumers, agricultural industry, and natural resources. www.agr.state.il.us/about/index.html

Table 8. Multi-State Partners

	Environmental Protection Agency (Region 5)	Midwest Governors Association
Technological Attributes		
Gather/supply data		
Implement technology demonstration projects	✓	✓
Planning Attributes		
Educate/perform outreach	✓	
Identify needs/opportunities and conduct studies	✓	✓
Bring together stakeholders		✓
Programmatic Attributes		
Fund/leverage funding for alternative fuels and AVT	✓	✓

- *U.S. EPA Region 5.* U.S. EPA Region 5's priorities for the Midwest and Great Lakes derive from the Administrator's action plan; the agency's emerging work in eco-regions; joint priorities negotiated with states and tribes and finally, the measures used to track the region's annual performance. The Air and Radiation Division, along with state, local and tribal partners, is responsible for helping to achieve and maintain clean and breathable air in the Great Lakes area. Areas of responsibility include air monitoring, air policy and regulation, and air enforcement. www.epa.gov/Region5/

- *Midwest Governors Association*. The MGA is a nonprofit, nonpartisan organization that brings together the governors of 12 states to work cooperatively on public policy issues of significance to the Midwestern region. Last year, the MGA held an Energy Summit (www.midwesterngovernors.org/energysummit.htm), which included several presentations on biofuels. The MGA has also produced information on biobased fuels available at: www.midwesterngovernors.org/Publications/Biobased_Products_Transportation.pdf.

Table 9. Federal Partners

	Department of Energy	Department of Transportation	Environmental Protection Agency	Department of Agriculture
Technological Attributes				
Gather/supply data	✓			✓
Implement technology demonstration projects	✓	✓	✓	
Planning Attributes				
Educate/perform outreach	✓	✓	✓	
Identify needs/opportunities and conduct studies	✓	✓	✓	
Bring together stakeholders	✓	✓		
Programmatic Attributes				
Fund/leverage funding for alternative fuels and AVT	✓	✓	✓	

- *U.S. DOE*. The DOE’s overarching mission is to advance the national, economic, and energy security of the United States; to promote scientific and technological innovation in support of that mission; and to ensure the environmental cleanup of the national nuclear weapons complex. www.energy.gov/
 - *Alternative Fuels and Advanced Vehicles Data Center (AFDC)*. The AFDC provides publications, reports, and newsletters related to plug-in hybrid electric vehicles. www.afdc.energy.gov/afdc/
 - *Energy Information Administration (EIA)*. EIA is a statistical agency of the U.S. DOE. The agency’s mission is to provide policy-neutral data, forecasts, and analyses to promote sound policy making, efficient markets, and public understanding regarding energy and its interaction with the economy and the environment. www.eia.doe.gov/fuelrenewable.html
 - *National Renewable Energy Laboratory (NREL)*. NREL is the nation’s primary laboratory for renewable energy and energy efficiency research and development. Its mission and strategy are focused on advancing the U.S. DOE's and the nation's energy goals. www.nrel.gov/
 - *Office of Energy Efficiency and Renewable Energy (EERE)*. EERE works to strengthen the country’s energy security, environmental quality, and economic vitality in public-private partnerships. In early May 2009, \$786.5 million from

the ARRA was allocated to EERE's Biomass Program to accelerate advanced biofuels research and development and to provide additional funding for commercial-scale biorefinery demonstration projects. EERE's Vehicle Technologies Program is developing more energy efficient and environmentally friendly highway transportation technologies that will enable the country to use less petroleum. EERE's State Energy Program provides grants to states and directs funding to state energy offices from the EERE's technology programs. www.eere.energy.gov/

- *U.S. DOT*. The mission of the Department is to serve the U.S. by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets the nation's vital national interests and enhances the quality of life of the American people, today and into the future. www.dot.gov/index.cfm
 - *The John A. Volpe National Transportation Systems Center*. The Volpe Center is part of the U.S. DOT's Research and Innovative Technology Administration and is a fee-for-service federal organization. The Volpe Center's work is performed for federal agencies and state, regional, local, and international entities. The Volpe Center has conducted research, modeling, and stakeholder involvement on alternative fuels and AVT. www.volpe.dot.gov
- *U.S. EPA*. U.S. EPA promotes and expands the use of environmentally beneficial alternative fuels and vehicles by providing the states with tools, such as benefits models, State Implementation Plan Credits, the National Clean Diesel Campaign, and the Clean Fuels Fleet program. In spring 2009, the National Clean Diesel Campaign awarded \$86.5 million from the ARRA to states for clean diesel activities. EPA also coordinates with the DOE and DOT so that their Energy Policy Act and Transportation Equity Act of the 21st Century programs promote alternative fuels and vehicles having the greatest environmental gains. www.epa.gov/oms/consumer/fuels/altfuels/altfuels.htm
- *U.S. Department of Agriculture (USDA)*. Information on USDA's website related to alternative fuels and fleet efficiency program focuses on USDA's fleet of vehicles. www.da.usda.gov/energyandenvironment/altfuels/index.html
 - *National Agricultural Library (NAL)*. The NAL is one of four national libraries of the U.S. The NAL houses one of the world's largest and most accessible agricultural information collections and serves as the nexus for a national network of state land-grant and U.S. Department of Agriculture field libraries. www.nal.usda.gov/

Private sector

- *Ethanol conversion manufacturers* – For example, Flex Fuel U.S. is a manufacturer of ethanol conversion kits located in Chicago. The kits enable gasoline-powered vehicles to run with any combination of E85 and gasoline. <http://flexfuelus.com/>

Table 10. Other Partners

	Private Sector	Non-profit Organizations and Associations
Technological Attributes		
Gather/supply data	✓	✓
Implement technology demonstration projects	✓	
Planning Attributes		
Educate/perform outreach	✓	✓
Identify needs/opportunities and conduct studies		✓
Bring together stakeholders		✓
Programmatic Attributes		
Fund/leverage funding for alternative fuels and AVT	✓	

Non-profit organizations and associations

- *Illinois Energy Association.* The Illinois Energy Association assists in coordinating the activities of its member utilities before the Illinois General Assembly and the U.S. Congress. The Energy Association also is involved in utility industry initiatives with various federal and state regulatory agencies. www.ilenergyassn.org/mbrcompanies/ipc.asp
- *Illinois Oil and Gas Association.* The Illinois Oil and Gas Association serves as an agency through which oil and gas producers, land owners, royalty owners, and others who may be directly or indirectly affected by or interested in oil and gas development and production in Illinois, may protect, preserve and advance their common interests. www.ioga.com
- *Illinois Petroleum Marketers Association (IPMA) and Association of Convenience Stores (IACS).* IPMA/IACS is a non-profit organization that promotes a more profitable marketing environment for the petroleum marketers and convenience store operators doing business in Illinois. www.ipma-iacs.org/i4a/pages/index.cfm?pageid=1
- *Illinois Propane Gas Association (IPGA).* IPGA promotes the safe and varied uses of propane, sponsors education and safety programs for persons in the industry, and educates the public as propane consumers through the cooperation of its members. www.ilpga.org/trades_costs.cfm
- *Illinois Soybean Association* (sponsor of Chicago Clean Cities). The Illinois Soybean Association is the statewide organization for Illinois soybean farmers. The farmers on its board administer soybean checkoff funds to support research, promotion and educational programs designed to increase demand for Illinois soybeans and administer legislative and membership programs. www.ilsoy.org/

- *International Association for Natural Gas Vehicles (IANGV)*. IANGV was established in 1986 to provide the NGV industry with an international forum and to foster growth, safety, product development and policy formation. www.iangv.org/
- *Illinois 2H2*. The Illinois 2H2 Partnership was established by the Illinois Coalition and stakeholders in the hydrogen and fuel cell arena to create an industry cluster centered on the development of hydrogen as an energy carrier. The Partnership released “The Hydrogen Highway: Illinois' Path to a Sustainable Economy and Environment,” which serves to organize a statewide effort in creating a sustainable economic and environmental impact for Illinois through hydrogen and fuel cell technology advancement. The plan promotes establishing a “Hydrogen Highway,” a corridor of hydrogen energy demonstration projects situated around Interstate 90. This organization has not had recent activity, and its current existence is uncertain. <http://releases.usnewswire.com/printing.asp?id=28056>
- *National Biodiesel Board (NBB)*. The NBB is the national trade association representing the biodiesel industry as the coordinating body for research and development in the United States. It was founded in 1992 by state soybean commodity groups, who were funding biodiesel research and development programs. Since that time, the NBB has developed into a comprehensive industry association, which coordinates and interacts with a broad range of cooperators including industry, government, and academia. www.biodiesel.org/

Section 3: Alternative Fuel and AVT Options

This section provides an overview of alternative fuels and AVT. Table 11 compares the general time horizons for alternative fuels to become potentially pervasive in the Chicago region. Appendix 4 contains an in-depth discussion of the types of alternative fuels and AVT options.

Table 11. Time Horizons for Alternative Fuels

	Fuel	CNG	LNG	Propane	Biodiesel	Methanol	Ethanol	Electricity	Hydrogen
Timeframe	Near-term	✓	✓	✓	✓	✓	✓	✓	
	Mid-term	✓	✓	✓	✓	✓	✓	✓	
	Long-term				✓	✓	✓	✓	✓

Natural gas and propane are non-renewable fuels considered to be alternative fuels. Natural gas is used in vehicles as compressed natural gas (CNG) and liquid natural gas (LNG). Of all alternative transportation fuels in use domestically, propane is the most widely used. Propane is often used in non-road applications such as forklifts, construction, and agricultural vehicles. Nationally, the viability of natural gas and propane as effective near-term fuels for local and urban fleets is strong, especially in scenarios where operators plan to replace vehicles and use centralized fueling and distribution systems. A drawback of natural gas and propane use is that GHG reduction benefits may be less pronounced on a lifecycle basis despite the petroleum displacement and localized air quality benefits provided.

Biofuels, which include ethanol, biodiesel, and methanol, currently exist and can be used in all vehicle types. Ethanol and biodiesel offer a near-direct petroleum displacement benefit and thus offer energy security and air quality benefits. Ethanol, however, requires more frequent refueling than gasoline because it contains 27 percent less energy. Additionally, there is debate regarding the lifecycle emissions benefits of biofuels. While availability is limited nationwide, the Chicago region’s proximity to the nation’s biofuels production centers in the Midwest may help the region overcome the near- and long-term distribution challenges others in the country likely face and may support regional economic development goals as well.

Electricity refers to the presence and flow of electric direct or alternating currents. Because of its versatility as a source of energy, electricity is rapidly becoming included in transportation fuels’ discussions. At present, electric vehicles (EVs) are not typically advantageous for GHG lifecycle reductions, as most vehicles now charge from coal-based electricity. In Illinois, however, nuclear power generates about half of the state’s total electricity consumed, which is a higher proportion than in other states, while just under half is generated from coal and a smaller

percentage from natural gas.⁴⁵ It should be noted, however, that with the deregulation of the electric grid, energy used in northeastern Illinois may come from several other states, some of which have higher percentages of coal-based power generation. More details about this will be included in the forthcoming CMAP “snapshot” profiling the region’s energy.

Hydrogen as a transportation fuel, especially in applications powered by fuel cells, is currently viewed as the ultimate form of sustainable transportation. Considerable research and development are needed before overcoming existing vehicle and production challenges. Significant progress is yet to be made in realizing energy efficiencies and/or total lifecycle GHG emissions reductions. For these reasons, hydrogen is not viewed as a near-term alternative fuel option for the Chicago region.

AVTs consist of hybrid mechanical, pneumatic, or hydraulic systems, as well as some that operate entirely electrically. Hybrids paired with a conventional drivetrain are commonplace today, and offer benefits in carbon emissions, increased reliability, and extended maintenance intervals. Transit agencies across the country have used hybrid diesel buses to decrease fuel consumption and maintenance and operational costs, along with small reductions in GHG emissions. In Chicago, the CTA has purchased over 150 hybrid buses as a strategy to lower emissions, fuel use, and maintenance costs after the successful pilot program involving 20 hybrid buses was completed in 2008. CTA’s Budget Office calculates that every \$0.10 change in the price per gallon of fuel increases expenses by \$2.4 million and estimates the fuel economy of the new hybrid buses to be a 100 percent improvement over the buses they are replacing.⁴⁶ Hybrids are based on a near-term technology that has matured to a point at which hybrids are as commercially viable as conventional vehicles.

⁴⁵ Energy Source by State: Illinois. U.S. Department of Energy, Energy Information Administration. 2005.

