Clean Cities 2015 Annual Metrics Report

Caley Johnson and Mark Singer

National Renewable Energy Laboratory

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
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December 2016

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Prepared under Task No. VTP2.0410

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List of Acronyms

AFDC	Alternative Fuels Data Center
AFV	alternative fuel vehicle
CNG	compressed natural gas
CO_2e	carbon dioxide equivalent
DOE	U.S. Department of Energy
E85	a high-level ethanol blend
EPA	U.S. Environmental Protection Agency
EV	all-electric vehicles
EVSE	electric vehicle supply equipment
GGE	gasoline gallon equivalent
GHG	greenhouse gas
GREET	Greenhouse Gas, Regulated Emissions, and Energy Use in Transportation
HDV	heavy-duty vehicle
HEV	hybrid electric vehicle
IR	idle reduction
kWh	kilowatt hour
LDV	light-duty vehicle
LNG	liquefied natural gas
MGGE	million GGE
NCFP	National Clean Fleets Partnership
NREL	National Renewable Energy Laboratory
ORNL	Oak Ridge National Laboratory
PEV	plug-in electric vehicle
PHEV	plug-in hybrid electric vehicle
PIM	Petroleum Impact Model
RNG	renewable natural gas
VMT	vehicle miles traveled
WPCC	Workplace Charging Challenge

Introduction

The U.S. Department of Energy's (DOE's) Clean Cities program advances the nation's economic, environmental, and energy security by supporting local actions to cut petroleum use and greenhouse gas (GHG) emissions in transportation. A national network of nearly 100 Clean Cities coalitions, whose territory covers 80% of the U.S. population, brings together stakeholders in the public and private sectors to deploy alternative and renewable fuels, idle-reduction (IR) measures, fuel economy improvements, and new transportation technologies as they emerge.

Each year, DOE asks Clean Cities coordinators to submit annual reports of their activities and accomplishments for the previous calendar year. Progress reports and information are submitted online as a function of the Alternative Fuels Data Center (AFDC) at the National Renewable Energy Laboratory (NREL). Coordinators report a range of information that characterizes the membership, funding, projects, and activities of their coalitions. They also document activities in their region related to the development of refueling/charging infrastructure, sales of alternative fuels; deployment of alternative fuel vehicles (AFVs), plug-in electric vehicles (PEVs), and hybrid electric vehicles (HEVs), and plug-in hybrid electric vehicles (PHEVs); IR initiatives; fuel economy improvement activities; and programs to reduce vehicle miles traveled (VMT). NREL analyzes the data and translates them into petroleum-use and GHG emission reduction impacts, which are summarized in this report.

All of the designated coalitions active throughout 2015 completed reports, representing a response rate of 100%. The coalitions that submitted 2015 annual reports are listed in Appendix A. Coalition coordinators assembled the data based on voluntary reports from their stakeholders—the private and public entities that are members of the coalitions. As such, each of these reports represents a subset of the Clean Cities activities throughout the nation, and taken together, they are an important indicator of the impact of the coalitions. Accomplishments from the National Clean Fleets Partnership (NCFP) and Workplace Charging Challenge (WPCC) are also reported directly from those programs.

In addition to collecting data through the coordinator and partnership reports, NREL compiles metrics about activities funded by the Clean Cities program at NREL, Argonne National Laboratory, and Oak Ridge National Laboratory (ORNL). NREL and Argonne provide a range of technical data, tools, and resources to support coalitions in their efforts to accelerate the use of alternative fuels, advanced vehicles, and other technologies. ORNL produces the *Fuel Economy Guide*, the FuelEconomy.gov website, and other public information related to fuel economy. Metrics pertaining to the uses and impacts of these resources are presented in this report as estimated petroleum savings.

A compilation of data from this report, along with reports from previous years, can be accessed at www.afdc.energy.gov/data/categories/clean-cities. Previous years' reports can be downloaded in their entirety at www.afdc.energy.gov.

Summary of Key Findings

Clean Cities activities saved nearly 1.1 billion gallons of gasoline[1] in 2015. Table 1 represents the combined results of all strategies of petroleum savings. In this table, "coalition- and partner-reported savings" resulted from activities reported by coalitions and NCFP partners. These reports included the quantity of fuel used or numbers that allow an easy conversion into fuel use (such as number of vehicles, average fuel economy, and average miles traveled). NCFP savings were combined with coalition numbers this year after the partners reported their data either directly to coalitions or through NREL. The WPCC reported savings are independent of coalitions, with overlap removed. "Estimated outreach savings" resulted from coalition outreach, education, and training events, as estimated by NREL and ORNL via the methods outlined in the Estimated Outreach Savings section. NREL and ORNL also estimated the savings from two Clean Cities websites—fueleconomy.gov and the AFDC—using the same methods.

As shown in Table 1, savings from coalition-reported activities increased 23% in 2015, while the estimated savings decreased 30%. The decrease in estimated savings is likely due to low gasoline prices throughout 2015, reducing audience participation in outreach events and websites. Savings from coalition-reported projects would have been even greater, but beginning in 2014, VMT-reduction projects were capped at 10% of any coalition's total savings. Total 2015 petroleum savings increased 6% compared to 2014, which has resulted in the Clean Cities program falling slightly behind schedule to meet its goal of 2.5 billion gallons per year by 2020.

Table 1. Petroleum Savings of Each Portfolio Element

	Technology	Million GGEs Saved	Percent of Total Coalition-Reported Savings	Percent of Grand Total Savings	Increase from Last Year
Coalition- and Partner-Reported Savings	Alternative Fuels and Vehicles	640.5	76%	59%	27%
	HEVs and PEVs	91.9	11%	9%	8%
	Idle Reduction	36.7	4%	3%	-3%
	Fuel Economy	34.5	4%	3%	64%
	VMT Reduction	26.0	3%	2%	8%
	Off-Road	11.0	1%	1%	17%
	Total Coalition-Reported Savings	840.6	100%	78%	23%
Workplace Charging Challenge[a]		1.9	na	0%	55%
Estimated Savings	FuelEconomy.gov	130.3	na	12%	-22%
	Coalition outreach, education, and training events	54.9	na	5%	-53%
	AFDC	51.5	na	5%	-5%
	Total Savings from Estimates	236.7	na	22%	-30%
Grand Total[b]		1,079.2	na	100%	6%

[a] Any project reported by both WPCC and a collaborating coalition was attributed to the coalition in this report.
[b] Totals and subtotals may differ from the sums due to rounding.

[1] The petroleum saved includes both gasoline and diesel. Petroleum savings in this report are expressed in gasoline gallon equivalents (GGEs), using the lower heating value ratio of the fuels.

Clean Cities activities also helped to reduce GHG emissions. As shown in Table 2, coalition-reported activities prevented 3.6 million tons of carbon dioxide equivalent (CO_2e) from being emitted into the atmosphere. Outreach events and tools kept another 2 million tons of CO_2e out of the atmosphere, for a total of 5.6 million tons CO_2e. This GHG emissions reduction is equivalent to completely removing 1.3 million conventional cars from U.S. roads. The overall reduction in GHG emissions is 15% less than the overall reduction in 2014, partially due to an update in GHG conversion factors (see Changes to the 2015 Report section) and partially because low gasoline prices led to fewer drivers responding to outreach events and lab websites.

Table 2. GHG Emissions Reduced by Clean Cities in 2015

	Technology	Tons of GHG Emissions Averted	Equivalent Cars Removed[a]	Percent of Coalition Total
Coalition- and Partner-Reported Reductions	Alternative Fuels and Vehicles	1,403,130	314,071	39%
	HEVs and PEVs	875,049	195,868	25%
	Idle Reduction	449,634	100,644	13%
	Fuel Economy	427,556	95,702	12%
	VMT Reduction	320,337	71,703	9%
	Off-Road	93,691	20,971	3%
	Total Coalition-Reported Reductions	3,569,396	798,960	100%
Workplace Charging Challenge[b]		9,658	2,162	na
Estimated Reductions	FuelEconomy.gov	1,612,926	361,031	na
	AFDC	161,429	36,134	na
	Coalition outreach, education, and training events	268,176	60,027	na
	Total Reductions from Estimates	2,042,531	457,192	na
	Grand Total	5,621,585	1,258,313	na

[a] Calculated as total passenger car GHG emissions (Table 2-13 in the U.S. Environmental Protection Agency's (EPA's) *Inventory of GHG Emissions and Sinks: 1990–2014*) divided by total short wheelbase light-duty vehicles (Table VM-1 in the Federal Highway Administration's *Highway Statistics*, 2014).
[b] Workplace Charging Challenge numbers exclude any projects that overlapped with the coalitions.

Coalitions were also remarkably successful in securing project awards from numerous sources, thereby leveraging DOE's investment in the program. In 2015, the coalitions won 112 new project awards (project-specific grants) worth a total of $55 million and another $39 million in leveraged funds from coalition members. This funding represents nearly a 4:1 leveraging of the $24 million DOE Clean Cities program budget in Fiscal Year 2015.

Clean Cities coordinators spent nearly 137,000 hours pursuing Clean Cities' goals in 2015, which is equivalent to having a national network of 68 full-time professionals working in the field to reduce U.S. dependence on petroleum. Coordinators logged 2,971 outreach, education, and training activities in 2015, which reached an estimated 25 million people, saved an estimated 54.9 million GGEs of petroleum, and reduced more than 268 thousand tons of GHGs. Local government fleets were the most common audience at these events, followed by the general public.

Changes to the 2015 Annual Metrics Report

The 2015 Annual Report differs from its predecessors in a number of ways. Some of these indicate a change in the technologies now available, some indicate a change in the reporting process, and some indicate a change in the way the report was written. These changes include:

- GHG calculations and default assumptions were updated to be in agreement with Argonne's 2015 Greenhouse Gas, Regulated Emissions, and Energy Use in Transportation (GREET) model and 2016 Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) tool. This had the overall effect of reducing the estimated benefits from natural gas and propane while increasing the benefits from biodiesel, ethanol, and electricity. The net effect was a reduction in estimated GHG benefits from the current mix of Clean Cities technologies.
- The NCFP reporting process was folded into the Clean Cities annual reporting tool. Therefore, NCFP does not have its own line item this year, but is reported through the collaborating coalitions instead. NCFP data reporting also increased substantially this year, from 14 to 17 partners reporting.
- Renewable diesel was added to the annual report for the first time this year.
- Coordinators began reporting how many chargers were being operated for electric vehicle supply equipment (EVSE) projects, rather than just the number of vehicles using them and the kilowatt hours (kWh) dispensed through them.
- A new vehicle category was added for EVSE projects—"Mix of EVs and PHEVs." It was assumed that this category was composed of 50% each, based on Polk numbers.
- In the outreach section, the "Alternative fuel vehicles" category was separated into its six component fuels to enable greater reporting resolution.

Attribution and Fuel Use Factors

To clarify the link between coalition activities and end results, the coalition annual report includes an attribution factor that accounts for the percentage of a project's outcome that may be due to coalition activities rather than to the activities of other project participants. This attribution factor was used in the estimates of impacts for fuel economy, VMT reduction, IR, alternative fuel use, and outreach projects. Coordinators estimated the percentage of the project's outcome their coalition was responsible for, and the project's overall outcome was multiplied by that percentage to determine the coalition's impact. Although subjective, this method attempts to address the issue of attribution where a coalition is one of several partners involved in a project. To reduce the subjectivity of this factor, NREL provides a tool to help a coalition estimate its contribution to a given project.