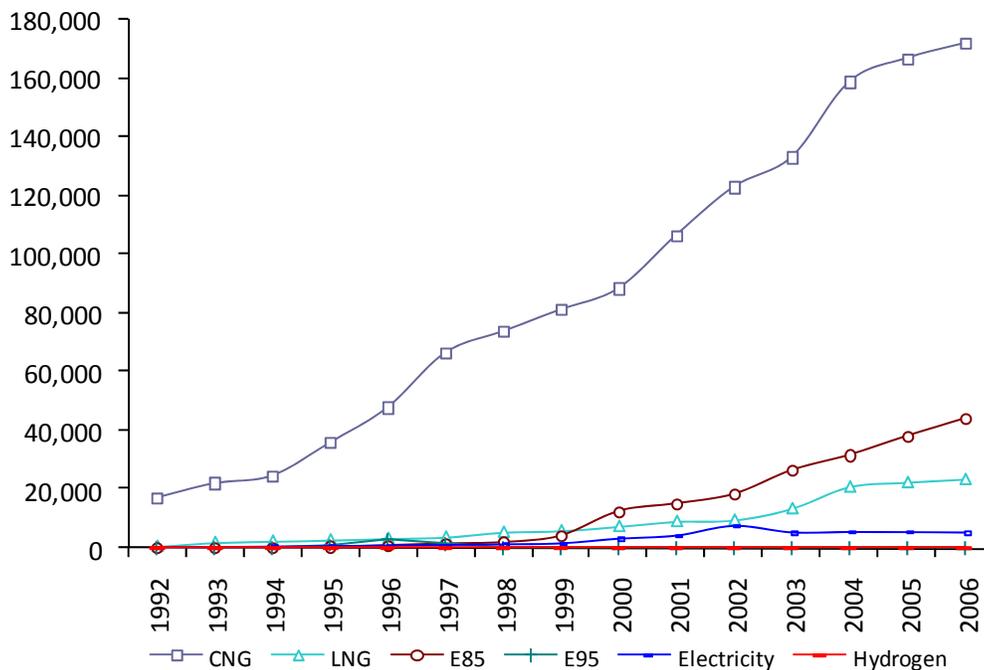
⁴⁶ CTA to Evaluate Battery-Powered Hybrid Electric Bus, Chicago Transit Authority Press Release. www.transitchicago.com/news/default.aspx?ArticleId=134. June 17, 2008.

3.1 Alternative Fuel and AVT Trends

Over the last fifteen years, consumption of most alternative fuels by fleet vehicles has grown nationwide. Throughout the country, CNG has been the most widely used alternative fuel, with E85 historically being a distant second. Figure 1 shows the estimated consumption of six different alternative fuels in the United States from 1992 through 2006. With the EISA helping drive significant increases in ethanol production, it is expected that ethanol consumption will also experience additional growth in the near term.

Figure 1. Estimated Consumption of Alternative Fuels by AFVs in the U.S. (thousand gasoline gallon equivalents)

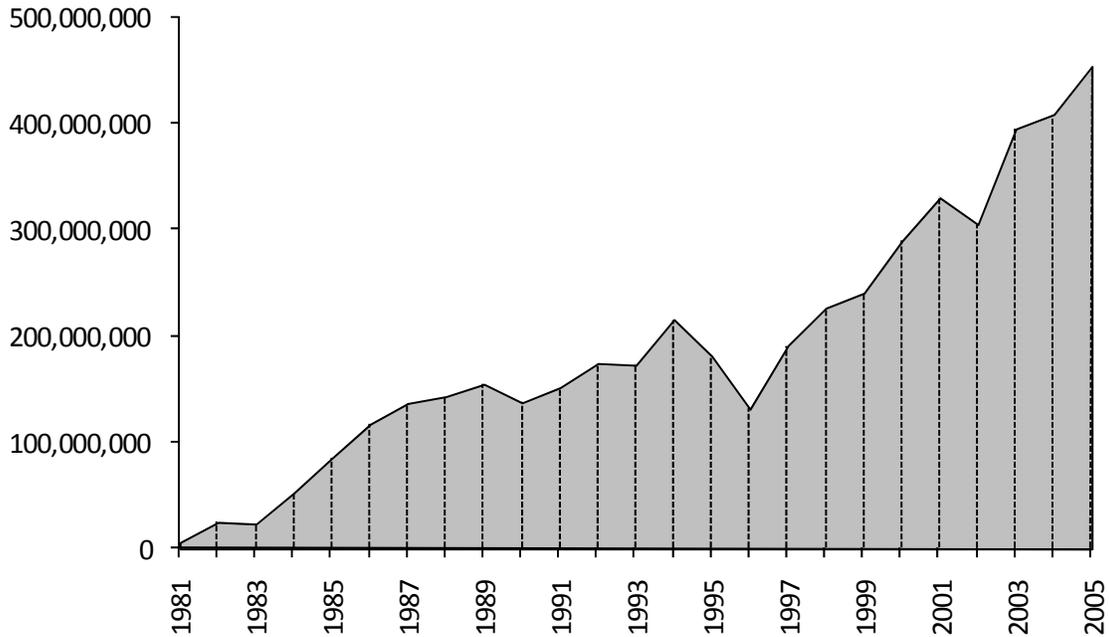
Source: Energy Information Administration. www.eia.doe.gov/emeu/aer/contents.html



Historical data on ethanol use in Illinois, pictured in Figure 2, offers additional indication of the fuel's growing prevalence. In 2005, 4.2 percent of the nation's alternative fueling stations were located in Illinois, the 16th highest percentage in the country.

Figure 2. Historical Ethanol Consumption in Illinois (gallons/year)

Source: DOE Energy Efficiency and Renewable Energy



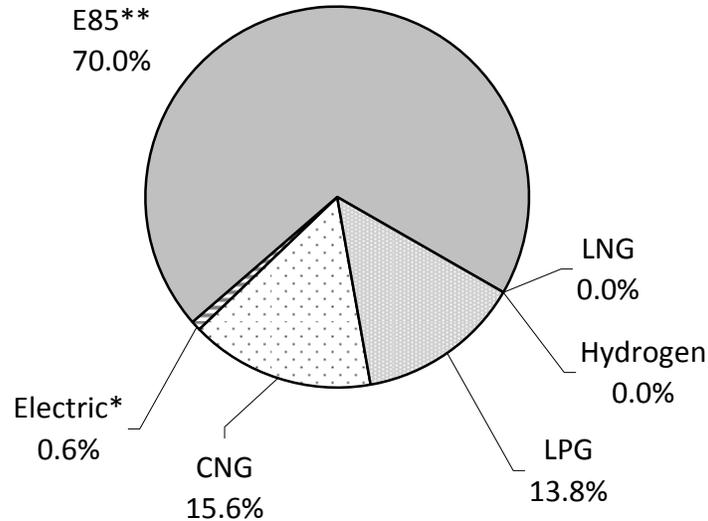
In 2005, Illinois accounted for 12.8 percent of the total ethanol volume consumed in the United States.

apps1.eere.energy.gov/states/transportation.cfm/state=IL

While E85 is currently the most commonly used alternative fuel in Illinois in terms of number of AFVs using it, other fuel types are becoming increasingly promising options. As Figure 3 shows, CNG and propane, which is also known as liquefied petroleum gas (LPG), comprise nearly a third of the alternatively-fueled vehicles in use in Illinois. Currently, it is likely that electricity and hydrogen are alternative fuel options that will be available in longer-term time horizons.

Figure 3. Estimated Number of AFVs in Use in Illinois, by Fuel Type, 2006

Source: Energy Information Administration. www.eia.doe.gov/alternate/page/atftables/afvtransfuel_II.html



*Excludes gasoline-electric and diesel-electric hybrids.

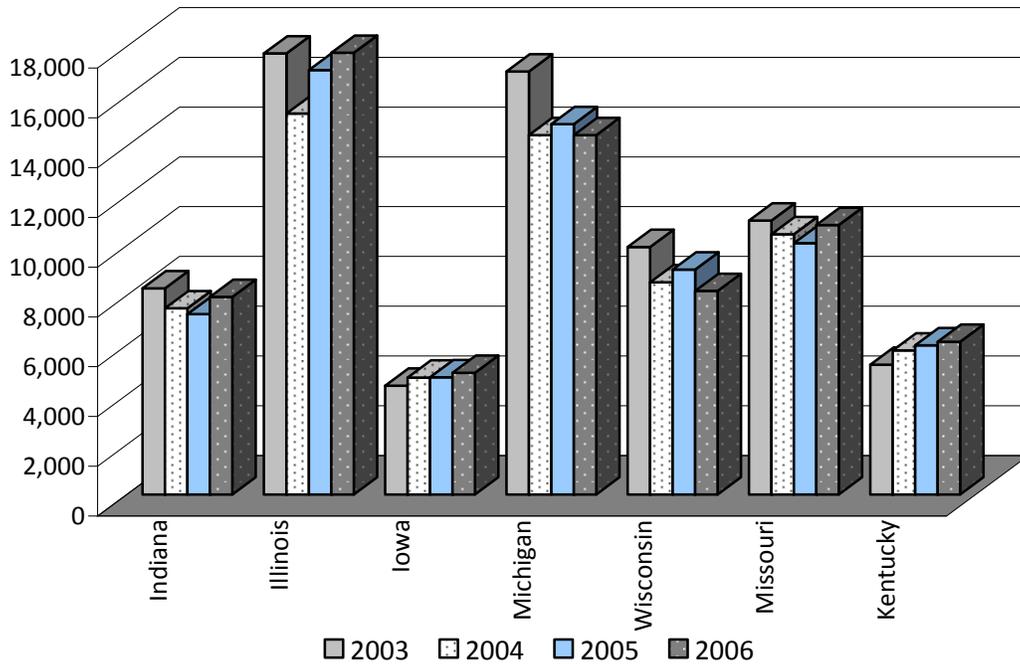
**Excludes E85 vehicles used by private individuals (non-fleet users) because most of those are believed to be in use as traditional gasoline-powered vehicles.

Note: Vehicles in use do not include concept and demonstration vehicles that are not ready for delivery to end users.

Among other states in the Midwest region, Illinois had the highest number of AFVs in use from 2003 through 2006. Figure 4 provides comparison. While AFV use per capita is lower than most other neighboring states (Illinois' population is considerably higher than most neighboring states), AFV use data suggest that the infrastructure necessary to widely deploy and promote alternative fuels in the state is already in place or being established.

Figure 4. Estimated Number of AFVs in Use by Midwestern State, 2003—2006

Source: Energy Information Administration



Note: Excludes gasoline-electric and diesel-electric hybrids. Excludes E85 vehicles used by private individuals (non-fleet users) because most of those are believed to be in use as traditional gasoline-powered vehicles. Vehicles in use do not include concept and demonstration vehicles that are not ready for delivery to end users.

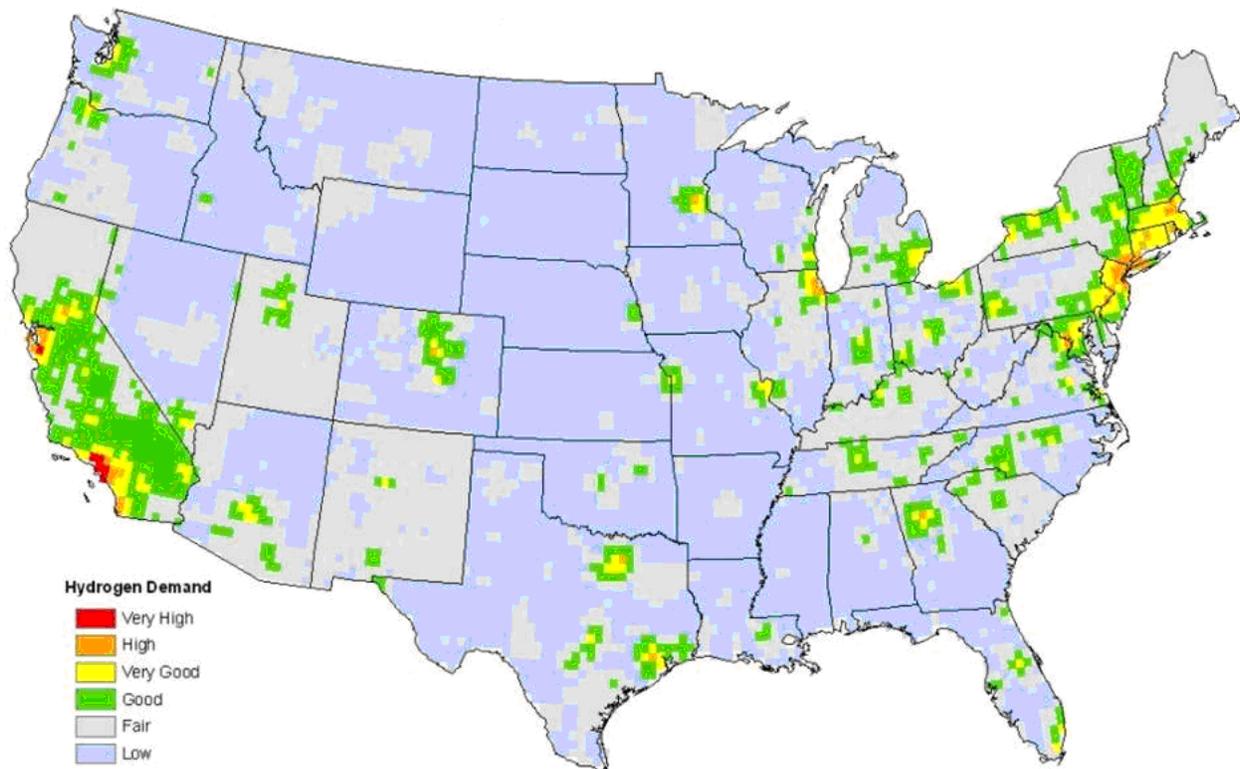
A 2006 study by the National Renewable Energy Laboratory⁴⁷ used geographic information systems (GIS) to analyze demographic, socio-economic, transportation, and policy data that influence hydrogen demand (Figure 5). The demand scenarios were used to estimate infrastructure needs and usage throughout the country and to predict transition infrastructure costs. According to the authors of this study:

Using literature relating to alternative fuel deployment, along with the transportation sector's experience and expertise in this area, key attributes of consumers and policies were identified as critical for market acceptance of hydrogen vehicles. Consumer attributes are those that describe the consumer themselves, such as income, education level, and the number of vehicles they own. Policy attributes are those that are the result of external factors that influence the market for hydrogen vehicles, such as government incentives and local air quality. These attributes lay the foundation for a national look at how these efforts combine, resulting in the most preferred or likely locations for hydrogen demand to grow.

Based on this analysis, Chicago ranked sixth as the metropolitan area with the greatest relative likelihood of adopting hydrogen vehicles behind New York, Los Angeles, San Francisco, Boston, and Philadelphia.

Figure 5. Hydrogen Infrastructure Demand Consumer Strategy

Source: National Renewable Energy Laboratory. www.nrel.gov/gis/images/map_hydrogen_consumer_strategy.jpg

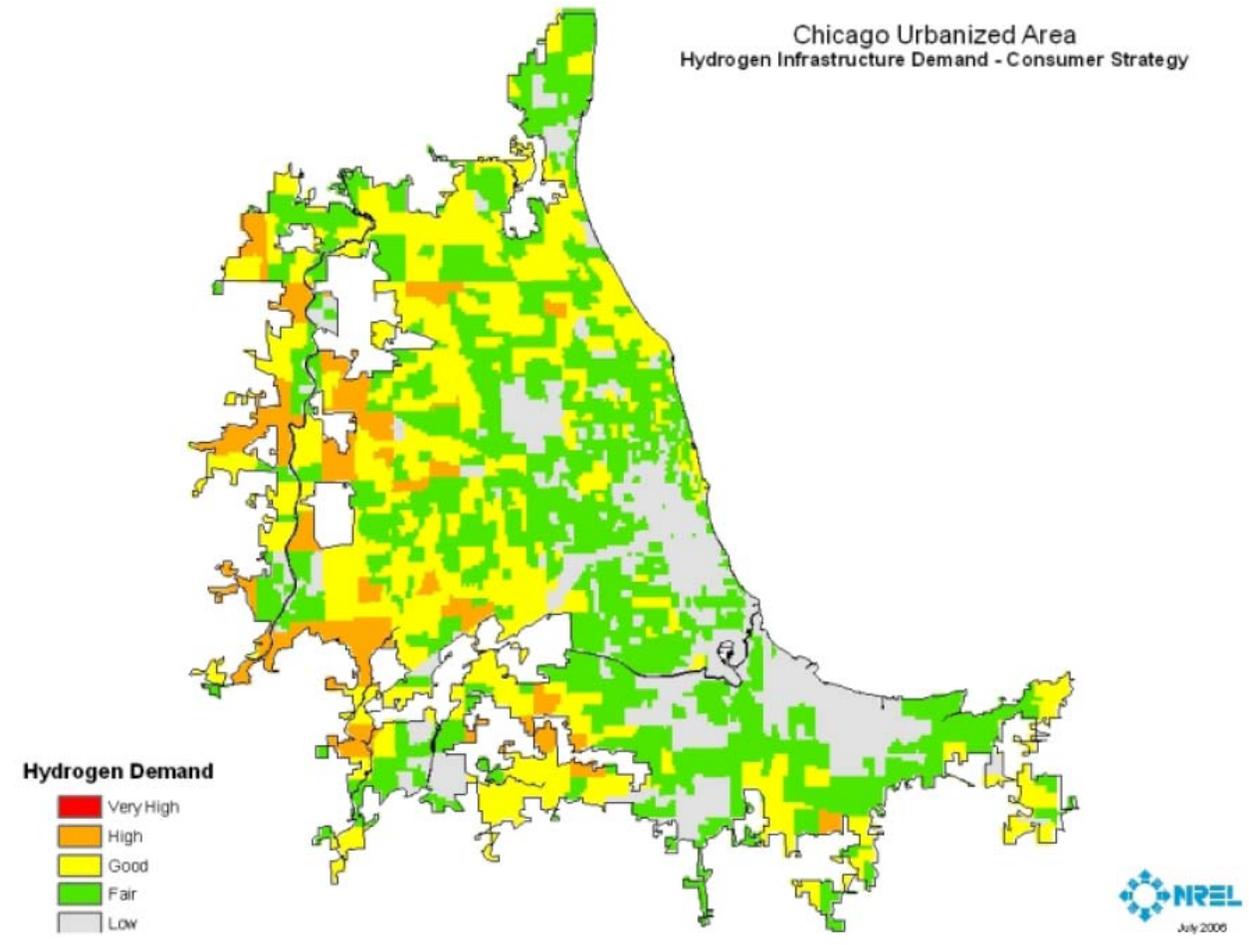


⁴⁷ Melendez, M., and A. Milbrandt. *Geographically Based Hydrogen Consumer Demand and Infrastructure Analysis*. Technical Report prepared under Task No. HF65.8310. NREL/TP-540-40373, October 2006. www.afdc.energy.gov/afdc/pdfs/geographic_hydrogen_demand.pdf

The results of this national-level analysis led to an initial analysis of a few metropolitan areas at the census tract level to identify suitable infrastructure within the metropolitan area. The results of this analysis for Chicago are presented in Figure 6.

Figure 6. Chicago Urbanized Area Hydrogen Infrastructure Demand—Consumer Strategy

Source: National Renewable Energy Laboratory. www.nrel.gov/hydrogen/pdfs/40373.pdf



Another study by the National Renewable Energy Laboratory⁴⁸ estimates the biomass resources available in the United States by analyzing biomass feedstock data both statistically and graphically using GIS. The results of this study are presented in Figure 7. As a state, Illinois, which ranks second in total biomass resources, ranks:

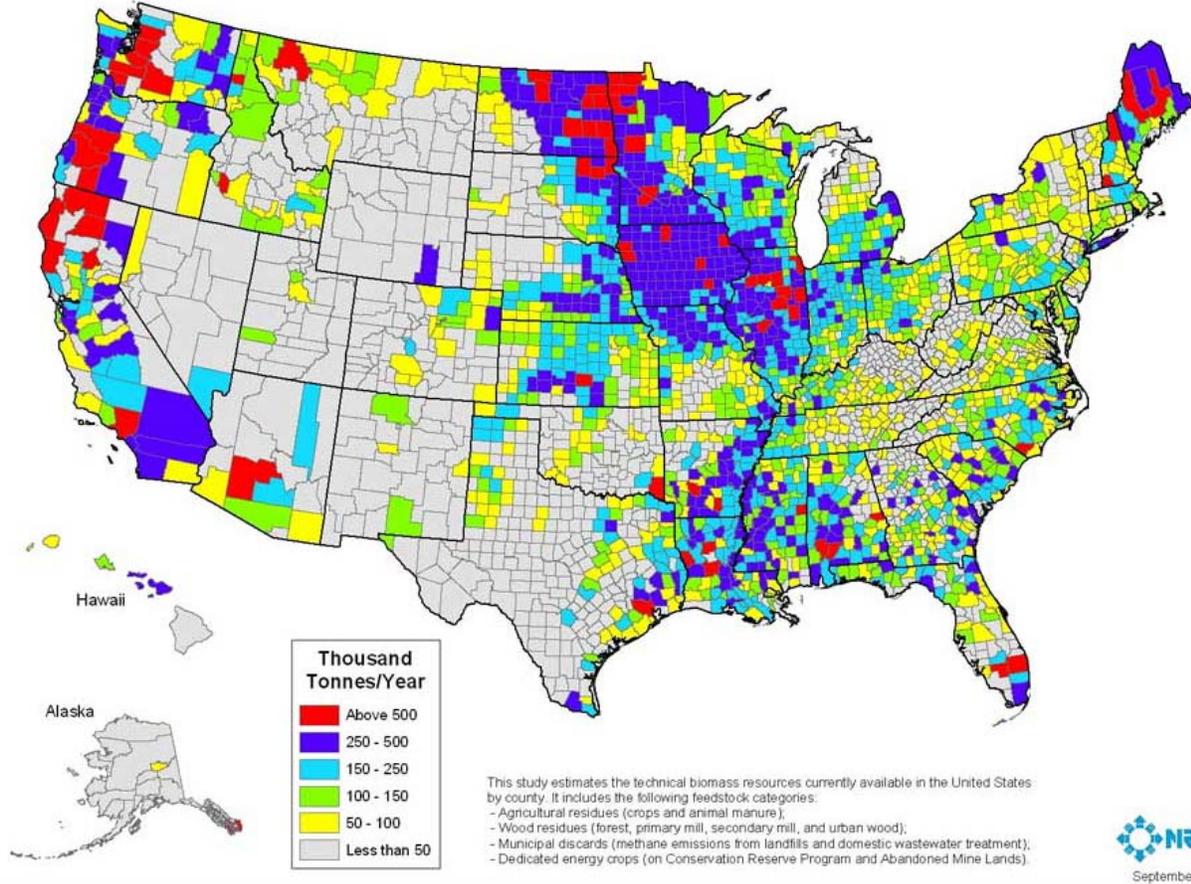
- 2nd in crop residues
- 6th in switchgrass on Conservation Reserve Program lands
- 30th in forest residues
- 2nd in methane from landfills
- 10th in methane from manure management

⁴⁸ Milbrandt, A. *A Geographic Perspective on the Current Biomass Resource Availability in the United States*. Technical Report prepared under Task No. HY55.2200. NREL/TP-560-39181, December 2005. www.nrel.gov/docs/fy06osti/39181.pdf

- 31st in primary mill wood resources
- 9th in secondary mill wood resources
- 5th in urban wood resources
- 5th in methane from domestic wastewater resources

Figure 7. Biomass Resources Available in the United States

Source: National Renewable Energy Laboratory. www.nrel.gov/gis/images/map_biomass.jpg



Section 4: Opportunities

There is no single model that best illustrates the ideal roles for MPOs in alternative fuels and AVT planning. Roles are rapidly being defined and evolving. Additionally, there are no direct statutory or regulatory Federal roles for MPOs in considering or regulating use of alternative fuels or the deployment of AVT or supportive infrastructure. However, the planning requirements in SAFETEA-LU do encourage MPOs to include consideration of energy “to protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.”⁴⁹ Additionally, alternative fuel and AVT use can help MPOs meet Clean Air Act Amendment criteria pollutant attainment levels.

CMAP can set the stage for substantive future collaboration with new and existing partners through the on-going planning process by demonstrating the relevance of widespread alternative fuels use to its goals for the region. To do so, CMAP can perform a variety of functions. Opportunities for involvement can be grouped into three, broad categories, analogous to the roles partners can play outlined in Section 2:

- Technological opportunities;
- Planning opportunities; and/or
- Programmatic opportunities.

Technological opportunities refer to near-term activities related to the demonstration and evaluation of various innovations and technical improvements. Planning opportunities are strategic, regional, and long-term in nature. They are associated with actions CMAP might take to advance alternative fuel use directly in the on-going long-range planning process. Programmatic opportunities generally are most obviously shorter-term and more explicit (e.g., programming of funding from the Congestion Mitigation and Air Quality Improvement Program [CMAQ] in the TIP) than planning opportunities. Longer term, the use of other flexible funding sources for alternative fuels or AVT could be established within the MPO’s planning process.