Coalition-Reported Petroleum Savings and Greenhouse Gas Emissions Reduction

Coordinators submitted information about their petroleum use reductions, broken down according to the technologies in the Clean Cities portfolio. NREL analyzed the data, converted it into a quantity of gasoline saved by each element of the portfolio, and reported in units of GGEs—the amount of energy contained in a gallon of gasoline. As shown in Table 1, about 841 million GGEs (MGGEs) were saved through coalition-reported Clean Cities coalition efforts in 2015—an average of 10.1 MGGEs per coalition. This is 30% higher than the total petroleum savings of 645 MGGEs reported in 2014. The fact that all reported NCFP projects were grouped into this "coalition- and partner-reported" category this year helped add to this increase.

Clean Cities' petroleum use reduction also leads to a substantial reduction in GHG emissions. To estimate the GHG reductions resulting from Clean Cities activities, we used a variation of the GREET model. This model takes into account the fuel life-cycle, or "well-to-wheels," GHG emissions for transportation fuels, which include fuel production, transport, and use in the vehicle. It does not take into account the emissions from indirect land use changes or vehicle manufacturing.

Alternative Fuels and Vehicles

As shown in Figure 1, alternative fuels (used in AFVs and in biodiesel blends) and HEVs/PEVs accounted for approximately 732 MGGEs saved, or 87% of the coalition-reported petroleum savings. This is an increase of 33% over the amount of petroleum that was saved by alternative fuels in 2014.

In 2015, coalitions reported a total inventory of more than 790,000 AFVs, split among 10 fuel types, with renewable diesel included in the report for the first time in 2015. This represents a 23% increase from last year. Hydrogen vehicles nearly doubled between 2014 and 2015 with a 94% increase, but the growth was from a small baseline. Compressed natural gas (CNG) vehicles, PEVs, and biodiesel vehicles increased by around 50%. Liquefied natural gas (LNG) and propane vehicles increased by nearly one-third. Renewable natural gas (RNG) vehicles and HEVs grew by significant percentages (17% and 14%, respectively). The number of flexible fuel vehicles that can operate on E85 (a high-level ethanol blend) decreased by 1%.

The amount of petroleum displaced increased from 2014 to 2015 for all fuel types. Displacements from hydrogen, RNG, and LNG increased by more than 50% (94%, 78%, and 56%, respectively). CNG, E85, and biodiesel showed similar increased petroleum displacement (37%, 33%, and 32% respectively). PEVs and LPG showed strong double digit increases (22% and 17% respectively). HEVs showed the lowest growth at 5%.

Figure 1 also shows the percent of GGEs displaced by AFVs according to fuel type. CNG remains at the top of the list, accounting for 55% of the total AFV petroleum displacement, despite the fact that only 14% of the total AFVs use CNG. This is in stark contrast to E85, which accounts for only 9% of the AFV petroleum savings even though 34% of reported AFVs can use E85.

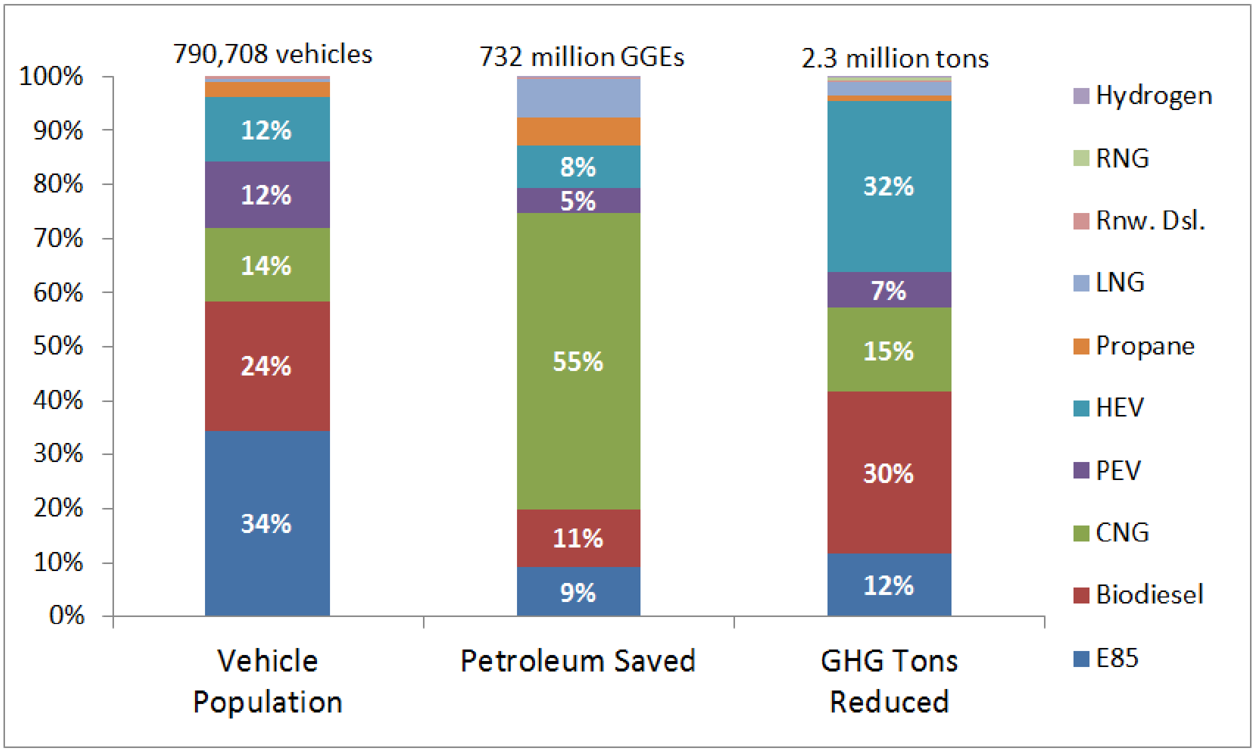

Figure 1. 2015 percent of AFVs, petroleum saving, and GHG reductions by fuel type

The average number of GGEs displaced per vehicle, shown in Table 3, reveals some interesting trends. For a given vehicle, this number is influenced by four factors:

1. The frequency with which the AFV uses alternative fuel (dedicated AFVs tend to displace more petroleum than vehicles that can use petroleum-based fuels in addition to alternative fuels)
2. The number of miles per year the AFV travels (higher mileage displaces more petroleum)
3. The AFVs' fuel economy. Vehicles with lower fuel economy consume more fuel and therefore displace more petroleum. Therefore, Table 3 shows light-duty vehicles (LDVs) and heavy-duty vehicles (HDVs) separated to increase fidelity
4. The amount of petroleum contained in the alternative fuel (ethanol and biodiesel blends contain significant quantities).

For example, LNG HDVs captured in the data save more petroleum per vehicle, on average, than other HDVs do—152% more than CNG vehicles and 35 times more than biodiesel HDVs. This is not surprising, given that LNG vehicles are primarily used in heavy-duty applications and travel relatively long distances. The number of vehicles is included in Table 3 to indicate how robust the data is for a given fuel/vehicle combination. For example, hydrogen and RNG LDVs might be skewed by their small sample size to appear to reduce more GGEs per vehicle than they would if they had a larger sample size.

Table 3. Average Annual Petroleum Displacement per Vehicle

Fuel	GGEs per HDV	# HDVs	GGEs per LDV	# LDVs
LNG	13,429	3,974	none reported	0
Hydrogen	7,717	77	1,569	18
CNG	5,335	69,478	828	37,805
PEV	4,163	4,015	178	92,881
RNG	3,664	305	2,245	61
HEV	2,797	8,958	393	85,372
Propane	2,376	11,535	850	11,227
Renewable Diesel	706	1,368	45	1,815
Biodiesel	388	160,479	521	29,344
E85	334	1,310	249	270,686

Alternative fuels and AFVs were responsible for more GHG emissions reductions than any other coalition-reported activity. We calculated these reductions by subtracting the life-cycle GHG emissions resulting from the use of an alternative fuel in a vehicle from the life-cycle GHG emissions resulting from the use of gasoline or diesel fuel in an equivalent vehicle. For the purposes of these calculations, gasoline is considered the baseline fuel for all LDVs, except in the case of biodiesel, for which conventional diesel fuel is used as the baseline. Gasoline is considered the baseline fuel for HDVs using E85, CNG, LNG, and propane because these vehicles are equipped with spark-ignition (gasoline-like) engines. For all other alternative fuel HDVs, we used conventional diesel fuel as the baseline.

As shown in Figure 1, the GHG emissions reductions are not necessarily proportional to the petroleum displacement because the various alternative fuels emit different levels of life-cycle GHGs. RNG is a prime example of a fuel that has extremely low life-cycle GHG emissions because it precludes the emission of methane from landfills, wastewater treatment facilities, and farms. It is also worth noting that VMT reduction, HEVs, IR, and fuel economy improvement projects have a disproportionately high reduction of GHGs relative to their petroleum displacement. This is because these technologies eliminate 100% of the GHG emissions per gallon of petroleum saved, while alternative fuels reduce GHG emissions by a lesser amount per gallon of petroleum saved.

HDVs made up 33% of the reported AFVs. These HDVs are responsible for 76% of the AFV petroleum savings. The average HDV AFV displaces 6.5 times as much petroleum as the average LDV AFV. The use of LNG is confined exclusively to HDVs. Likewise the overwhelming majority of hydrogen, CNG, renewable diesel, RNG, and biodiesel is used by HDVs (95%, 92%, 92%, 89%, and 80%, respectively). Seventy-four percent of propane use occurred in HDVs. Petroleum displacement from PEVs was evenly split between LDVs and HDVs (50% each). The only technologies whose petroleum savings were dominated by LDVs was E85 (with only 1% from HDVs) and HEVs (57% from LDVs).

Fuel Economy

Petroleum savings from coalition-reported fuel economy projects increased 64% in 2015, to 35 MGGEs, making it the fastest-growing technology category. This savings resulted from nearly 52,000 vehicles, for an average displacement of 669 GGEs per vehicle. Figure 2 shows that some fuel economy improvement projects were much more effective at reducing petroleum than others. The "hydraulic hybrid vehicles" category showed a significant opportunity for additional growth since it has such a high fuel-use reduction per vehicle level and is not yet widely utilized by Clean Cities coalitions.

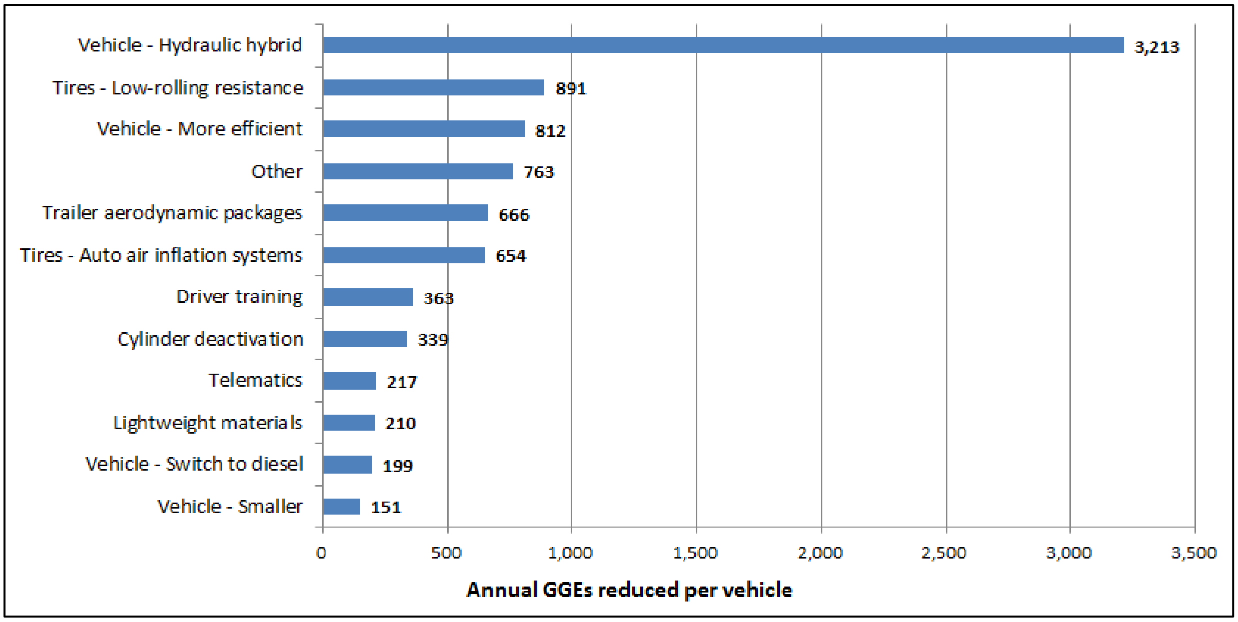

Figure 2. Average fuel-use reduction per vehicle for 2015 fuel economy projects

Vehicle Miles Traveled Reduction

VMT reduction projects save fuel and reduce GHG emissions by reducing the miles that vehicles travel. They include strategies such as carpooling, biking, teleworking, and public transportation. Sixty-six of the 83 (80%) reporting coalitions reported at least one VMT reduction project in 2015. The total number of projects increased in 2015 to 388. In the 2014 and 2015 reporting cycles, the credit that DOE claims from VMT projects was limited to 10% of any given coalition's petroleum reduction. This is because many of these projects still are not seen as within DOE's purview, yet they are in the purview of many coalition host organizations. This limit affected 25 coalitions. Even with this limit in place, coalitions saved 26 MGGEs of fuel. The project types, numbers, and sizes of the unlimited projects are shown in Table 4.

Table 4. VMT Reduction Project Types, Number, and Displacement

Project Type	Number of Projects	Increase in # of Projects	GGEs per Project
Other	76	13	56,600
Carpooling	74	6	286,494
Non-motorized locomotion (e.g., bicycles)	72	11	15,210
Mass transit	70	-6	424,426
Telecommute	33	2	13,972
Route optimization	31	19	18,993
Car sharing (e.g., Zipcar)	22	-1	37,546
Compressed work week	10	-1	4,786
Total	388	43	150,079[a]

[a] GGEs per project calculated before the 10% limit of coalition overall petroleum savings was implemented.

Idle Reduction

The estimated fuel savings for IR technologies and policies was 37 MGGEs in 2015, which resulted in a GHG reduction of 450 thousand tons. The number of IR projects increased 1% in 2015, yet the quantity of petroleum that these projects displaced decreased 3%. As shown in Figure 3, auxiliary power units were responsible for the greatest percentage (34%) of petroleum savings. IR policies, direct-fire heaters, and the other category followed with significant percentages (21%, 13%, and 12%, respectively). Truck-stop electrification and automatic engine shutoff contributed 9% and 8%, respectively. The remaining methods combined for a total of 4% of the petroleum displacement.

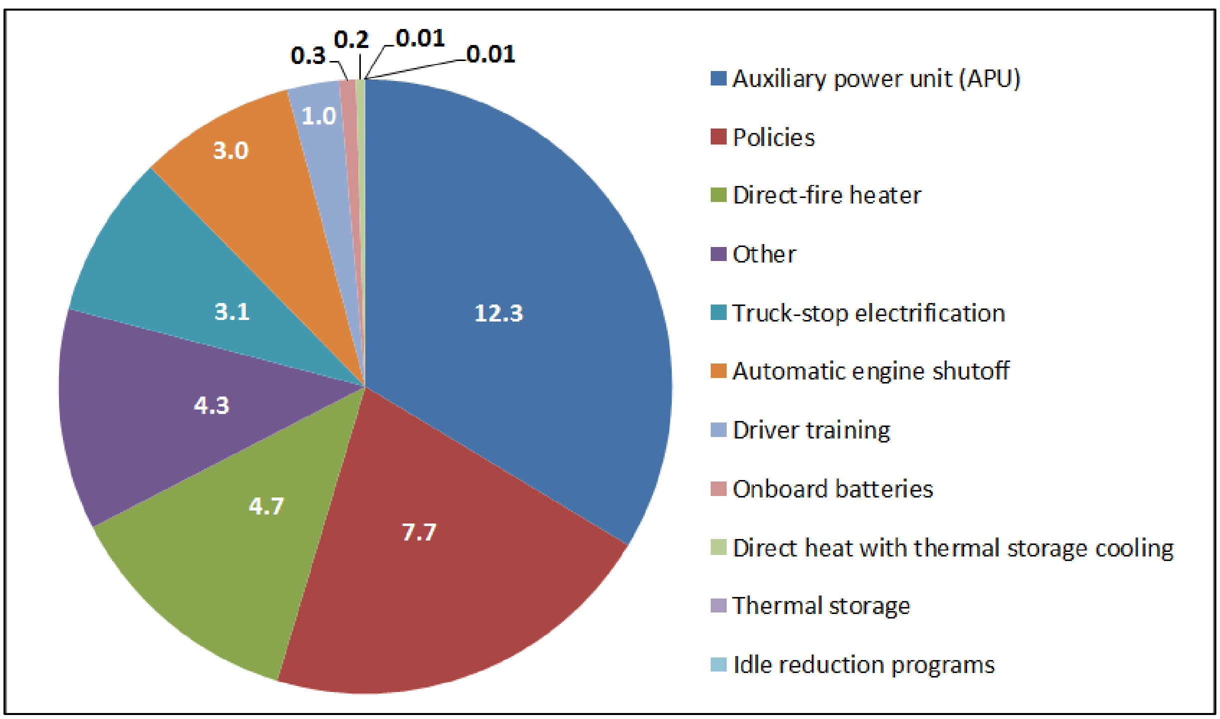

Figure 3. Fuel savings from IR projects (MGGE)

Off-Road Vehicles

Vehicles used in off-road applications contributed to the petroleum savings reported by coalitions. Petroleum savings occurred when these vehicles were AFVs and used alternative fuel or when fuel economy or VMT efforts were implemented. Table 5 shows the number of off-road vehicles (or pieces of equipment) reported by coalitions in 2015. These categories are self-descriptive, with the exceptions of "construction equipment," which includes cranes, earth movers, and similar equipment, and "recreation equipment," which includes jet skis, snowmobiles, and all-terrain vehicles. The number of off-road vehicles increased 14% from 2014 to 2015, and their overall petroleum displacement increased 17%. The largest growth in number of vehicles since 2014 was seen in ships with an 80% increase. The largest reduction was in landscaping and lawn equipment with a 33% reduction.

Table 5. Number of Off-Road Vehicles or Equipment and Petroleum Saved

Application	Number of Vehicles	GGEs Saved	GGEs per Vehicle
Construction equipment	5,706	1,672,043	293
Other	5,546	1,894,398	342
Forklifts	3,947	930,673	236
Mining equipment	2,285	2,380,361	1,042
Landscaping and lawn equipment	1,787	343,163	192
Recreational equipment	557	35,711	64
Farm equipment	111	159,118	1,433
Street sweeper	82	32,581	397
Ships	81	2,595,240	32,040
Railroads	50	994,876	19,898
Planes	3	3,243	1,081
Total (and weighted average)	20,155	11,041,407	548

Overall savings from off-road vehicles totaled 11 MGGE. Vehicles using biodiesel accounted for 59% of the AFVs included in this category. Vehicles using other fuels in off-road applications included propane (19%) and electric vehicles (17%). The other six fuels and technologies together accounted for just 5% of the total vehicles. Biodiesel use was focused in the mining equipment, ships, construction equipment, and other equipment applications. Electric vehicles (EVs) were primarily used in railroads, "other equipment," and forklifts. Propane vehicles were primarily reported as forklifts, construction equipment, landscaping equipment, farm equipment, and "other equipment." Applications varied widely in the number of GGEs displaced per vehicle, as shown in Table 5. Off-Road equipment also reduced GHG emissions by 94 thousand tons.

National Partner Petroleum Savings and Greenhouse Gas Emissions Reduction

In April 2011, Clean Cities began partnering with large nationwide fleets that operate in areas larger than any given coalition. The NCFP grew to 27 fleets in 2015, and 17 of them reported their fuel use data directly to NREL. NREL then allocated NCFP data to individual coalitions based on garage locations, refueling locations, and partner estimates. The coordinators then verified that they did assist the NCFP fleets in their region and claimed full, partial, or no credit for the partner's alternative fuel use that was attributed to them. The average partner worked with 10 coalitions as they implemented new technologies across the nation. However, some of the partners' work was also done independently of local coalitions and was previously not reported. Of the 152 million GGEs petroleum saved by the National Partners, 93 million of them were not allocated to or claimed by any coalitions (as shown in Table 6). These partners still benefitted from the expertise, tools, and other resources provided by the national Clean Cities program, so credit for their activities was still taken at the national level.

Table 6. Vehicles and Petroleum Reduction from National Partners

Fuel/Drivetrain	Vehicles	Petroleum Saved ('000 GGEs)	GHG Reduced (tons)
CNG	18,520	74,443	62,757
LNG	1,736	38,387	38,502
Fuel Economy	13,982	13,386	170,509
Propane	4,255	12,792	5,015
Biodiesel	53,299	6,195	54,253
Electric	1,647	3,971	15,947
HEV	1,532	1,090	13,430
PHEV	3,154	786	4,056
Hydrogen	55	463	1,852
E85	1,053	380	1,314
Idle Reduction	2,400	86	1,071
EV/PHEV	44	15	76
Total	101,677	152,360	368,780

Workplace Charging Challenge Petroleum Savings and Greenhouse Gas Emissions Reduction

Clean Cities added the WPCC to its portfolio of strategies in 2012. Each year, the WPCC annual report highlights accomplishments of the initiative from June 1 to May 31. Table 7 weights the accomplishments from the 2015 and forthcoming 2016 WPCC annual reports to provide an estimate of accomplishments in calendar year 2015 (the Clean Cities reporting period). WPCC projects that were already reported by coalitions were subtracted to avoid double counting them. In 2015, the WPCC efforts added 11,078 PEVs to Clean Cities' fleet. These PEVs saved 1.9 million gallons of gasoline and reduced GHG emissions by more than 9,600 tons.