While some activities within the opportunity areas may overlap, the following sections describe potential, high-level CMAP roles within each. Table 12 summarizes these roles.

4.1 Technical Opportunities

While important as a learning tool for improving technologies, testing implementation, and addressing regulatory issues, a fleet introduction strategy alone has not been shown to be an entirely successful approach to deploying alternative fuel technologies. Finding ways to garner consumer acceptance is equally important.⁵⁰ The alternative fuels industry, perhaps with support from academia, will likely be the leader in developing the innovations that could result in the widespread market penetration and acceptance of alternative fuels. Rising and fluctuating fuel

⁴⁹ FHWA, Linking Land Use and Transportation: www.fhwa.dot.gov/Planning/ppasg.htm

⁵⁰ National Renewable Energy Laboratory. February 2006.
www.afdc.energy.gov/afdc/pdfs/lessons_learned_2006.pdf

costs, increasing air pollution, and the need to develop local economies will likely guide industry’s effort to be innovative.

Table 12. Summary of Potential CMAP Roles

		Existing/Near Term						Long Term	
		CNG	LNG	Propane	Biodiesel	Methanol	Ethanol	Electricity	Hydrogen
Technical	Conduct emissions modeling	✓	✓	✓	✓	✓	✓	✓	✓
	Provide mapping expertise				✓	✓	✓		
	Provide technical assistance to partners	✓	✓	✓	✓	✓	✓	✓	✓
	Support technology demonstration project(s)							✓	✓
Planning	Integrate alternative fuels and AVT into the goals of <i>GO TO 2040</i> .	✓	✓	✓	✓	✓	✓	✓	✓
	Create or participate in an alternative fuel and AVT program.	✓	✓	✓	✓	✓	✓	✓	✓
	Establish a lead education, outreach, and coordination role	✓	✓	✓	✓	✓	✓	✓	✓
	Conduct and/or collaborate on land use, emissions, and other related studies	✓	✓	✓	✓	✓	✓	✓	✓
	Plan to fund infrastructure supporting alternative fuels and AVTs	✓	✓	✓	✓	✓	✓	✓	✓
	Plan to fund alternatively-fueled public vehicles and/or fleets	✓	✓	✓				✓	✓
	Promote regional adoption of green taxicab policies							✓	
	Help relevant stakeholders develop alternative fuels and AVT-use incentives				✓	✓	✓	✓	✓
	Encourage more stringent regional GHG emission targets	✓	✓	✓	✓	✓	✓	✓	✓
	Tie alternative fuel and AVT use in with local and regional climate action planning processes	✓	✓	✓	✓	✓	✓	✓	✓
	Provide municipalities assistance revising security and emergency management practices, as necessary				✓	✓	✓	✓	✓
	Use land use planning to promote effective deployment of alternative fuels and AVTs	✓	✓	✓	✓	✓	✓	✓	✓
Program-matic	Develop criteria for selecting projects that advance alternative fuels use	✓	✓	✓	✓	✓	✓	✓	✓
	Consider creating grant program specifically for alternative fuels use							✓	✓
	Fund alternatively-fueled public vehicles, fleets, and/or supporting infrastructure	✓	✓	✓	✓	✓	✓	✓	✓

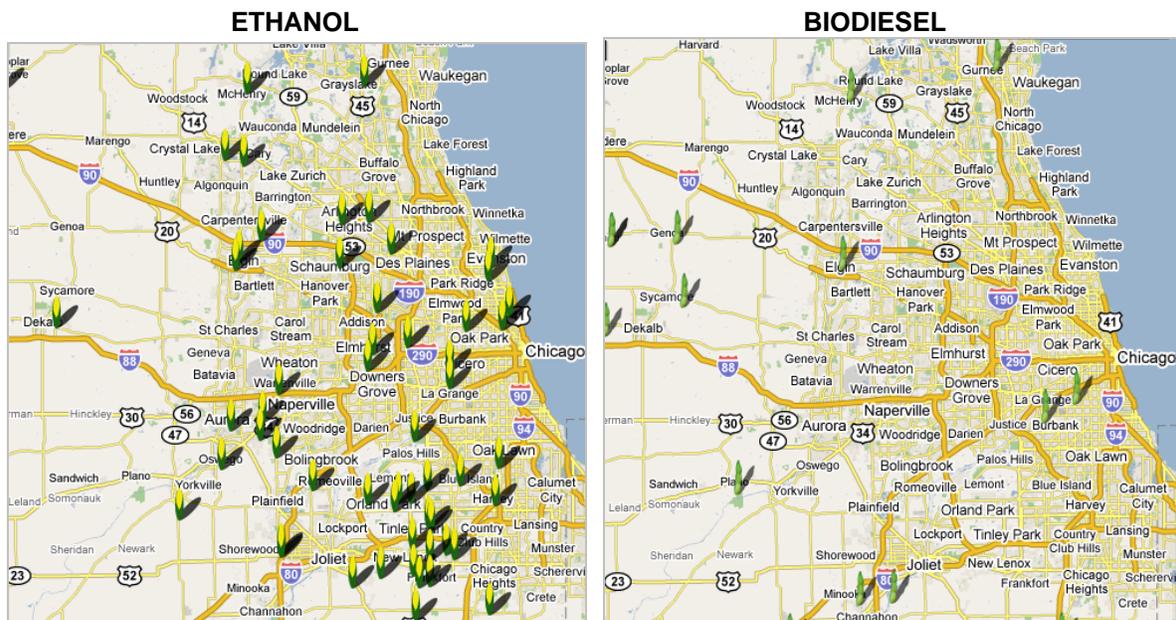
In general, some actions CMAP could take to support the effort to make technological advancements are:

Conduct emissions modeling. CMAP can model emissions from the various alternative fuel technologies or acceptance scenarios. One approach would be to use MOBILE 6.2 or its successor, MOVES, to model the impacts on emissions levels given different situations of alternative fuel vehicle market penetration in the region. Results could be used to endorse economic, environmental, and/or energy policy statements. *Timing: near-term to on-going.*

Provide mapping expertise. CMAP could also conduct or coordinate alternative fuels mapping analyses for the region, especially for biofuels. Some mapping analyses have been previously completed. For example, the “E-85 Clean Energy Infrastructure Development Program” is a grant from the Illinois Clean Energy Community Foundation. Over recent years, the program, which is part of the Governor’s Opportunity Returns initiative, identified and filled E-85 fueling station gaps in 11 priority areas in the state. Up to 50 percent of the cost for the conversion of an existing station to allow for E-85 operation or up to 30 percent of the cost for construction of a new E-85 refueling facility or major modification to an existing facility was provided.⁵¹ At present, there are approximately 75 E-85 fueling stations and 10 biodiesel fueling stations within 50 miles of Chicago (see Figure 8 for locations of public stations). Since these fuels currently have the greatest potential for pervasive near-term deployment, additional mapping analyses may offer insight on areas of deficient alternative fuel availability.

Figure 8. Public Ethanol and Biodiesel Refueling Stations in Chicago Region

Source: Illinois Green Fleets, www.illinoisgreenfleets.org and U.S. DOE Alt Fuels Locator, www.afdc.energy.gov/afdc/stations/find_station.php



CMAP can also conduct alternative fuels impact analysis mapping to evaluate the travel patterns and land use and development implications (e.g., would increased electricity generation capacity be needed?) associated with proliferation of these fuels’ use. As an example, hydrogen—unlike

⁵¹ Illinois E-85 Infrastructure Development Program: www.commerce.state.il.us/dceo/Bureaus/Energy_Recycling/Energy/Renewable+Fuels/03E85_Infrastructure.htm

biofuels—is incompatible with most existing fueling station infrastructure. New recharging/fueling stations near major roadway arteries would likely be necessary to ensure wide and even hydrogen availability. In this case, analysis of the impacts of alternative fuels use could provide insight on where new stations should be built so that consumers did not need to travel long distances to refuel their vehicles, as well as how the new stations presence might affect other economic, social, and environmental considerations.⁵² *Timing: near-term to on-going.*

Provide technical assistance to partners. CMAP can offer technical assistance on alternative fuels to municipalities, counties, and agencies in the Chicago region. Specifically, working with Chicago Area Clean Cities, CMAP could provide a “hotline” service for managing the response to the public’s questions on alternative fuels. In the absence of a centralized response network, questions would likely be directed to local government staff that may or may not be able to give consistent answers. CMAP can also help organize any necessary public meetings and outreach activities associated with alternative fuels, so that individual mayors (local governments) are not repeatedly tasked with technical response and interaction regarding the fuels.

CMAP can help evaluate and publicize alternative fuel use as well. On December 3, 2008, CTA began using plug-in, electric-hybrid buses that run on battery power for most of the day.⁵³ Approximately 20 of a planned 150 of the buses have been deployed. CMAP can help distribute to outlying counties and communities in the region lessons learned from Chicago’s experience in using these and other (e.g., CNG) alternatively-fueled vehicles.

To staff a hotline and to publicize and evaluate alternative fuel use, CMAP would likely need to hire an alternative fuels expert/coordinator. This staff position could coordinate other alternative fuels work in which CMAP would be involved, such as the mapping and modeling activities described above, and work closely with Chicago Area Clean Cities. Having an expert on staff would demonstrate CMAP’s commitment to alternative fuel use in the region. *Timing: near-term to on-going.*

Support technology demonstration project(s). CMAP can coordinate with municipalities, auto manufacturers, and other relevant stakeholders (e.g., utility companies) to conduct a demonstration project for fuel alternatives that are to be available on a longer time horizon, namely electric plug-ins and hydrogen. For example, a city or county’s motor vehicle fleet could be replaced with electric- or hydrogen-powered vehicles as part of a controlled evaluation. Performance data could be provided to relevant groups to assist with emissions estimations, production decisions, and feasibility analyses. *Timing: longer term.*

⁵² SANDAG is currently undertaking a similar effort. In its *Alternative Fuels Infrastructure Study*, SANDAG is analyzing appropriate locations for alternative fuel infrastructure to best leverage geographic, institutional, financial and environmental resources. The study is also intended to investigate vehicle and fuel types that are most likely to be adopted, assessing such factors as supply issues, environmental impacts, regulatory mandates, and financing models. www.sandag.org/index.asp?projectid=339&fuseaction=projects.detail

⁵³ www.transitchicago.com/news/default.aspx?Archive=y&pg=6&All=y&ArticleId=541

4.2 Planning Opportunities

Several planning opportunities exist for CMAP, some of which are currently being pursued, as evidenced by the forthcoming regional GHG inventory and regional energy profile. Most, if not all, of these opportunities require close coordination with the Chicago Area Clean Cities coalition to maximize resources and to avoid redundancy. A handful of MPOs, such as those in Albany and Dallas/Ft. Worth, successfully administer their metropolitan areas' Clean Cities programs. By pursuing some of the opportunities described below, CMAP can be well-positioned to accept this responsibility should the need arise.

Integrate alternative fuels and AVT into GO TO 2040. As a first step in integrating alternative fuel and AVT use and deployment in the region into its planning process, CMAP should integrate alternative fuels and AVT as a key strategy of *GO TO 2040*. Similar to how other MPOs have integrated alternative fuels and AVT into their LRTP, CMAP can specify alternative fuels and AVT as part of the objectives, strategies, and/or actions to achieve its environmental or climate change goals. Specifying alternative fuel and AVT use and deployment at this level provides the foundation for CMAP to pursue other alternative fuel and AVT opportunities. As part of these objectives, strategies, or actions, CMAP may want to mention explicitly how it intends to work closely with the Chicago Area Clean Cities coalition on advancing the region's alternative fuel and AVT use. *Timing: near-term.*

Create or participate in an alternative fuel and AVT program. Similar to NYMTC's Regional Clean Fuels program, CMAP can create a program to promote the use and deployment of alternative fuels and AVT. This program can be the umbrella under which CMAP can pursue other opportunities. *Timing: near- to longer term.*

Establish a lead education, outreach, and coordination role. CMAP is well-positioned to market alternative fuels and AVT in the region and guide the region's assessment of the viability of and requirements for widespread alternative fuels penetration and AVT implementation. NCTCOG's Transportation and Air Quality Marketing Program Area can serve as a basis for CMAP's education and outreach work. Work on educating the public and stakeholders on alternative fuels and AVT could stand alone or be incorporated into other current initiatives.