Table 7. WPCC 2015 Accomplishments

Year	PEVs	kWh (million)	GGE (million)	GHG (tons)
June 2014 to May 2015[a]	9,031	11.8	1.7	8,500
June 2015 to May 2016[b]	12,562	14.6	2.0	10,514
Jan to Dec 2015	11,091	13.5	1.9	9,675
Coalition Overlap	13	0.03	0.003	17
CY 2015 WPCC Accomplishments	11,078	13.4	1.9	9,658

[a] Numbers sourced from the *2015 Workplace Charging Challenge Mid-Program Review: Employee's Plug In.*[2]

[b] Preliminary numbers sourced from the forthcoming *2016 Workplace Charging Challenge program update report.*

Estimated Petroleum Savings and Greenhouse Gas Emissions Reduction

Two categories comprise estimated petroleum savings: "estimated lab savings," which includes national lab activities, such as the *Fuel Economy Guide* and the AFDC website, and "estimated outreach savings," which includes coalition outreach activities. Both categories impact behaviors such as vehicle purchases, fuel choice, driving habits, vehicle maintenance, and transportation patterns. Calculating these petroleum savings involves a fair degree of uncertainty, but it is nevertheless important to quantify the impacts of educational and outreach activities as best we can. Not doing so would imply that these activities had no impact, which is inaccurate. This section outlines our approach and provides the results.

Methods Used to Estimate Petroleum Use and Greenhouse Gas Emissions Reduction by Websites and Outreach Activities

To estimate petroleum and GHG reductions from Clean Cities' online resources and outreach events, NREL and ORNL developed the Petroleum Impact Model (PIM) and added related functionality to the Clean Cities annual report website.

Clean Cities coordinators reported the type of outreach event, the number of people reached by each event, the technologies presented, and the coalition's percent attribution. To determine the number of people reached by a given event, the annual report website multiplied the audience number by the percent attributed to the coalition. When multiple technologies were presented at a given event, the annual report assumed the number of people reached to be divided evenly among the technologies. These data are then entered into the PIM as "persons reached by the coalition about a given technology."

[2] http://energy.gov/sites/prod/files/2015/12/f27/105313-5400-BR-0-EERE%20Charging%20Challenge-FINAL_0.pdf

The PIM multiplies this persons-reached number by the probability a person will take action (defined as purchasing an AFV or more efficient vehicle, or as changing driving or fueling behavior). This probability is derived by comparing the outreach event and technology to comparable marketing media and products. Eleven of these media–product combinations have a "customer conversion ratio" that is recorded by various marketing firms, as shown in Table 8. The customer conversion ratio is the ratio of purchases made (desired action) over the total number of people contacted through the outreach activity. The code in Table 8 is provided for continuity through the calculation process.

Table 8. Benchmark Customer Conversion Rates and Their Sources

Code	Benchmark Conversion Rate	Reference
1	0.6% for electronics (expensive, complicated) websites	Fireclick.com, accessed June 16, 2011
2	1.3% for environmentally related, incremental cost purchase	Bird, Lori. 2004. *Utility Green Pricing Programs: Design, Implementation, and Consumer Response*
3	2% for common websites and website ads	Nielsen and Facebook, 2010. Advertising Effectiveness: Understanding the Value of a Social Media Impression. And Fireclick.com, accessed June 16, 2011
4	2.5% for industry-specific mail	Direct Marketing Association (DMA). 2011
5	3.2% for email	Fireclick.com, accessed June 16, 2011
6	7% for affiliates and 8% for "social ads" that are endorsed by peers	Fireclick.com, accessed June 16, 2011. Nielsen and Facebook, 2010. Advertising Effectiveness: Understanding the Value of a Social Media Impression.
7	(Rate not listed here due to copyright restrictions) AdMeasure product: LDVs	GfK Mediamark Research & Intelligence, LLC. 2011
8	(Rate not listed here due to copyright restrictions) AdMeasure product: Gasoline	GfK Mediamark Research & Intelligence, LLC. 2011
9	(Rate not listed here due to copyright restrictions) AdMeasure smoking cessation	GfK Mediamark Research & Intelligence, LLC. 2011
10	2% for direct mail to current customers	Eisenberg, B. "The Average Conversion Rate: Is it a Myth?" ClickZ. February 1, 2008

For activity-type/audience-action combinations that were not directly addressed by research, NREL adjusted the customer conversion ratios based on the Ostrow Model of Effective Frequency, Krugman's Three Exposure Theory, and the authors' assumptions. Table 9 lists a set of relationships that increase or decrease the impact of advertisements.

Table 9. Relationships for Media Effectiveness and Their Sources

Code	Relationships	Source
A	Degree of media interactivity increases impact	Ostrow Model of Effective Frequency
B	Brand recognition increases impact	Ostrow Model of Effective Frequency
C	Long purchase cycle increases impact	Ostrow Model of Effective Frequency
D	Less frequent usage of item increases impact	Ostrow Model of Effective Frequency
E	Affordability of item increases impact	Ostrow Model of Effective Frequency
F	Simple message increases impact	Ostrow Model of Effective Frequency
G	Media clarity (not cluttered) increases impact	Ostrow Model of Effective Frequency
H	Message in relevant environment increases impact	Ostrow Model of Effective Frequency
I	Audience attentiveness increases impact	Ostrow Model of Effective Frequency
J	More steps in processing the media increases impact	Krugman's Three Exposure Theory
K	Availability of item increases impact	Author's Assumption
L	Length of vigilance required decreases impact	Author's Assumption

We adjusted the benchmark conversion rates shown in Table 8 by the relationships for media effectiveness shown in Table 9. The direct application of these rates and relationships is shown in Table 10, where the number relates to the code in Table 8 and the letters relate to the code in Table 9. The final customer conversion ratios used are displayed in Table 11.

Table 10. Combination of Benchmarks and Relationships

Activity Type	Purchase New AFV	Use Alt. Fuel in Existing Vehicle	Use Biodiesel Blends in Diesel Vehicle	Purchase More Efficient Car	Operate Vehicle More Efficiently	Purchase HEV	Reduce Idling	IR HDV (Equipment Purchase)	Reduce VMT
Advancing the Choice	6+H+I+J-E	6+H+I+J	6+H+I+J	6+H+I+J	6+H+I+J	6+H+I+J-E	6+H+I+J	6+H+I+J-E	6+H+I+J
Advertisement	7-K	8-K-L	8-K-L	7+E	9-G-L	7-K	9-L	7+E	9-L
Conference	6+H+J-E	6+H+J	6+H+J	6+H+J	6+H+J	6+H+J-E	6+H+J	6+H+J-E	6+H+J
Literature Distribution	4+B+H-E	4+B+H	4+B+H	4+B+H	4+B+H	4+B+H-E	4+B+H	4+B+H-E	4+B+H
Media Event	7-E-G-H-K	8-G-H-K	8-G-H-K	7-G-H+E-K	9-G-H-K	7-E-G-H+B-K	9-G-H-K	7-E-G-H-K	9-G-H-K
Meeting	6+A+B+I-E	6+A+B+I	6+A+B+I	6+A+B+I	6+A+B+I	6+A+B+I-E	6+A+B+I	6+A+B+I-E	6+A+B+I
Website	1+B+J	3+B+J	3+B+J	3+B+J	3+B+J	1+B+J	3+B+J	1+B+J	3+B+J

Table 11. Customer Conversion Ratios Used in the PIM

Activity Type	Purchase New AFV	Use Alt. Fuel in Existing Vehicle	Use Biodiesel Blends in Diesel Vehicle	Purchase More Efficient Car	Operate Vehicle More Efficiently	Purchase HEV	Reduce Idling	HDV IR Equipment Purchase	Reduce VMT
Advancing the Choice	2.0%	6.0%	6.0%	5.0%	7.0%	2.0%	5.0%	4.0%	8.0%
Advertisement	0.6%	5.5%	5.5%	2.0%	10.0%	2.0%	10.0%	3.0%	4.0%
Conference	2.0%	6.0%	6.0%	5.0%	7.0%	2.0%	5.0%	4.0%	8.0%
Literature Distribution	2.0%	3.0%	3.0%	2.5%	3.0%	2.5%	3.0%	2.5%	5.0%
Media Event	0.6%	2.5%	3.0%	1.2%	3.0%	1.2%	4.0%	2.0%	2.0%
Meeting—Other	2.0%	7.0%	6.0%	5.0%	7.0%	2.0%	5.0%	4.0%	8.0%
Website	2.0%	4.0%	3.0%	3.0%	4.0%	3.0%	3.0%	3.0%	3.0%

The persons-reached multiplied by the appropriate customer conversion ratio (from Table 11) results in the number of people assumed to take the intended action. After the conversion factors have been applied, the PIM is similar to the Clean Cities annual reporting tool as it converts the estimated number of vehicles purchased or number of people changing their driving habits into petroleum saved. We make downward adjustments of 30%–40% to the estimates to account for probable overlaps between audiences attending outreach events and entities reporting their own petroleum savings via a Clean Cities coalition. We apply the estimated petroleum savings only to the reporting year in question, even though many of the vehicle purchases and behavioral changes will likely last beyond that year.

We also used the PIM to estimate petroleum savings resulting from the AFDC. NREL gathers AFDC website statistics that allow us to estimate the number and characteristics of individual users. The PIM then uses inputs, defaults, and methodologies similar to those it employs in calculating the savings from coalition websites (including the website row of Table 11) to estimate the total petroleum savings attributable to the AFDC.

Estimated Lab Savings

Both NREL and ORNL use a variety of means to track the use of the information and resources they provide on behalf of the Clean Cities program. ORNL produces the *Fuel Economy Guide* based on fuel economy data from the EPA. It also produces and maintains the FuelEconomy.gov website along with other print products and educational activities related to fuel economy. By tracking the number of new car buyers, used car buyers, and car drivers exposed to fuel economy products through their educational materials, and assuming a 1% to 3.3% improvement in fuel economy per customer, ORNL estimated that the fuel economy materials resulted in a savings of 130 MGGEs in 2015. This is a reduction of 22% from 2014, most likely attributable to lower gasoline prices (27% lower than 2014[3]) reducing interest in fuel economy and therefore visitors to fueleconomy.gov.

Online resources managed by NREL reached a large audience in 2015, as the Clean Cities and AFDC websites received a combined 6.6 million page views. The sites provide a range of resources to support coordinators, fleets, businesses, policymakers, and other transportation decision-makers in their efforts to implement the technologies and strategies in the Clean Cities portfolio. The sites' content includes technical data, case studies, and publications, along with databases of federal and state incentives and laws, fueling station locations, available vehicles, and other information and tools.

NREL estimates that the 6.2 million page views through 1.9 million sessions by 1.4 million users of the AFDC resulted in a petroleum savings of 52 MGGEs in 2015. When estimating petroleum savings, we assumed that 20% of the AFDC visitors were overlaps with activities reported by the coalitions so we did not count the activities of those 20%. Compared to 2014, this activity is a 1% reduction in page views and a 5% reduction in petroleum savings. The discrepancy is largely due to a reduction in visits to pages with a higher probability of displacement (such as the alternative fuel station locator) and an increase in visits to pages with a lower probability of displacement (such as data, analysis, and trends, and tools that help drivers and fleets determine the payback of investments in alternative fuel vehicles and infrastructure).