CMAP can also coordinate the activities of a variety of stakeholders, including municipalities, school districts, transit fleet operators, state and federal agencies, and groups like Chicago Area Clean Cities. Workshops, advisory committees (such as MetroPlan's Clean Air Team or NYMTC's Clean Technology Group), and/or technical panels could be convened at the regional level to discuss alternative fuel topics such as the development of new fueling facilities, the dissemination of results from alternative fuel models and studies, and possibilities for public-private partnerships (PPP). Regarding the latter, CMAP could identify candidate PPP projects and conduct both the benefit-cost analysis for them and safeguard the public's interest by using the agency's experience to engage the public in meaningful ways. *Timing: near-term to on-going.*

Conduct and/or collaborate on land use, emissions, and other related studies. Land use decisions affect transportation movement and will likely play a significant role in enabling or

hindering the proliferation of alternative fuels and AVT. To help ensure that land use planning accommodates and encourages alternative fuels infrastructure development and access, CMAP can conduct primary research or collaborate on land use, emissions, and bottleneck—among other—studies undertaken by other entities in the region.

For example, in terms of GHG emissions, CMAP currently has no regulatory authority, and, therefore, does not formulate or administer rules and regulations pertaining to vehicular emission controls. However, regulatory agencies within the region are implementing or considering a number of additional vehicle emission control measures and related actions that promise GHG emission reductions. CMAP can help these agencies assess the sensitivity of air quality models to various changes in fuel split as based on the region's transportation model. Such research could help improve the implementation of air quality investment programs and/or ridesharing policies.

Longer term, research into the development issues surrounding hydrogen and electric vehicle use will likely be necessary. Considerations surrounding the construction of site electric rapid chargers (for PHEVs) or hydrogen fueling stations (for hydrogen-powered vehicles) will need to be addressed at municipal and state levels. Through the long-range planning process, CMAP can help municipalities identify issues such as where to locate the stations to provide even regional coverage (e.g., through mapping and transportation model runs), the compatibility of neighboring cities/regions/states' alternative fuels decisions, and local zoning issues that may arise (e.g., station locating or zoning changes to accommodate additional electricity generation capacity and/or hydrogen storage). In one example, the State of Washington, in partnership with Oregon and California, is exploring opportunities for partnerships with the private sector and other public agencies to analyze the feasibility of distributing alternative fuels along Interstate 5. CMAP could perform a similar role at the regional level.⁵⁴ *Timing: near-term to on-going to longer term.*

Plan to fund infrastructure supporting alternative fuels and AVTs. CMAP can plan to implement activities that would help ensure that the infrastructure necessary to sustain alternative fuels and AVT is in place. For example, federal regulations require underground storage tank (UST) systems to be compatible with the substance stored in the tank. Most UST systems currently used to store conventional gasoline are not rated for use with ethanol blends greater than 10 percent. Similar issues currently inhibit the storage of other alternative fuels. CMAP could plan to fund studies to identify where uncertified UST and pumps were and/or develop strategies to help filling stations become certified.

Another example where infrastructure deficiencies could limit alternative fuel use in the region is at rail terminal facilities. Unlike petroleum fuels, currently pipelines do not transport biofuels. Given the region's proximity to a majority of the nation's bio-refineries, it is expected that biofuels will be a primary alternative fuel source for the region, at least initially. CMAP could help municipalities assess how increased biofuels shipments would impact development in and around rail terminals (e.g., are terminal facilities adequate? [new terminals currently take four to

⁵⁴ www.wsdot.wa.gov/NR/rdonlyres/032ED091-D629-41E6-A1A9-748C35FDCAD3/51672/AlternativeFuels_folio.pdf

five years to complete]; would rail to truck transloading create undesired traffic, safety, development concerns?; etc.). A shift to electric or hydrogen vehicles would likely create similar questions regarding infrastructure placement and sufficiency. *Timing: near-term.*

Plan to fund alternatively-fueled public vehicles and/or fleets. CMAP could develop a policy – separate from or as a distinct component of CMAQ – that supports the purchase of new, or the retrofitting of existing vehicles to, alternatively-fueled vehicles that local governments and/or the region’s transit agencies operate. Some potential targets are garbage trucks, road sweepers, buses, airport vehicles/fleets, and law-enforcement vehicles. Related activities are already in progress. For example, the City of Chicago is currently ordering hybrid diesel versions of an aerial bucket truck, a shuttle bus for use at O’Hare International Airport, and a refuse truck. This policy could be similar to the policies surrounding H-GAC’s Clean Vehicles funding program. *Timing: near- to longer term.*

Promote regional adoption of green taxicab policies. The City of Chicago has a taxicab ordinance that encourages taxicab companies to add hybrid vehicles to their fleets. License holders with a fleet of more than 50 cabs are required to have at least one hybrid in that fleet.⁵⁵ Some have proposed that beginning 2009, every new or replacement cab be either gas-electric hybrid or fueled by biofuels, propane, or hydrogen.⁵⁶

CMAP can develop a policy statement encouraging all counties and municipalities in the region to consider similar green taxicab policies, as a shift to AVT taxis is likely coupled with significant emissions reductions given that the Chicago metropolitan area has the second largest number of taxicabs in the nation.⁵⁷ CMAP could also facilitate the convening of focus groups (of stakeholders such as taxicab companies) to discuss opportunities and concerns related to an incremental conversion to alternatively-fueled fleets. *Timing: longer term.*

Help relevant stakeholders develop incentives for alternative fuels and AVT use. A majority of low-fuel economy vehicles often remain in the fleet for long periods of time.⁵⁸ Unless tax rebates or other incentives increase market penetration and/or fleet renewal rates, it may take many years for complete fleet renewal, especially for private and consumer fleets.⁵⁹ CMAP can provide stakeholders assistance incentivizing individuals’ and companies’ use of alternative fuels and AVT. Some examples of incentives are a tax or excise tax credit program, parking priority, HOV-lane access, and variable toll-pricing.⁶⁰ *Timing: longer term.*

⁵⁵ City of Chicago, Department of Environment Press Release: Wednesday, February 8, 2006

⁵⁶ Finance Committee Chairman Edward M. Burke (14th Ward) and Transportation Committee Chairman Tom Allen (38th Ward) have proposed that Chicago’s entire fleet of 6,700 taxicabs go green by January 1, 2014. www.wbbm780.com/pages/2357646.php?

⁵⁷ The Changing Face of Taxi and Limousine Drivers. July 6, 2004. www.schallerconsult.com/taxi/taxidriver.pdf

⁵⁸ U.S. DOT Volpe Center. *Alternative Fuels Roadmap*. Preliminary draft, January 2009.

⁵⁹ U.S. DOT Volpe Center. *Alternative Fuels Roadmap*. Preliminary draft, January 2009.

⁶⁰ “Policies to Promote Plug-in Hybrid Electric Vehicles for Greenhouse Gas Emissions Reductions and Oil Displacement” offers examples of additional policy incentives to promote PHEV use. Samaras, Constantine, et al. www.trb.org/am/ip/paper_detail.asp?paperid=28536

Encourage stringent regional GHG emission targets. As discussed in the U.S. DOT/Volpe Center’s Climate Change and Energy Action Strategy Paper done for CMAP⁶¹, and incorporated into the forthcoming GHG inventory and regional energy profile, CMAP can incorporate the use of energy and GHG-related performance measures, including the concept of “carbon-equivalent” budgeting, in *GO TO 2040* scenarios or policies. CMAP can also work with its partners to devise and adhere to more stringent regional GHG emission targets. CMAP can then model and evaluate GHG emission reductions associated with alternative fuels and AVT use in the transportation plan. *Timing: near-term.*

Provide municipalities with assistance in revising security and emergency management practices, as necessary. Increased traffic of alternatively-fueled vehicles pose new security and emergency management challenges. CMAP is uniquely positioned to help the region develop plans to address emergency response considerations. For example, many emergency responders are not aware that foams used for fuel fire suppression are incompatible with some biofuels (e.g., alcohol fuels like ethanol and methanol). CMAP could help educate emergency responders in the region’s communities on the need to be equipped with the appropriate foams. When the risks of other alternative fuels are planned for and mitigated, CMAP can help disseminate “effective practice” information to communities throughout the region. *Timing: near-term.*

Tie alternative fuel and AVT use in with local and regional climate action planning processes. CMAP could align targets, such as those defined by the Chicago Clean Cities program and anticipated in the forthcoming GHG inventory and regional energy profile, with strategies that provide both a measure of programs’ success and a means by which a local authority could take responsibility or make a commitment to reduce its per capita carbon footprint by a predetermined percent over a given time period. This could enable CMAP to work with local municipalities to create not only voluntary climate action plans, but also transparent policy initiatives to achieve measurable results by monitoring key indicators. Climate action plans could also revolve around long-range planning activities, such as CMAP’s *GO TO 2040* plan, and could incorporate segmented policy periods. This would allow energy and emissions inventories to be surveyed and the effectiveness of current policies to be evaluated and modified as necessary. *Timing: near- to longer term.*

Use land use planning to promote effective deployment of alternative fuels and AVTs. Land-use and public transit planning in CMAP’s core activities directly complement alternative fuels and AVT deployment. In the case of land use planning, smart growth strategies in *GO TO 2040* that increase urban density and reduce driving distances promote the viability of alternative refueling infrastructure and limited-range AVTs. Lack of refueling/recharging infrastructure is a primary barrier to alternative fuels and AVTs, and smart growth increases user proximity to infrastructure and reduces the overall number of stations that must be built. It also enables wider use of limited-range vehicles, such as plug-in electric vehicles. *Timing: longer term.*

⁶¹ www.goto2040.org/uploadedFiles/publications/snapshot_series/CC_Energy_Paper_10-15-08.pdf

4.3 Programmatic Opportunities

Assuming goals for alternative fuels and AVT are outlined in the *GO TO 2040* regional plan, there are opportunities for CMAP—through its TIP funding decisions—to ensure near-term actions reflect regional plan goals (as well as those in Chicago’s Climate Action Plan), including:

Develop criteria for selecting or screening projects that advance alternative fuels use. CMAP can develop selection or screening criteria for the funding of alternative fuel-related projects. These criteria can be used when selecting projects for the LRTP and for funding through the TIP. Given that most municipalities converting their fleets to alternatively-fueled vehicles currently use gaseous fuels (CNG, LNG, or propane)⁶², Table 1 only highlights these and the long-term fuels for this potential CMAP role. *Timing: near- to longer term.*

Consider creating a grant program specifically for alternative fuel and AVT innovation. CMAP can develop a grant program designed to encourage municipalities, counties, and agencies to develop and/or support innovative alternative fuel use activities. The grant program could support partnerships among communities and industry to fully integrate alternative fuel technology and/or support infrastructure into the region. *Timing: longer term.*

Fund alternatively-fueled public vehicles, fleets, and/or supporting infrastructure. Similar to H-GAC’s Clean Vehicles funding program, CMAP can program funding that promotes and accelerates the full adoption of a regional green fleet. For example, transit fleets in the region are an ideal market for alternative fuels since the vehicles are centrally-fueled and many vehicles can be fueled by a single station, thereby ensuring a steady load on the station, which improves viability. This activity could include, among other activities:

- The dedication of funding to purchase alternative fuel vehicles in the region;
- The dedication of funding to assist in identifying alternative fuel infrastructure (e.g., storage tank and pump certification) gaps;
- An evaluation of the benefits of specific GHG emission reductions related to different green-vehicle penetration scenarios;
- An assessment of the benefits from a “Cash-for-Clunkers” program;
- Support for incentives for early vehicle retirement and the purchase of alternatively-fueled replacements; and
- Promoting adoption of California Low-Emission Vehicle standards and/or regional policies that encourage alternative fuel infrastructure in the region.

Likely partners include the state legislature, fleet managers, auto manufacturers, and/or local government agencies. *Timing: near- to longer term.*

⁶² Seventy-five CNG vehicles, 234 E-85 vehicles, and 215 hybrid vehicles have been deployed in Chicago. Source: City of Chicago Department of Fleet Management – Alternative Fuel Program.

4.4 Potential Funding Sources

There is a wide variety of funding sources available for alternative fuel activities. The Clean Cities Coalition maintains updated information on funding resources, and encourages coordination with the local Clean Cities lead⁶³. Aside from traditional funding sources, localized collaboration with regional partners can result in promising projects and new funding opportunities. According to a Clean Cities fact sheet, “For example, Kentucky’s Commonwealth Clean Cities Partnership initiated a project to convert six buses at Mammoth Cave National Park to propane. From this modest beginning, the coalition established a network of new projects and funding sources with partners that included the National Park Foundation, the U.S. DOE, the Propane Education and Research Council, propane and car dealers, an equipment installer, and a nationwide resort company.”⁶⁴ Additionally, the Cape Cod National Seashore entered into a Cooperative Research and Development Agreement (CRADA) with the Wentworth Institute of Technology, the U.S. DOT/Volpe Center, an electric-drive systems integrator, and a manufacturer of a natural gas micro turbine. “Outside-the-box” thinking, and partnering with local agencies, businesses, or learning institutions can help generate projects that, if successful, can lead to future funding opportunities and partnerships.