The Clean Cities website received 371,000 page views through 121,000 sessions from 64,000 visitors. However, we did not make petroleum use reduction estimates for the Clean Cities website because we assumed the majority of site visits were related to Clean Cities activities taking place through coalitions, and those activities were already reported by the coalitions. For the same reason, we did not make petroleum use reduction estimates for other Clean Cities activities performed by NREL, such as webinars, technical advice, presenting and exhibiting at conferences, and publications.

Estimated Outreach Savings

Coalitions' outreach, education, and training activities were classified into nine categories, as shown in Table 12. A total of 2,971 activities were reported, which were estimated to have reached nearly 25 million people. Compared to 2014, the number of events increased by 1%, while the number of persons reached decreased by 64%. This is because the average size of events decreased from last year—from 23,478 persons per event to 8,408. This overall reduction in audience interest and participation is likely due to the 27% reduction in gasoline prices between 2014 and 2015. Furthermore, this average size is heavily influenced by large media events. The majority of people (90%) were reached through media events in 2015, even though only 10% of the outreach activities were media events. The overall decrease in people reached through media events was largely driven by a return from the abnormalities of 2014. These abnormalities were two high-profile media stories in Minnesota and Oregon that gained national coverage and syndication. The one category that showed improved attendance in 2015 is the coalition-held workshops. The average coalition-held workshop had 1,800 attendees in 2015—nearly a six fold increase from 2014.

[3] EIA Petroleum Navigator, accessed 8/15/2016 at www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm.

Table 12. Outreach, Education, and Training Activities

Activity type	Number of Activities	Share of Total Activities	Activities Increase Since 2014	Persons Reached	Share of Total Persons Reached	Persons Increase Since 2014
Meeting - Other	898	30%	12%	135,552	0.5%	-80%
Conference participation	546	18%	13%	563,067	2.3%	6%
Literature Distribution	397	13%	10%	460,973	1.8%	-22%
Meeting - Stakeholder	383	13%	-1%	14,546	0.1%	-22%
Media Event	287	10%	1%	22,570,242	90.3%	-63%
Workshop held by coalition	286	10%	-16%	523,194	2.1%	389%
Social Media	108	4%	-35%	82,463	0.3%	-34%
Website	44	1%	-10%	121,453	0.5%	-48%
Advertisement	22	1%	-61%	509,727	2.0%	-90%
TOTAL	2,971	100%	1%	24,981,217	100%	-64%

Figure 4 illustrates the types of audiences reached through the 2,971 outreach activities. The coalitions could aim any one activity toward multiple audiences; in fact, each activity targeted an average of 2.3 different audiences. Government fleets were the most-cited target audience, followed by the general public, then private fleets. Entities with specialized applications—such as utility trucks, mass transit, delivery trucks, waste management, and airports—were identified as audiences in 41% of the outreach activities. The composition of outreach activities was consistent with last year's.

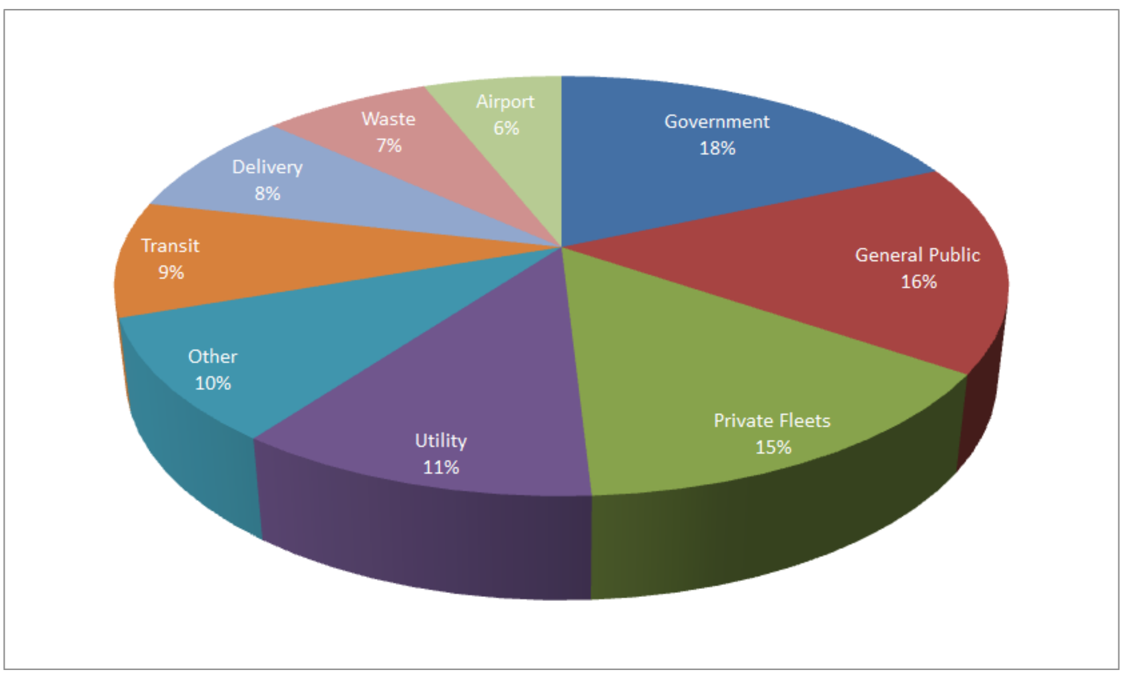

Figure 4. Percent of people reached via outreach activities split among audience types

Coalitions' outreach events featured a relatively even mix of technologies, as illustrated in Figure 5. No single technology dominated, but EVs were covered more than any of the other technology types. Just as with audience types, any one activity could address more than one technology; each activity featured an average of 2.5 different technologies.

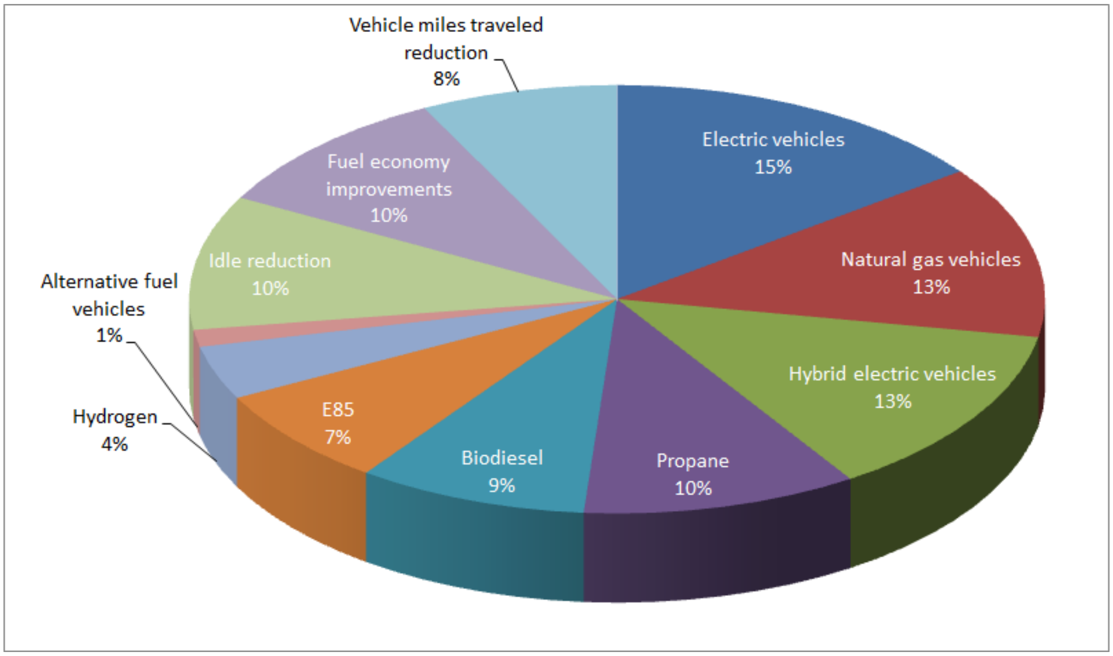

Figure 5. Percent of outreach activities by technology type

Using the PIM, NREL estimates that Clean Cities coalition outreach events prompted and enabled actions that saved 55 MGGEs of petroleum in 2015, after accounting for a substantial overlap with reported savings. This is a 53% reduction from 2014, which is slightly less than the 64% reduction in overall people reached (as examined in the first paragraph of this section). The difference in these two numbers is likely due to the PIMs new resolution since it now treats each alternative fuel separately instead of grouping them.

Goal Tracking and Cumulative Petroleum Savings and Greenhouse Gas Emissions Reduction

In 2005, Clean Cities set a goal of displacing 2.5 billion GGEs per year by 2020. The data presented in this report show that Clean Cities is slightly behind schedule to meet this goal. Clean Cities' progress toward its petroleum use reduction goal is shown in Figure 6, where the path toward achieving the 2020 goal is represented by the blue dashed line and actual petroleum savings are tracked by the black solid line. When the goal was originally set in 2005, meeting it required a compounded annual growth rate of 16.6%. The average growth rate required henceforth to meet the 2020 goal has increased to 18.3%.

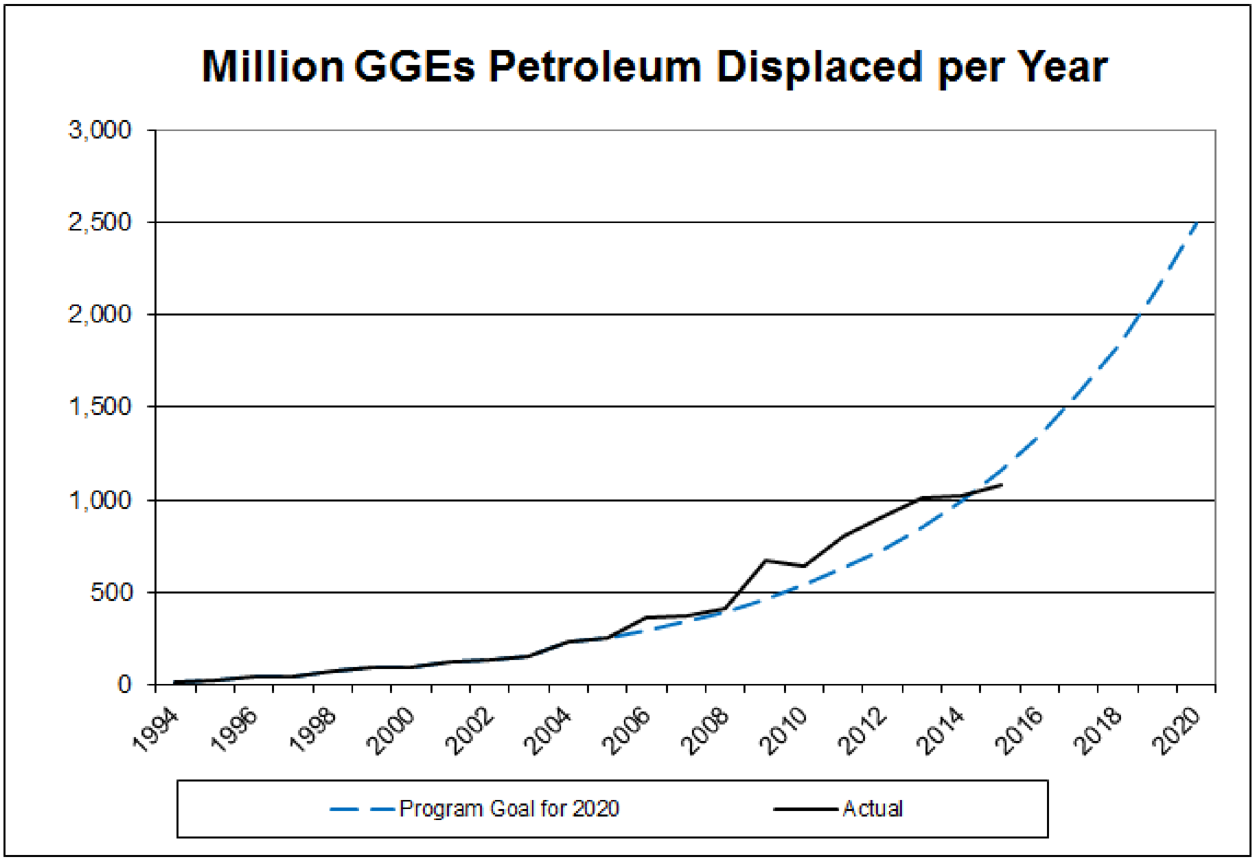

Figure 6. Annual petroleum savings trajectory to meet 2020 goal and actual progress