Traditional funding sources include but are not limited to, Federal grants (Grants.gov), DOE Grants, EPA grants, FedBizOpps, CMAQ funds, Foundation Center funds (foundationcenter.org), and EERE’s State Energy Program, which received \$3.1 billion from the ARRA – a substantial increase over previous years’ total annual funding of under \$100 million per year for formula grants and special projects.⁶⁵ There are also funding opportunities for specific alternative fuels from various nationwide proponent groups such as the National Biodiesel Board, National Ethanol Vehicle Coalition, Natural Gas Vehicle Coalition, Electric Drive Transportation Association, Propane Education and Research Council, and the National Hydrogen Association. Additionally, automakers, federal and state programs offer rebates and incentive programs for alternative fuels or fuel efficient vehicles. Up-to-date information can be found in the Vehicle Buyer’s Guide for Consumers.⁶⁶

The State of Illinois offers rebates for alternative fuel projects and vehicle purchases through the Illinois Green Fleets Program⁶⁷ and provides assistance in ethanol and biodiesel development projects.⁶⁸

⁶³ Chicago Area Clean Cities Coalition: www.chicagocleancities.org/index.shtml.

⁶⁴ “Funding Alternative Fuel Activities,” U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Clean Cities Coalition, April 2003.

⁶⁵ EERE, State Energy Program, About the Program: apps1.eere.energy.gov/state_energy_program/funding_states.cfm

⁶⁶ U.S. Department of Energy, Alternative Fuels and Advanced Vehicles Data Center: www.afdc.energy.gov/afdc/progs/vehicles_search.php.

⁶⁷ Illinois Environmental Protection Agency, Illinois Green Fleets: www.illinoisgreenfleets.org.

⁶⁸ Illinois Environmental Protection Agency, Agricultural Information Center, Alternative Fuels: www.epa.state.il.us/agriculture/alternative-fuels.html.

Section 5: Next Steps

There are many opportunities for CMAP to play a significant role in promoting and deploying alternative fuels and AVT in the Chicago region. While other MPOs are involved in this work to varying degrees – both working with and without key partners – CMAP has the opportunity to be a leader within Illinois and nationally among MPOs on these important emerging issues. Involvement in these issues will complement several key goals being considered for *GO TO 2040*, including climate change mitigation, energy conservation, and economic development.

The key question CMAP must answer is how involved does it want to be with alternative fuels and AVT. Six potential roles are summarized below, none of which are mutually exclusive. Which combination of roles to emphasize has implications for how to incorporate alternative fuels and AVT in *GO TO 2040*. Companion questions to address are:

- What are the necessary steps CMAP needs to take to assume its desired role(s)?
- How quickly can roles be translated into concrete actions?
- What are the implications of inaction?
- What type of fuel/technology should be supported?

5.1 Use in GO TO 2040 Scenario Building

CMAP's level of support of alternative fuels and AVT in the region and the region's alternative fuel and AVT use in general have important implications for developing the *GO TO 2040* scenarios. Depending on the degree of use, alternative fuels and AVT can have a significant impact on the region's GHG emissions and criteria air pollution. Various degrees of supporting these technologies can be reflected in the scenarios. For the most part, the alternative fuels and AVT strategy will be included in the "innovate" scenario, but that does not preclude other, related strategies from the "preserve" or "reinvest" scenarios.

As part of an approach to alternative fuels, CMAP may consider the location of alternative fuel infrastructure, including fueling stations and bio-refineries, in its scenarios so that it can accurately evaluate that the impacts of location decisions for these facilities. CMAP may also wish to consider land conservation for growing fuel stocks – in areas where more land is conserved, more fuel stocks could be grown closer to biorefineries in the Chicago region. This proximity positively impacts transportation distances and costs, related environmental impacts, and the quality of life in the region. However, there are other concerns about the use of regional agricultural land for biofuels production; these are not explored in this paper, but are described in more detail in CMAP's work on agricultural preservation.

5.2 Audience

The audience for CMAP's alternative fuel and AVT work is similar to the potential partners discussed earlier and includes four general groups:

- Public sector – local, county, or state agencies or authorities

- Private sector – fuel providers, fleet managers, agriculture, and major industries and their associations (e.g., taxi cab association)
- Non-profits – advocacy, planning, and environmental organizations
- Academia – universities

Depending on the role CMAP assumes, CMAP should reach out to these groups to coordinate its activities with their work.

5.3 Potential Roles

The following roles are complementary, not mutually exclusive; that is, they can be combined in various ways to support implementation of the regional vision. Each role involves pursuing a combination of the opportunities discussed earlier. To fill any of the first four roles, CMAP would need to increase resources available to focus on alternative fuel and AVT issues.

Leader – As a leader, CMAP could convene an MPO-based group of alternative fuel and AVT stakeholders and develop a program to support alternative fuels and AVT in the region. This support could be accomplished through undertaking any or all of the technical, planning, and programming activities discussed in this paper.

Technical Expert – As a source of expertise, CMAP could pursue each of the technical opportunities discussed earlier by being involved in the alternative fuel and AVT work of other agencies and organizations to ensure that technical work is topical, related to transportation planning, and relevant to the region.

Alternative Fuels Planner – As an alternative fuels planner, CMAP could pursue each of the planning opportunities discussed earlier. CMAP should be involved with other agencies' and organizations' alternative fuel and AVT activities to ensure that its planning work is topical, valuable, regionally relevant, and integrated into transportation planning and decision-making processes in the region.

Advocate – As an advocate, CMAP could promote and market alternative fuels and AVT in the region. To be current with the state of the practice, CMAP should join existing alternative fuel and AVT partnerships and organizations in the region and should keep track of and publicize promising new technologies and opportunities for its regional partners to pursue.

Funder – Considering CMAP's leadership in guiding funding for regional transportation investments, it could work closely with its partners to pursue each of the programmatic opportunities discussed earlier, thereby channeling more transportation funds to alternative fuel and AVT projects in the region.

Participant – As a participant, CMAP could join existing alternative fuel and AVT partnerships and organizations and provide support as appropriate.

CMAP could also define its role by first pursuing a few targeted opportunities and then incrementally pursue additional opportunities to ultimately assume one of the roles described

above. This kind of evolving role could either be specialized (i.e., technical, planning, advocacy, or funding) or more general and ambitious, such as becoming a leading alternative fuel and AVT agency in the region. An incremental approach would allow CMAP to establish a complementary regional role in support of partners with more direct responsibilities for alternative fuel and AVT issues. Regardless of the roles CMAP assumes, CMAP should coordinate its work on alternative fuels and AVT with the Chicago Clean Cities Coalition, since it has a presence in most major metropolitan areas and a relationship with the U.S. DOE that has helped it develop a significant level of expertise in the field.

Related Resources

Greene, David, Jason Zhou and W.T. Wilson. *Consumer Choice of E85: Lessons from Minnesota's Experience*. TRB 09-3018. TRB Annual Meeting 2009, submitted August 1, 2008.

This study estimates the sensitivity of aggregate demand for E85 to the relative availability of E85 versus gasoline at retail outlets, as well as the sensitivity of E85's market share to the prices of E85 and gasoline. Monthly data from the state of Minnesota for the period 1997 to 2008 are used to estimate a model of E85 choice by owners of flexible fuel vehicles.

Hickman, Robin, Olu Ashiru and David Banister. *Achieving Carbon Efficient Transport: Backcasting from London*. TRB 09-0476. TRB Annual Meeting 2009.

This study discusses important policy levers for promoting alternative fuels penetration.

Khanna, Madhu. *Meeting the Demand for Biofuels: Implications for Land Use, Greenhouse Gas Emissions and Nitrogen Use*. University of Illinois Urbana-Champaign. Presented at the Farm Foundation's Conference: Transition to a Bioeconomy: Environmental and Rural Development Impacts. St. Louis, MO, October 15-16, 2008.

<http://www.farmfoundation.org/news/articlefiles/401-Madhu%20Khanna.pdf>

Letendre, Steven and Richard Watts. *Effects of Plug-In Hybrid Electric Vehicles on the Vermont Electric Transmission System*. TRB 09-2542. TRB Annual Meeting 2009.

Lindsey, Marshall, et al. *The Effect of Residential Location on Vehicle Miles of Travel, Energy Consumption and Greenhouse Gas Emissions: Chicago Case Study*. TRB 09-2919. TRB Annual Meeting 2009, submitted August 1, 2008.

This study uses recent Chicago data to explore the effect of residential location on household VMT patterns, which directly affect energy consumption and GHG emissions. Household travel-survey data were used to explore spatial variation in VMT, as well as EC and GHG emissions, accounting for the vehicle types reported in the survey

Melendez, M., and A. Milbrandt. *Geographically Based Hydrogen Consumer Demand and Infrastructure Analysis*. Technical Report prepared under Task No. HF65.8310. NREL/TP-540-40373, October 2006.

Milbrandt, A. *A Geographic Perspective on the Current Biomass Resource Availability in the United States*. Technical Report prepared under Task No. HY55.2200. NREL/TP-560-39181, December 2005.

Sperling, Daniel, and Deborah Gordon. *Two Billion Cars: Driving Toward Sustainability*. Oxford University Press, January 2009.

Tursun, Umit Deniz, et al. *Optimal Biomass Transportation and Biorefinery Locations in Illinois*. University of Illinois Urbana-Champaign. Presented at the Farm Foundation's Conference: Transition to a Bioeconomy: Environmental and Rural Development Impacts. St.

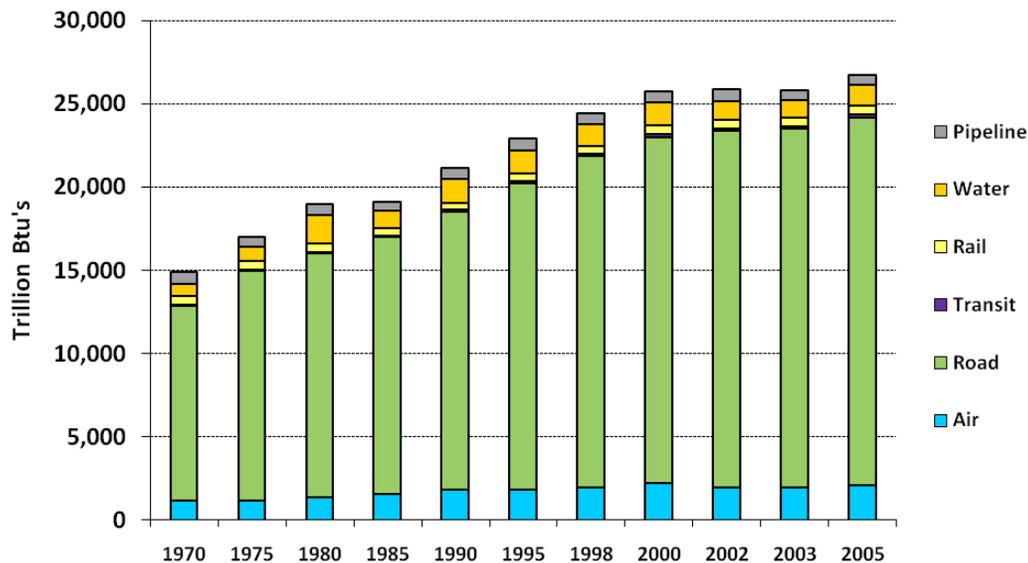
Action Strategy Paper for CMAP: *Alternative Fuels and Advanced Vehicle Technologies*, page 53
U.S. DOT/Volpe Center

Louis, MO, October 15-16, 2008. http://www.farmfoundation.org/news/articlefiles/401-Scheffran%20FF_Transportation.pdf

Appendix 1: National Context

Transportation alone consumes the most energy of all major domestic economic sectors, of which 98 percent demand is met by petroleum-based (non-renewable) fuel sources. On-road (non-transit) transportation makes up over 80 percent of all transportation energy consumption (Figure 1.1).⁶⁹

Figure 1.1. Energy Consumption by Transportation Mode, 1970-2005



Three factors drive overall transportation-based petroleum demand and, ultimately GHG emissions: (1) the petroleum content of transportation fuels, (2) vehicle fuel efficiency, or economy, and (3) the total VMT. Essentially, reducing transportation based energy consumption and GHG or CO₂ emissions involves (1) switching petroleum-based fuels for alternative fuels, (2) developing more fuel efficient vehicles, or (3) reducing the number of miles that people drive. In the United States, the most effective policies would incorporate *all* of these measures.

Trends show that Americans are spending more time driving alone and are traveling longer distances. Since 1980, the number of miles that Americans drive has grown three times faster than the U.S. population, and almost twice as fast as vehicle registrations. Figure 1.2 shows how fast VMT has outpaced U.S. population growth since 1970 and how dramatically this trend is projected to continue in the future.⁷⁰ This is not surprising, considering that approximately 90 percent of all person-miles traveled in the U.S. are in private vehicles (trains, walking, bicycles, airplanes, etc., make up the other 10 percent).⁷¹

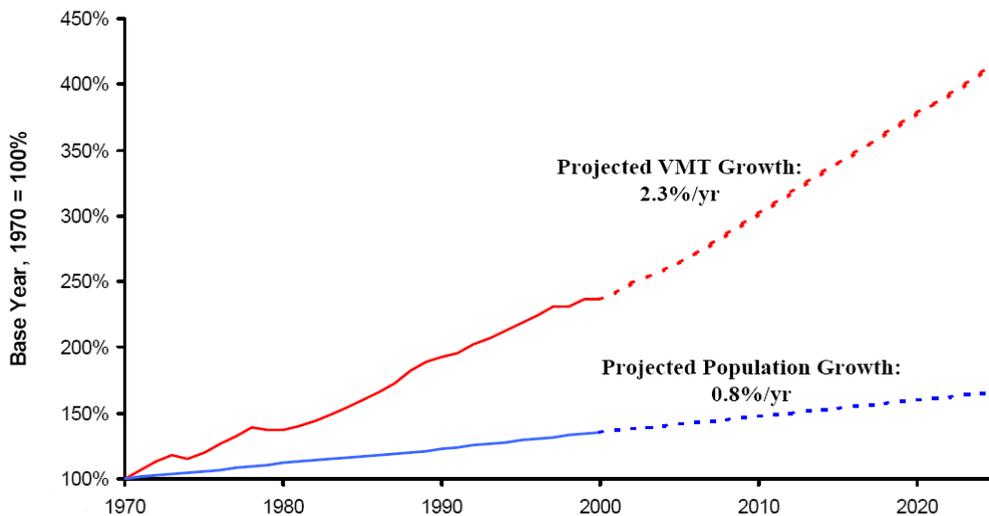
⁶⁹ U.S. DOT Volpe Center. *Alternative Fuels Roadmap*. Preliminary draft, January 2009.

⁷⁰ *Ibid.*

⁷¹ U.S. DOT Federal Highway Administration. *National Household Travel Survey, 2001 Summary of Travel Trends*. Washington, D.C.: U.S. Department of Transportation

Since World War II, land-use development patterns in the U.S. have generally favored low-density, decentralized growth that places homes, workplaces, schools, retail districts, and other services in locations that are impractical to reach by means other than driving. It should be noted that this decentralized growth, which increases both the distance and the number of trips that trucks must travel to deliver market goods, has contributed to increased freight and heavy truck VMT, as well (in addition to the proliferation of e-commerce and an increased demand for shipped goods).

Figure 1.2. Past and Projected Growth in VMT and Population



Implementing “smart growth” planning methods that cut VMT by increasing mixed-land use, propagating compact development, and providing a variety of transportation and transit choices is a fundamental strategy for reducing the transportation sector’s petroleum dependency. However, because the nation has been so extensively settled in such a sprawled fashion, reversing the trend will be a long-term process that will necessitate the simultaneous need for alternatives to oil.

The United States has always been a technology-solutions oriented culture. Thus, a strong drive has emerged for public and private investment to advance efficiency and alternative fuels technologies, in addition to other VMT reduction strategies.

Appendix 2: City of Chicago Transportation Strategy to Reduce GHG Emissions⁷²

Below is a list of the City of Chicago's top ten actions to reduce GHG emissions from the transportation sector (with potential GHG emission reduction in parentheses):⁷³

1. Invest in transit (0.83 MMTCO₂e),
2. Expand transit incentives (0.03 MMTCO₂e),
3. Promote transit-oriented development (0.63 MMTCO₂e),
4. Make walking and biking easier (0.01 MMTCO₂e),
5. Car share and carpool (0.5 MMTCO₂e),
6. Improve fleet efficiency (0.21 MMTCO₂e),
7. Achieve higher fuel efficiency standards (0.51 MMTCO₂e),
8. Switch to cleaner fuels (0.68 MMTCO₂e),
9. Support intercity rail, and
10. Improve freight movement (1.61 MMTCO₂e).

⁷² www.chicagoclimateaction.org

⁷³ www.chicagoclimateaction.org/pages/transportation/52.php. According to this website, MMTCO₂e (million metric tons carbon dioxide equivalent) is the term for the quantity of any greenhouse gas, including carbon dioxide, methane and others, translated CO₂ by weighing it by its relative global warming potential. A reduction of 1 MMTCO₂e is equivalent to removing nearly 185,000 cars from the road.

Appendix 3: Example Clean Cities MOU and Goals⁷⁴

MEMORANDUM OF UNDERSTANDING

“Capital District” Area Clean Cities Coalition

Formally Established to Create a More Efficient, Domestically Secure, Environmentally Harmonious, Sustainable and Safe American Energy Transportation Sector

MEMORANDUM OF UNDERSTANDING

By and Among,

*Capital District Clean Communities
Adirondack/Glens Falls Transportation Council
Albany County Airport Authority
BAF Technologies
Brown Coach
Capital District Regional Planning Commission
Capital District Transportation Authority
Capital District Transportation Committee
Clean Energy Fuels
City of Oneonta
Cummins Northeast
Delta Air Lines
Environmental Business Association of NYS
Gorman Terminals LLC
Hudson Valley Community College
Leonard Bus
Mohonasen School District
New York State Department of Environmental Conservation
New York State Department of Transportation
New York State Energy Research and Development Authority
New York State Office of General Services
New York State Office of Parks, Recreation and Historic Preservation
New York State Thruway Authority
New York Power Authority
Niagara Mohawk
NPB Computers
Ravena-Coeyman’s-Selkirk Central School District
Saratoga Bridges
Shenendehowa Central School District
Schwan’s
Siemen’s Building Technologies
Sprague Energy Corporation
SLA Transport Inc.
SUNY at Cobleskill
Upstate Tours*

and

U.S. DEPARTMENT OF ENERGY

⁷⁴ Provided by the Capital District Clean Communities

INTRODUCTION

Background

The United States Department of Energy (DOE) is committed to energy use in the American transportation sector that is more efficient, less dependent on foreign sources, less environmentally disruptive, sustainable, and safe.

The Energy Policy Act of 1992, supplemented by the 1993 Executive Order 12844: Federal Use of Alternative Fuel Vehicles, and the Clean Air Act Amendments of 1990, all establish guidelines for effecting a favorable energy and environmental situation in the transportation sector. The DOE *Clean Cities* program is an umbrella to structure and achieve Energy Policy Act program goals and to coordinate objectives of governments and other Federal directives, such as the Clean Air Act.

Purpose

The purpose of this Memorandum of Understanding (MOU) is to set forth the agreements, respective responsibilities, and procedures necessary to carry out the objectives of the DOE Clean Cities program which accelerates the introduction and expands the use of alternative fuels and fuel blends and alternative fuel vehicles, accelerates the sales of hybrid vehicles, promotes informed consumer choice on fuel economy, and encourages the use of idle reduction technologies for heavy-duty trucks and other vehicles.

Authority

This MOU is authorized under the following laws and regulations: Energy Reorganization Act of 1974, which permits DOE to use the facilities of public agencies, requires DOE to consult with the heads of other agencies on the use of their facilities, and allows DOE to enter into cooperative projects with other public and private agencies; the Energy Policy Act of 1992, Section 505, Voluntary Supply Commitments, which requires DOE to obtain voluntary commitments to help achieve replacement fuel goals from fuel suppliers, fleet owners, and vehicle suppliers. Under this MOU, these groups, united with other local stakeholders, signify their commitment to contribute to the goals of the program.

Policy

Signatories under this MOU undertake their best efforts to achieve the specific goals and objectives set forth below.

MANAGEMENT AND PROGRAM GUIDELINES

This MOU commits the undersigned to work together toward achievement of Clean Cities goals and the goals and objectives below.

Clean Cities Coordinator Responsibilities

- Coordinate and document coalition activities
- Maintain database of stakeholders, community fleets, AFVs, and infrastructure
- Assist with overall implementation of the goals and development of new goals and objectives
- Coordinate meetings and reporting activities
- Participate as a member of the Steering Committee
- Delegate and monitor activities/responsibilities to other key stakeholders
- Act as a liaison between the Steering Committee, working groups and USDOE
- Work directly with the DOE Regional Support Offices to report coalition activities, progress, concerns, issues, etc.
- Provide assistance in public education activities
- Maintain and update, in concert with the coalition, the Program Plan
- Monitor and disseminate Federal/State/local legislative and incentive information to the coalition
- Assist with recruitment of stakeholders
- Represent Clean Cities and the coalition at other local functions and DOE events

DOE Responsibilities

- Provide a Federal advisor
- Provide program implementation and MOU drafting guidelines
- Guide placement of Federal AFVs responding to Clean Cities recommendations and resource matching plans
- Direct the award of Federal funds and grants as available
- Provide information, general assistance and material for public relations and promotional activities
- Provide training for coordinators, fleet operators and other participants
- Provide a hotline/clearinghouse for technical and other information
- Conduct information exchange workshops
- Provide assistance in public education activities

Stakeholder Responsibilities

Signatories to this document agree to fulfill their voluntary commitments to the Clean Cities Program as delineated in the updated goals and objectives

Guidelines

The Clean Cities program will be administered according to the updated goals and objectives. The signatories herein have agreed that the goals and objectives are designed to achieve Clean Cities objectives and follow the basic guidelines described below:

- Sets forth goals reflecting the planning process and defining what the organization seeks to accomplish
- Creates an organizational structure enabling Clean Cities to effectively carry out its mission
- Characterizes the AFV market situation by gathering primary information on fuels, vehicles, and infrastructure from participating Clean Cities stakeholders
- Delineates estimated timetables containing discrete action items, milestones and deadlines for achieving objectives and goals
- Establishes a monitoring system for program management, advertisement of program success, and method for conveying program performance to DOE

Supplementary Interagency or Other Agreements

Because the DOE Clean Cities program supports Congressional and Executive directives and many involve other Federal, State, and local governmental entities, Clean Cities program commitments may be subject to modification upon intervening Congressional or Executive guidance.

ADMINISTRATION

Public Information Coordination

Subject to the Freedom of Information Act (5 U.S.C. 552) decisions on disclosures of information to the public regarding projects and programs referenced in this MOU shall be made by the DOE following consultation with the other parties' representatives.

Amendment and Termination

This MOU may be amended by the mutual written agreement between DOE and signatories. This MOU may be terminated by the mutual written agreement of DOE and signatories. Signatories may terminate individual participation upon a 30-day written notice.

Effective Date

This MOU shall become effective upon the latter date of signature of the parties (April 12, 2005) and shall remain in effect for a period of 5 years, upon which the MOU becomes eligible for renewal.

MOU Signatories

...

Capital District Clean Communities Goals and Objectives (as of July 2008)

Mission Statement:

The Capital District Clean Communities coalition is a public/private partnership with the goal of reducing dependence on foreign petroleum resources, reducing vehicle emissions and enhancing the development of an AFV marketplace in the region. This mission statement is on target with the National Clean Cities focus:

- Increase the number of Alternate Fueled Vehicles (AFV's) in the marketplace
- Increase the use of fuel blends (diesel/biodiesel, ethanol/gasoline, and compressed natural gas (CNG)/hydrogen),
- Accelerate sales of hybrid vehicles,
- Promote informed consumer choice on fuel economy, and
- Encourage the use of idle reduction technologies, including vehicle retrofits, for heavy-duty trucks and other vehicles.

Toward this end, the CDCC has identified several goals that will be pursued in the next program period (5 years).

Goal 1: Recruit Additional Stakeholders and Improve Public Awareness of the Alternative Fuel Market

Objectives: The CDCC will

1. Provide an open forum for stakeholders and other interested participants to present information on alternative fuel vehicles and funding opportunities
2. Act as a clearinghouse of information on alternative fuels and distribute material to stakeholders through mailings, email and at stakeholder meetings
3. Schedule and hold quarterly stakeholder meetings
4. Actively identify new stakeholders through mailings and networking with existing stakeholders and through other forums, such as daily activities at the Metropolitan Planning Organization (which hosts the CDCC)
5. Actively reach out to neighboring counties (outside the four counties of the Capital District) to identify stakeholders that may be interested in the program. Brown Coach in Montgomery County and the City of Oneonta in Otsego County are two such entities that CDCC has been in contact with.
6. Participate in area workshops and conferences that are associated with the Clean Air/Alternative Fuel theme.
7. Maintain and improve the CDCC website (www.cdtcmpp.org/cdcc/cdcc.html), and ensure that the website, at a minimum, includes a link to the National Clean Cities website, a list of stakeholders, meeting notes and meeting notices.