Clean Cities efforts have added up considerably over the years. When the annual savings shown in Figure 6 are aggregated to cumulative savings, the overall impact can be seen. This cumulative petroleum savings, shown in Figure 7, is now more than 8.5 billion GGEs.

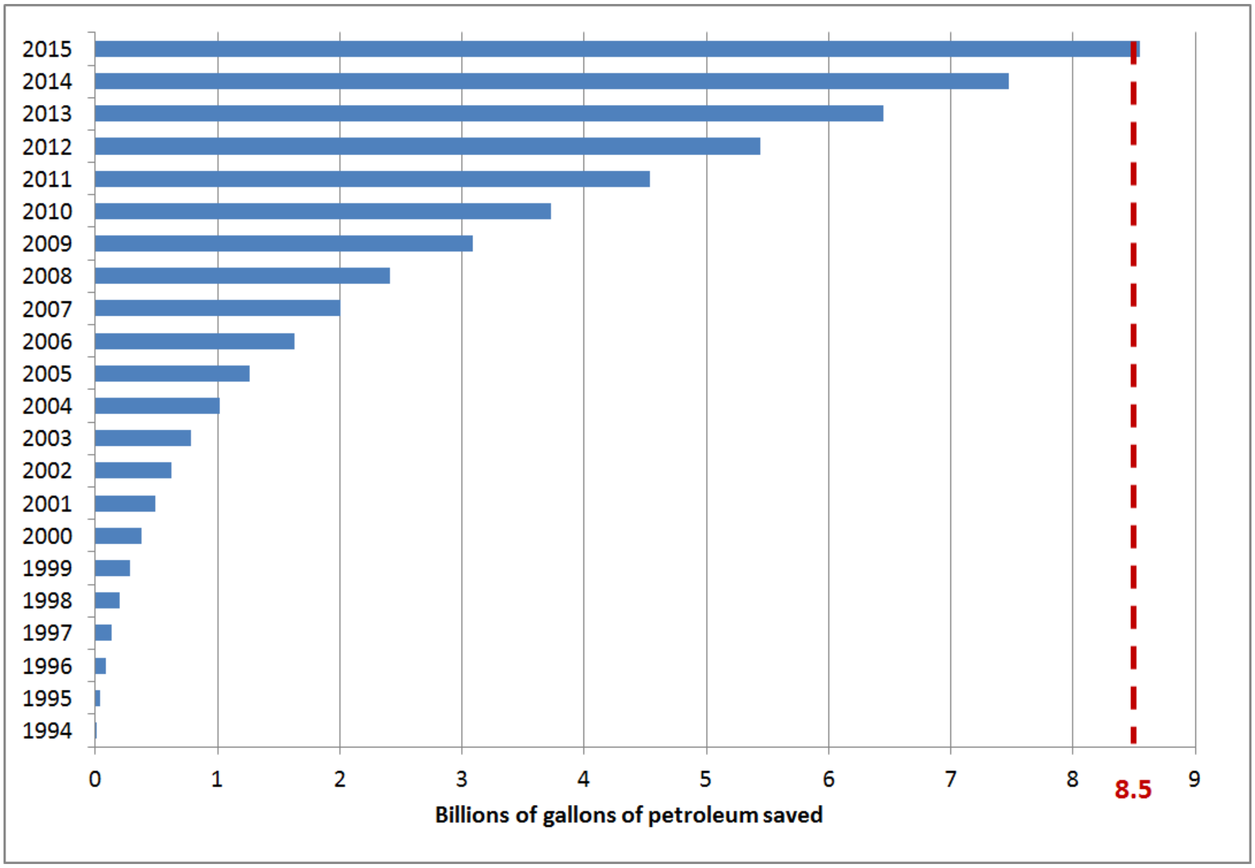

Figure 7. Cumulative petroleum savings of all Clean Cities activities

These petroleum savings have led to a cumulative of nearly 54 million tons of GHG emissions reductions over the years as well, as shown in Figure 8. The relationship between the two has not always been consistent, since different technologies can be more effective at either petroleum savings or GHG reductions (see Figure 1) and the Clean Cities technology portfolio changes over time. Furthermore, there was a shift in the GHG calculations in 2015. Therefore, Figures 7 and 8 do not reflect one another exactly.

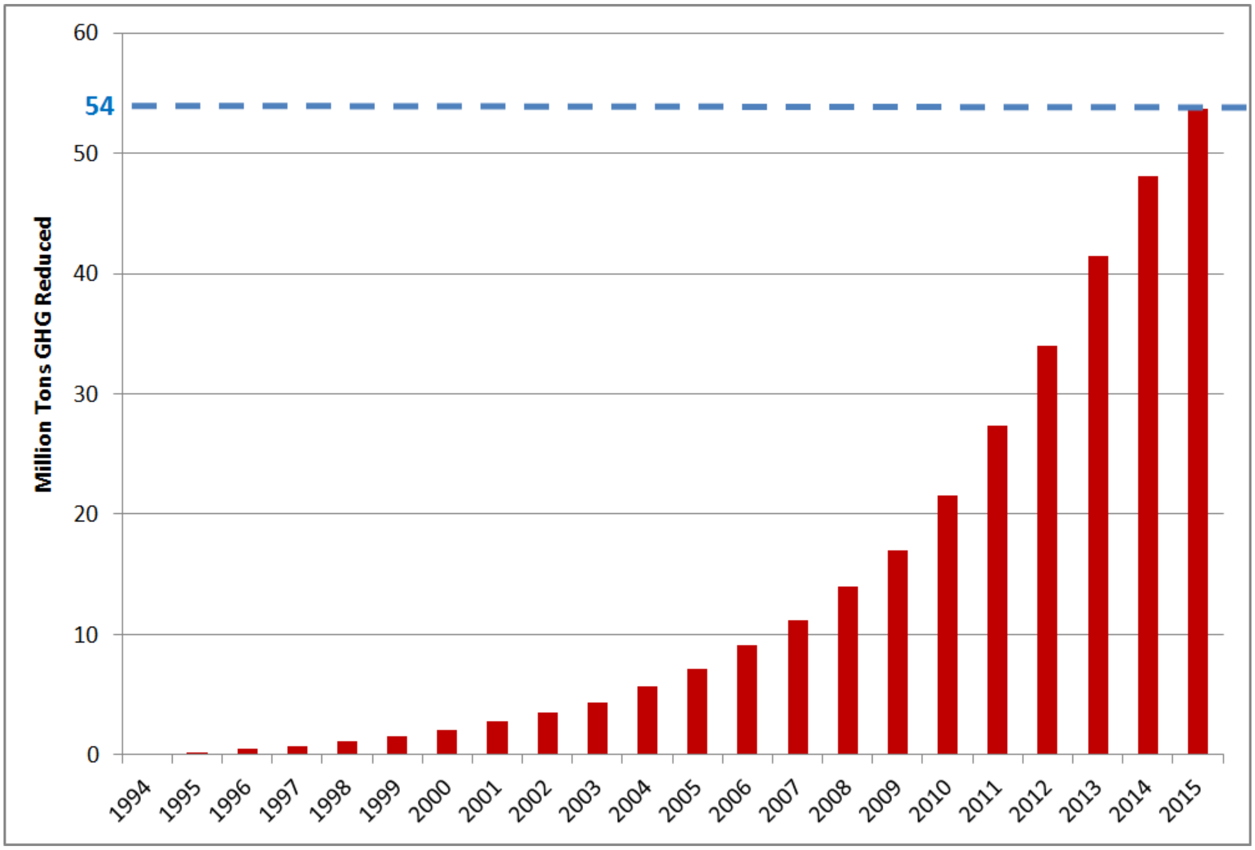

Figure 8. Cumulative GHG reductions from all Clean Cities activities

Alternative Fuel Vehicle Types and Markets

The online reporting tool asked coordinators to categorize their AFVs into key vehicle types and niche market fleets. Figure 9 shows that the largest portion (29%) of AFVs was cars. "Unknown/other" LDVs were the second most common AFV (at 26% of total). These are usually vehicles reported in conjunction with a Clean Cities-supported fueling station. Heavy trucks without trailers accounted for 13% of vehicles. Light trucks/vans/sport utility vehicles and "unknown" or "other" HDVs, which were mostly reported in conjunction with E85 and biodiesel public fueling stations, each accounted for 9% of vehicles. All remaining categories accounted for fewer than 4% of the vehicle population.

E85 LDVs were the most popular fuel/vehicle combination. E85 vehicles in the "unknown/other" light-duty segment (149,000 vehicles), the light trucks/vans/sport utility vehicles segment (42,000 vehicles), the car segment (72,000 vehicles), and the patrol car segment (9,000 vehicles) together comprised 34% of all vehicles.