Goal 2: Increase the Number of Alternative Fuel Vehicles and Retrofit Vehicles in the Region

Objectives: The CDCC will

1. Continue to work with New York State agencies with fleets in the Capital District area to support their plan for the acquisition and utilization of clean-fueled vehicles.
2. Continue to work with the Capital District Transportation Authority (CDTA) in introducing them to the alternative fueled vehicle market options, particularly the Hybrid-Electric transit bus.
3. Actively research and monitor funding opportunities that can be used to support and expand the inventory of alternative fuel vehicles in the area.
4. Continue to work with the Albany County Airport Authority in advancing their alternate fuel vehicle plan.
5. Work with the Metropolitan Planning Organization to put forth a diesel retrofit program to area municipalities using CMAQ funds.
6. Provide an open forum for stakeholders and other interested participants to present information on alternative fuel vehicles and funding opportunities
7. Act as a clearinghouse of information on alternative fuels and distribute material to stakeholders through mailings, email and at stakeholder meetings

Goal 3: Increase the Number of Public Alternative Fuel Fueling Stations in the Region

Objectives: The CDCC will

1. Continue to work with NYS OGS and NYSDOT to help identify area fueling needs and help justify opening area stations to the public as demand for fuel increases
2. Continue to work with the Albany County Airport Authority (ACAA) in creating a justification to open the ACAA CNG fueling station to the public as the need arises
3. Provide support, as needed, to NYSERDA and State agencies in garnering interest in opening ethanol and bio-diesel fueling stations in the area.
4. Actively research and monitor funding opportunities that can be used to support and expand the fueling infrastructure.

Goal 4: Provide Information and Assistance on Grant Opportunities and Funding

Objectives: The CDCC will

1. Actively research and monitor available grant opportunities
2. Provide information to stakeholders on available grant opportunities
3. Coordinate the development of grant proposals on behalf of stakeholders
4. Provide technical assistance to stakeholders in the development of proposals
5. Ensure that stakeholders are aware of the CMAQ program and of funding opportunities through CMAQ

Appendix 4: Alternative Fuel and AVT Options

Alternative Fuel Options

There are a number of current and emerging alternative fuels for transportation. Fundamentally, these fuels may be used to power AFVs evolving as two distinct types: (1) those that employ a conventional drivetrain and (2) those that utilize an electric drivetrain. Conventional drivetrain vehicles use an internal combustion engine (ICE) as a primary power source. At present, vehicles using a conventional drivetrain comprise a majority of the mainstream vehicle fleet. Electric drivetrain vehicles do not use ICE's for primary power production; rather, these vehicles use an electric motor to power the vehicle. Alternative fuels can be used as an energy source for either vehicle type, although typically most liquid and gaseous fuels are used for conventional drivetrain vehicles, and electricity and hydrogen are used to power electric drivetrain vehicles. Some vehicles, such as those employing battery-hybrid technologies, may use electricity as a partial fuel source, but still operate on a conventional drivetrain.

The following sections describe the benefits associated with each alternative fuel that both conventional and electric drivetrain vehicles use. The timeframe for widespread market penetration of each fuel is also discussed.

Non-renewable Alternative Fuels

Natural Gas and Propane

Natural gas and propane are non-renewable fuels considered to be alternative fuels. Natural gas is a readily available and domestically produced mixture of hydrocarbons (predominantly methane [CH₄]). This non-renewable alternative fuel is delivered via pipeline to end users. Propane, also known as liquefied petroleum gas (LPG) or autogas in Europe, is a three-carbon alkane gas (C₃H₈) stored under pressure inside a tank. As pressure is released, liquid propane vaporizes and turns into gas that is used for combustion. These fuels have been shown to cut toxic carbon monoxide emissions by 40 percent, and harmful particulate matter emissions by 80 percent.⁷⁵ Vehicles using these fuels have also demonstrated service lives of two to three years longer than those of gasoline or diesel vehicles, as well as longer intervals for scheduled maintenance. Both fuels are produced domestically, serving as a displacement for imported petroleum-based fuels.

Natural gas is used in vehicles as CNG and LNG. At present, only one passenger vehicle is available for purchase, with a wider array of applications available in heavy-duty vehicle classes

⁷⁵ U.S. DOE, Energy Efficiency and Renewable Energy. Alternative and Advanced Vehicles. www.afdc.energy.gov/afdc/vehicles/emissions_propane.html

(CNG engines are available from six domestic suppliers).⁷⁶ Due to the utility industry's use of natural gas, lack of availability is typically not a problem anywhere within the lower 48 states.

Propane may also be used in light- and medium-duty vehicles, heavy-duty trucks, and buses. Of all alternative transportation fuels in use domestically, propane is the most widely used. Propane is often used in non-road applications such as forklifts, construction, and agricultural vehicles. Propane vehicles are often converted gasoline vehicles, as many conversion kits are easily available. The technology is well established with a widely available fueling infrastructure. Like natural gas, propane is an attractive option for fleets, as propane vehicles have an established track record of lower maintenance costs.

Nationally, the viability of natural gas and propane as effective near-term fuels for local and urban fleets is strong, especially in scenarios where operators plan to replace vehicles and use centralized fueling and distribution systems. The technologies associated with each are proven, and vehicles and associated infrastructure are readily available at competitive cost. The air-quality benefits as well as maintenance cost benefits are also well-established and quantifiable.

A drawback of natural gas and propane use is that GHG reduction benefits may be less pronounced on a lifecycle basis despite the petroleum displacement and localized air quality benefits provided. Like conventional petroleum fuels, the lifecycle GHG emissions for natural gas and propane fuels are largely attributable to actual end-use combustion. While the carbon dioxide (CO₂) tailpipe emissions of a natural gas vehicle are approximately 20 percent less than a gasoline-burning one and natural gas production is less energy-intensive than petroleum,⁷⁷ from a lifecycle perspective natural gas leakage can occur during recovery, processing and transport, thus potentially tempering GHG benefits (given that methane is 23 times more potent as a GHG than CO₂).⁷⁸ Lifecycle GHG emission reduction estimates for propane fuel are similar to those for natural gas with studies reporting 18-20 percent GHG reductions over petroleum.⁷⁹

Renewable Alternative Fuels

Biofuels

Biofuels, which include ethanol, biodiesel, and methanol, currently exist and can be used in all vehicle types. Ethanol is a liquid alcohol that can be made through fermentation from any crop or plant that contains a large amount of sugar or components that can be converted into sugar, such as starch or cellulose. It can also be made from petroleum, natural gas, or coal. Biodiesel is a renewable fuel for use in diesel engines. It is derived from plant and animal oils and fats. Currently, biodiesel is made primarily from soybean oil. Methanol (also known as "wood alcohol" or "methyl alcohol") currently has a wide variety of industrial and commercial uses.

⁷⁶ Natural Gas Vehicles for America. Available Natural Gas Vehicles and Engines www.cleanvehicle.org/Available-NGVs-and-Engines.pdf. Updated, July 21, 2006.

⁷⁷ About Natural Gas Vehicles. Natural Gas Vehicles for America www.ngvc.org/about_ngv/index.html. 2008.

⁷⁸ Development of Baseline Data and Analysis of Life Cycle Greenhouse Gas Emissions of Petroleum-Based Fuels. 2008. National Energy Technology Laboratory.

⁷⁹ U.S. DOT Volpe Center. *Alternative Fuels Roadmap*. Preliminary draft, January 2009.

Although methanol is used to power flexible fuel vehicles (FFV) that can be powered by either gasoline or M-85 (a blend of 85 percent methanol and 15 percent gasoline), it is no longer being actively considered by auto manufacturers as a transportation fuel.

Ethanol and biodiesel offer a near-direct petroleum displacement benefit and thus offer energy security and air quality benefits.⁸⁰ In air quality terms, ethanol generally is considered a cleaner burning fuel than gasoline due to its oxygen content and lack of many of the toxic volatile organic compounds in gasoline. Similarly, biodiesel produces much less particulate matter exhaust than conventional diesel fuel.⁸¹

Electricity

Electricity refers to the presence and flow of electric direct or alternating currents. Because of its versatility as a source of energy, electricity is rapidly becoming included in transportation fuels' discussions. It has been used to power electric transit and rail vehicles, as well as to recharge batteries in emerging PHEV and battery electric vehicles. Electricity is not a fuel source when considering the current generation of hybrids, which are gasoline-powered but store and use electricity in batteries on a limited, supplementary basis.

At present, electric vehicles (EVs) are not typically advantageous for GHG lifecycle reductions, as most vehicles now charge from coal-based electricity. Developments in clean coal technology and other forms of electricity generation are needed for the environmental benefits of EVs to be realized. In addition, the lack of longevity, comparatively high cost, and limited efficiency of available battery or other electric storage technology (such as ultra-capacitors), as well as electricity source generation, currently limit the EV industry.

Hydrogen

Hydrogen as a transportation fuel, especially in applications powered by fuel cells, is currently viewed as the ultimate form of sustainable transportation. Hydrogen fuel cell vehicles are electric drive vehicles and are in testing or prototype use in both passenger cars and transit buses today. Hydrogen is also used in conventional drivetrain vehicles, in ICEs, although applications of this are relatively limited. Fuel cells are more efficient than ICEs and most of the research has primarily focused on fuel cell vehicles rather than conventional drive vehicles.

Considerable research and development are needed before overcoming existing vehicle and production challenges. Significant progress is yet to be made in realizing energy efficiencies and/or total lifecycle GHG emissions reductions.

Advanced Vehicle Technology Options

AVTs consist of hybrid mechanical, pneumatic, or hydraulic systems, as well as some that operate entirely electrically. Under development for decades and sometimes stymied by low fuel

⁸⁰ Ethanol, however, requires more frequent refueling than gasoline, because it contains 27 percent less energy.

⁸¹ There is debate regarding the lifecycle emissions benefits of biofuels.

costs, AVTs have begun making significant progress towards commercialization. As a result of successfully completing demonstrations in real-world, heavy-duty applications,⁸² AVTs have begun to emerge as a viable and cost-effective means to increase vehicle fuel efficiency in the near-, mid-, and long-term. In general, vehicles powered by electric drivetrains hold promise and are currently the focus of much international research and investment.

Hybrids paired with a conventional drivetrain are commonplace today, and offer benefits in carbon emissions, increased reliability, and extended maintenance intervals. Transit agencies across the country have utilized hybrid diesel buses to decrease fuel consumption and maintenance and operational costs, along with small reductions in GHG emissions. Hybrids are a near-term technology that has matured to a point at which they are commercially viable against conventional vehicles.

Modeling estimates for CO₂ emissions associated with electric vehicles are dynamic as the industry and technologies evolve. For example, PHEVs operated on coal-generated electricity show a 15 percent reduction in carbon emissions compared to gasoline vehicles. PHEVs powered by natural gas-based electricity may produce up to 62 percent less carbon emissions than conventional vehicles.⁸³

A hybrid vehicle does not have to be paired with electric motors or batteries to be considered a hybrid. For example, there has been renewed interest in hydraulic hybrid vehicles, which use hydraulics (compressed air moving through pipes and high-pressure storage cylinders) to capture energy from both the power plant (gas or diesel engine) and braking energy. This energy is then used to assist starting the vehicle from a standing stop. The technology provides a relatively inexpensive alternative to electric-based hybrid technology.⁸⁴ Hydraulic hybrids are currently under testing and evaluation, and are at the early stages of commercialization and can be considered a near-term option for specific applications; they deliver significant gains on fuel economy, emissions reduction and operating costs, specifically for medium-duty, urban applications. Especially useful in start-and-stop driving conditions, the United Parcel Service has been able to improve city fuel economy by 70 percent, reduce CO₂ emissions by up to 40 percent, and decrease break wear by 75 percent using hydraulic hybrids. A benefit of hydraulic hybrids over electric hybrids (specifically PHEVs) are hydraulic hybrids do not require new infrastructure, as they augment conventionally fueled drivetrains.

⁸² Hybrid-electric buses have been in service and operation since the late 1980s, and hybrid-electric light-duty and passenger vehicles have been in use since the 1990s.

⁸³ Potential Carbon Emissions Reductions from Plug-in Hybrid Electric Vehicles by 2030. National Energy Technology Laboratory. 2008.

⁸⁴ Hydraulic Hybrid, U.S. Environmental Protection Agency, Department of Modeling, Testing and Research. www.epa.gov/oms/technology/420f06043.htm.