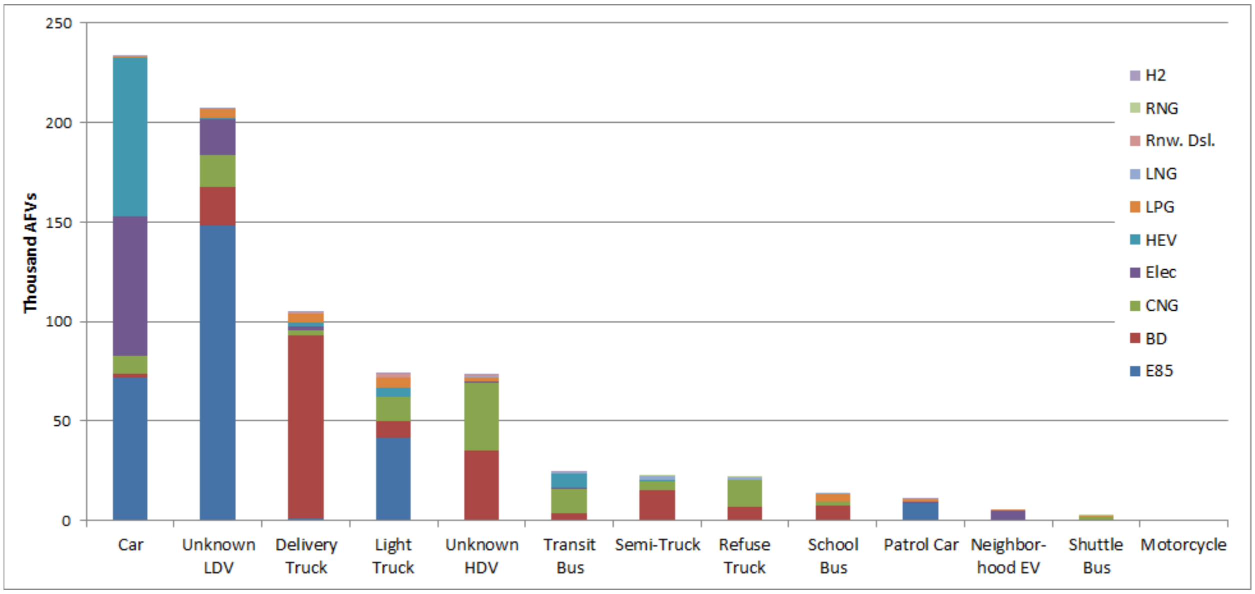

Figure 9. AFVs by vehicle and fuel type

Neighborhood EVs are small EVs only allowed on low-speed roads.

In addition to reporting vehicle types, coordinators also provided information about vehicle ownership and the markets served by reported vehicles. As shown in Figure 10, nearly half of the reported vehicles were owned by the general public or an unknown entity. Many of these vehicles were reported through fuel retailers. The next two largest ownership groups of AFVs are local governments and corporate fleets at 18% and 13%, respectively.

The number of vehicles in corporate fleets increased by 318%, and showed the most growth for any market in 2015. Most of these corporate fleet vehicles were biodiesel vehicles. The number of airport, utility, and general public vehicles all increased significantly (42%, 32%, and 13%, respectively). The most popular fuels for these markets were E85 for airport vehicles, biodiesel for utility vehicles, and E85 for general public vehicles. State government, USPS (United States Postal Service), and National Parks vehicles shrank by 5%, 5%, and 1%, respectively. Taxis and local government vehicles grew by 8% and 5%, respectively. Commuters were reported for the first time in 2015.

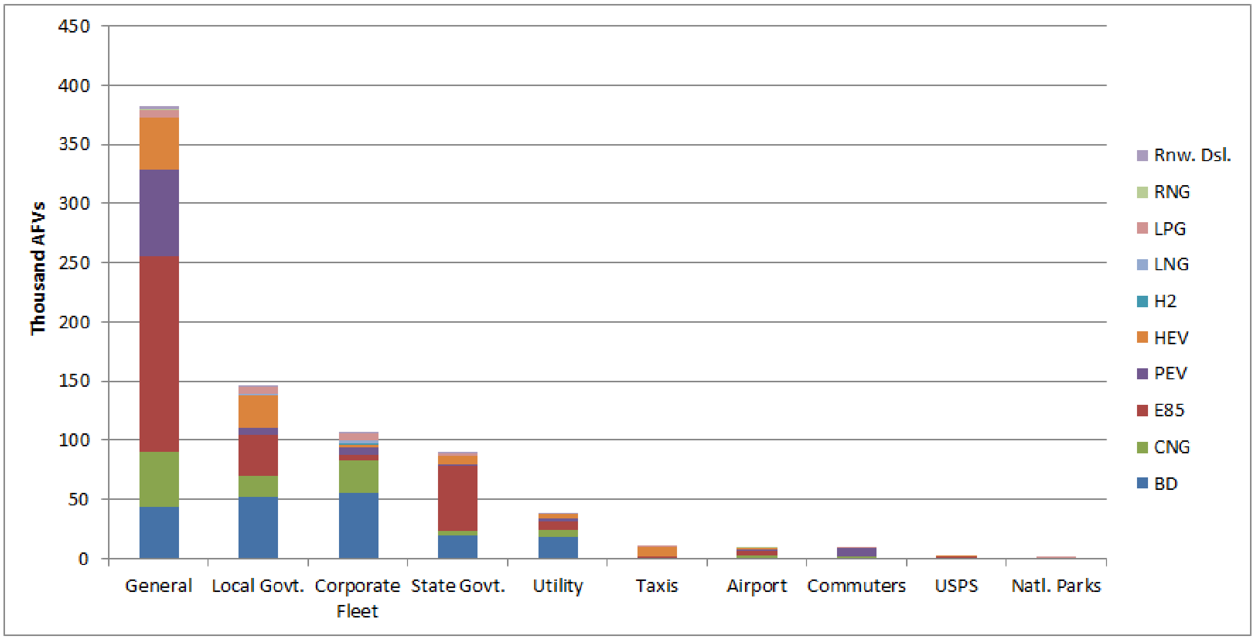

Figure 10. AFVs by market and fuel type

Emerging Technologies—Experimental, Prototype, and Demonstration Vehicle Projects

A small number of Clean Cities coalitions have worked with fleets and stakeholders who have an interest in field-testing advanced vehicle technologies (e.g., hydrogen and fuel cell vehicles). This subset of vehicles represents just 0.01% of the total number of alternative fuel or advance technology vehicles reported by coalitions. Some of these projects involve limited production, experimental, or prototype/demonstration models that are made available from vehicle manufacturers under special lease arrangements. This is a way for the manufacturers to gather in-use performance data, evaluate durability, and refine engineering designs for future vehicle models that may be under development. Data reported to Clean Cities for some of these vehicles show the extraordinary potential they have for both energy and environmental benefits, but no significant market trends could be drawn from this limited data set.

Coordinators and Coalition Types

Collectively, coordinators reported spending a total of 2,738 hours per week on Clean Cities tasks, or nearly 137,000 total hours over the course of the year.[4] This translates into 68 full-time, experienced technical professionals working to reduce U.S. dependence on petroleum. For an individual coalition, the average amount of time spent coordinating Clean Cities business per week was 33 hours, and the median was 30 hours. The average decreased from 34 hours in 2014, while the median remained consistent. The reporting website also gathered information on coordinator experience. Coordinators have been on the job for an average of 7.2 years. Fifty-two percent of coordinators have more than six years of experience as of 2015, and 48% have had six or fewer years of experience. Twenty-four coordinators have been with Clean Cities for at least 10 years.

[4] Assuming 50 work weeks per year.

Coalition types were tracked, and the relationships between coalition type and general metrics were analyzed. The coalition types correspond to their host organization (which generally pays the coordinator's salary) and are listed in the first column in Table 13 and defined in Appendix B. Standalone nonprofits are coalition types that are self-sustaining and do not operate as part of a larger host organization. There are no longer any coalitions that qualify as independent businesses.

The number of coalitions in each grouping is listed in the second column of Table 13, followed by metrics such as the average number of stakeholders, average funds (including grants and dues) received in 2015, the average GGEs of petroleum saved, and the average number of persons reached through outreach events. The range of all metrics overlaps heavily between groups, and the low sample size precludes statistical significance. Furthermore, many variables affecting the metrics in this table were not controlled for, so no cause/effect relationships can be inferred between coalition type and specific metrics. Coalitions that reported the highest number of stakeholders tended to be hosted in nonprofits, while those reporting the fewest stakeholders were hosted by city and county governments. Coalitions that raised the most funds on average were hosted by city or county governments. This same category of coalitions also saved the most petroleum consumption on average. Coalitions that reached the most people in outreach events were generally hosted in a nonprofit. Coalitions that brought in the least amount of funding were generally hosted by universities. Coalitions hosted by state governments saved the least amount of petroleum, and coalitions hosted by universities reached the fewest people.

Table 13. Coalition Metrics by Coalition Type

Coalition Type[a]	Total # of Coalitions	Average # of Stakeholders	Average Funds In	Average GGE Saved	Average Persons Reached
Nonprofit - Standalone	32	185	$3,824,295	10,522,020	48,517
Regional Governing Coalition	15	128	$1,542,279	10,990,981	154,251
Nonprofit - Hosted	13	140	$3,035,951	6,122,536	1,491,295
Government - State	9	152	$4,089,953	4,307,173	26,652
Government - City or County	8	72	$13,093,762	11,014,156	166,407
University	6	164	$882,443	6,552,857	26,164
Total/Overall Weighted Average	83	152	$6,651,414	9,004,305	300,979

[a] Coalition types are defined in Appendix B.

Project Funding

In 2015, 49 coalitions reported receiving 112 new project awards (project-specific grants) worth a total of $55 million. These coalitions also reported garnering $38 million in leveraged or matching funds for a combined total of $93 million. This funding represents nearly a 4:1 leveraging of the $24 million program budget in Fiscal Year 2015. The value of 13 of the 112 awards met or exceeded $1 million each. Table 14 presents a breakdown of the number and value of awards reported by the coalitions.

Table 14. Breakdown of 2015 Project Awards by Number and Value

Grant Range	Number of Grants	Share of Total Number	Total Value	Share of Grand Total Value
< $50,000	52	46%	$998,501	2%
$50,000 - $99,999	8	7%	$496,948	1%
$100,000 - $499,999	21	19%	$5,451,675	10%
$500,000 - $999,999	18	16%	$12,077,311	22%
$1,000,000 +	13	12%	$36,353,899	66%
Grand Total	112	100%	$55,378,334	100%

In addition to new 2015 awards, coordinators reported the portions of previous multiyear awards spent during the calendar year. If a coordinator failed to report the amount spent during 2015, we assumed it to be the total amount of the award divided by the number of years of award duration. Coalitions reported spending 57% of the funds they were awarded in 2015, suggesting that projects start quickly. In 2015, coalitions helped utilize a total of $112.3 million in project funds that were awarded and matched from 2008 to 2014.

Of the $93.3 million in project awards and leveraged funds awarded to coalitions in 2015, $30.6 million (33%) were listed as coming from state governments, $11.8 million (13%) came from Congestion Mitigation and Air Quality funding, and $4.5 million (5%) came from DOE. DOE funds (not including matching funds) distributed in 2015 and previous years totaled $3.4 million of the $112 million (3%) spent for projects in 2015. Funding from Clean Cities coalition support contracts was not included among the project awards because those funds are intended to enable certain coalition operations rather than specific projects.

About the Stakeholders

In 2015, 83 coalitions reported a total of nearly 12,600 stakeholders, for an average of 152 stakeholders per coalition. This is a 14% reduction from the average of 177 stakeholders in 2014. The fact that overall coalition-reported petroleum reduction went up 30% in the face of such a drop indicates that the average stakeholder was much more productive in 2015 than in 2014.

Participation in Clean Cities is voluntary, and coalitions draw local stakeholders from the public and private sectors. Stakeholders include local, state, and federal government agencies, large and small businesses, auto manufacturers, car dealers, fuel suppliers, public utilities, nonprofits, and professional associations. Coalitions reported that 53% of the total stakeholders were from the private sector. This composition is the same as in 2014 and shows a steady balance between public and private stakeholders in 2015.

Data Sources and Quality

Gathering data is often challenging for coordinators because they rely on voluntary reporting from their numerous stakeholders. Therefore, the annual report website contains some questions related to data sources and quality. In these questions, coordinators were asked to rate the quality of their data as excellent, good, fair, or poor. The "cumulative" bar in Figure 11 presents the response breakdown for the 83 coordinators who answered the question. Thirty-six percent of the respondents classified their data as excellent, 61% as good, 2% as fair, and 1% as poor. The one poor rating was due to an incomplete dataset because not enough stakeholders submitted data.

Relative to 2014, the poor category stayed the same, the fair category decreased two percentage points, the good category decreased by one percentage point, and the percentage of coordinators who felt their data was excellent increased three percentage points.

We also asked coordinators how they obtained their data. They could choose one or more of the following: online questionnaires (e.g., Survey Monkey), written (paper or electronic) questions to stakeholders, phone interviews with stakeholders, coalition records, or coalition estimates. Phone interviews were the most used method of data gathering, accounting for 27%. The second most common method was written questions (25%), then coalition records (19%), estimates (16%), and finally online questionnaires (13%). There were only minor shifts in this breakdown since 2014. Figure 11 shows that all collection methods resulted in similar levels of reliability.

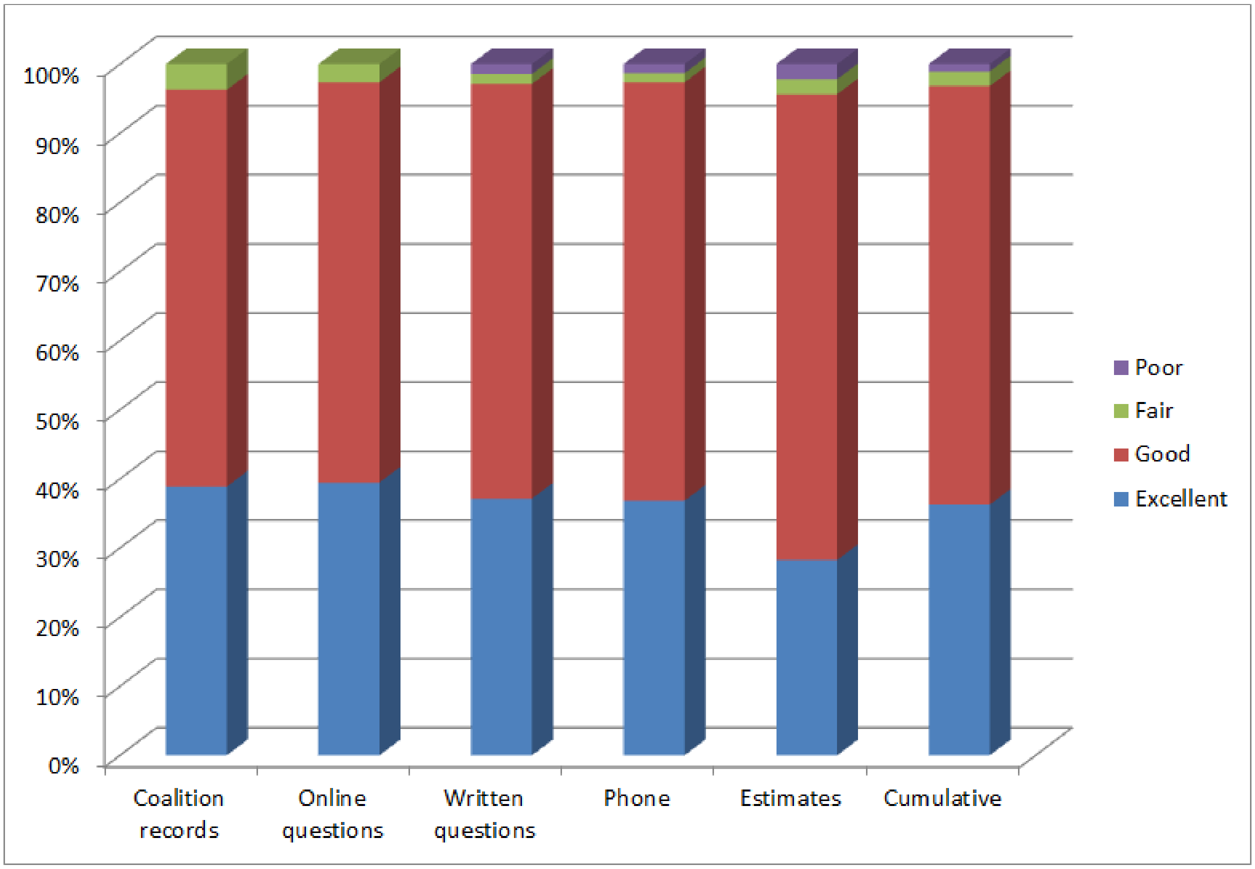

Figure 11. Data quality responses by data source

Conclusion

This Clean Cities 2015 Annual Metrics Report helps quantify the impact of the program as a whole and of the activities of individual coalitions. The report shows that Clean Cities coalitions had a year of many successful projects. The data that they reported showed a 30% increase in petroleum savings from 2014. However, outreach through coalitions and lab-run websites was down, with a 30% reduction in estimated petroleum savings. These outreach events were likely less successful due to low gasoline prices throughout 2015. This is also likely the cause of the reduction in active stakeholders reported. Overall, Clean Cities' petroleum savings increased from last year, but is slightly behind schedule to meet the 2020 goal of 2.5 billion GGEs per year. Clean Cities increased the number and diversity of AFVs and advanced vehicles on U.S. roads in 2015. The program decreased its overall GHG savings, largely because the updated conversion factors used to calculate GHG savings were less favorable than their predecessors. The combined efforts of local Clean Cities coalitions, DOE, and its national laboratories bring together otherwise disparate groups and funding sources to accelerate the nation's progress toward petroleum and emissions reduction goals. These government/industry partnerships help local communities and stakeholders band together to leverage people and resources to accomplish things at scale that none of them could achieve on their own.

Appendix A: Clean Cities Coalitions that Completed 2015 Annual Reports

State	Coalition
AL	Alabama Clean Fuels Coalition
AR	Arkansas Clean Cities
AZ	Tucson Clean Cities
AZ	Valley of the Sun Clean Cities Coalition (Phoenix)
CA	Central Coast Clean Cities
CA	Clean Cities Coachella Valley Region
CA	East Bay Clean Cities Coalition (Oakland)
CA	Long Beach Clean Cities
CA	Los Angeles Clean Cities Coalition
CA	Sacramento Clean Cities Coalition
CA	San Diego Regional Clean Cities Coalition
CA	San Francisco Clean Cities Coalition
CA	San Joaquin Valley Clean Cities
CA	Silicon Valley Clean Cities (San Jose)
CA	Southern California Clean Cities Coalition
CA	Western Riverside County Clean Cities Coalition
CO	Denver Metro Clean Cities Coalition
CO	Northern Colorado Clean Cities Coalition
CO	Southern Colorado Clean Cities Coalition
CT	Capitol Clean Cities of Connecticut
CT	Connecticut Southwestern Area Clean Cities
CT	Greater New Haven Clean Cities Coalition
CT	Norwich Clean Cities
DC	Greater Washington Region Clean Cities Coalition
DE	State of Delaware Clean Cities
FL	Central Florida Clean Cities Coalition
FL	Southeast Florida Clean Cities Coalition
FL	Tampa Bay Clean Cities Coalition
GA	Clean Cities-Georgia
HI	Sustainable Transportation Coalition of Hawaii
IA	Iowa Clean Cities Coalition
ID	Treasure Valley Clean Cities
ID MT WY	Yellowstone-Teton Clean Energy Coalition
IL	Chicago Area Clean Cities
IN	Greater Indiana Clean Cities Coalition
IN	South Shore Clean Cities
KS MO	Kansas City Regional Clean Cities
KY	Kentucky Clean Cities Partnership
LA	Louisiana Clean Fuels
LA	Southeast Louisiana Clean Fuel Partnership
MA	Massachusetts Clean Cities

State	Coalition
MD	State of Maryland Clean Cities
ME	Maine Clean Communities
MI	Ann Arbor Clean Cities Coalition
MI	Detroit Area Clean Cities
MI	Greater Lansing Area Clean Cities
MN	Twin Cities Clean Cities Coalition
MO	St. Louis Clean Cities
NC	Centralina Clean Fuels Coalition
NC	Land of Sky Clean Vehicles Coalition (Western North Carolina)
NC	Triangle Clean Cities (Raleigh, Durham, Chapel Hill)
ND	North Dakota Clean Cities
NH	Granite State Clean Cities Coalition
NJ	New Jersey Clean Cities Coalition
NM	Land of Enchantment Clean Cities (New Mexico)
NY	Capital District Clean Communities Coalition (Albany)
NY	Clean Communities of Central New York (Syracuse)
NY	Clean Communities of Western New York (Buffalo)
NY	Empire Clean Cities
NY	Genesee Region Clean Communities (Rochester)
NY	Greater Long Island Clean Cities
OH	Clean Fuels Ohio
OH	Northeast Ohio Clean Cities Coalition (Cleveland)
OK	Central Oklahoma Clean Cities (Oklahoma City)
OK	Tulsa Clean Cities
OR	Columbia-Willamette Clean Cities
OR	Rogue Valley Clean Cities
PA	Eastern Pennsylvania Alliance for Clean Transportation
PA	Pittsburgh Region Clean Cities
RI	Ocean State Clean Cities
SC	Palmetto State Clean Fuels Coalition
TN	East Tennessee Clean Fuels Coalition
TN	Middle-West Tennessee Clean Fuels Coalition
TX	Alamo Area Clean Cities (San Antonio)
TX	Dallas-Fort Worth Clean Cities
TX	Houston-Galveston Clean Cities
TX	Lone Star Clean Fuels Alliance (Central Texas)
UT	Utah Clean Cities
VA	Virginia Clean Cities
VT	Vermont Clean Cities
WA	Western Washington Clean Cities
WI	Wisconsin Clean Cities
WV	State of West Virginia Clean Cities

Appendix B: Definition of Clean Cities Coalition Types

Coalitions have categorized themselves into six different types, depending on their organizational structures and relationship to hosts.[5] Some coalitions fit within multiple types. These types are as follows:

1. "Government—City or County" coalitions are hosted by a city or county government such as a city department of transportation or municipally owned utility.
2. "Government—State" coalitions are hosted by a state government. This is generally in the state department of energy or department of environment. Coalitions hosted by a state university are not included in this category.
3. "Hosted in a Nonprofit" coalitions are hosted within a larger nonprofit or community service organization with 501(c)(3) status. The host organization's activities are broader in scope than the Clean Cities coalition, such as the American Lung Association.
4. "Standalone Nonprofit" coalitions are nonprofits typically with 501(c)(3) status and operate without the overhead support of a host organization.
5. "Regional Governing Coalition" coalitions are hosted in a multi-governmental body such as a council of governments, municipal planning organization, or regional planning commission.
6. "Hosted in a University" coalitions are hosted by a university (public or private).

[5] The relationship between a host organization and the coalition varies across the country. Typically, the coordinator of the coalition is an employee of the host organization, and the coalition benefits from the resources available at the host organization.