CalHEAT

TRUCK RESEARCH CENTER

California Hybrid, Efficient and Advanced Truck Research Center

California Truck Inventory and Impact Study

November 30, 2011

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For more information visit:

CalHEAT	www.calheat.org
California Energy Commission	www.energy.ca.gov
CALSTART	www.calstart.org

Purpose and Summary

This paper serves as a summary of the methodology and findings of the California Truck Inventory Study undertaken by CalHEAT. The goal of the study is to better understand the various types of trucks used in California, their relative populations, and how they are used. As the State looks to technologies with the ability to reduce petroleum consumption, it is imperative to understand that technologies will have widely varying impacts depending on the truck's characteristics and how it used. For example, a box truck used for heavy urban cycles may benefit greatly from hybridization or electrification, whereas a truck used to drive between Los Angeles and San Francisco may benefit more from aerodynamic improvements and light-weighting.

The ultimate goal of CalHEAT is to help the State develop a plan to meet 2020 goals in petroleum reduction, carbon reduction and air quality standards, as well as set up a framework and timeline for longer-term goals for carbon reduction. As CalHEAT prepares the transformation roadmap, which will coordinate the development of an overall research and market transformation plan and as CalHEAT facilitates that plan's implementation, it is important, first and foremost, that the different truck use types are clearly understood. Then, it is possible to move on to which of the various technologies might best address each type.

Characterization of Vehicle Populations

Trucks in California

A solid foundation for building the roadmap requires a clear understanding of the California fleet. It is necessary to know the number of trucks in different size categories, and how they are used. Data from a variety of sources has been collected and analyzed.

The primary resources are:

- database maintained by R. L. Polk & Co, which lists every vehicle registered in the state, along with information about each vehicle;[1]
- 2002 Vehicle Inventory and Use Survey VIUS study from the U.S. Census;[2]
- May 2008 edition of Climate Registry's General Reporting Protocol (GRP);[3] and
- 2008 California Air Resource Board Truck and Bus study.[4,5]

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[1] https://www.polk.com/knowledge/reports- CalHEAT worked with Polk to create a custom dataset from their database, which covers registered vehicles in CA

[2] http://www.census.gov/svsd/www/vius/2002.html

[3] http://www.theclimateregistry.org/downloads/GRP.pdf

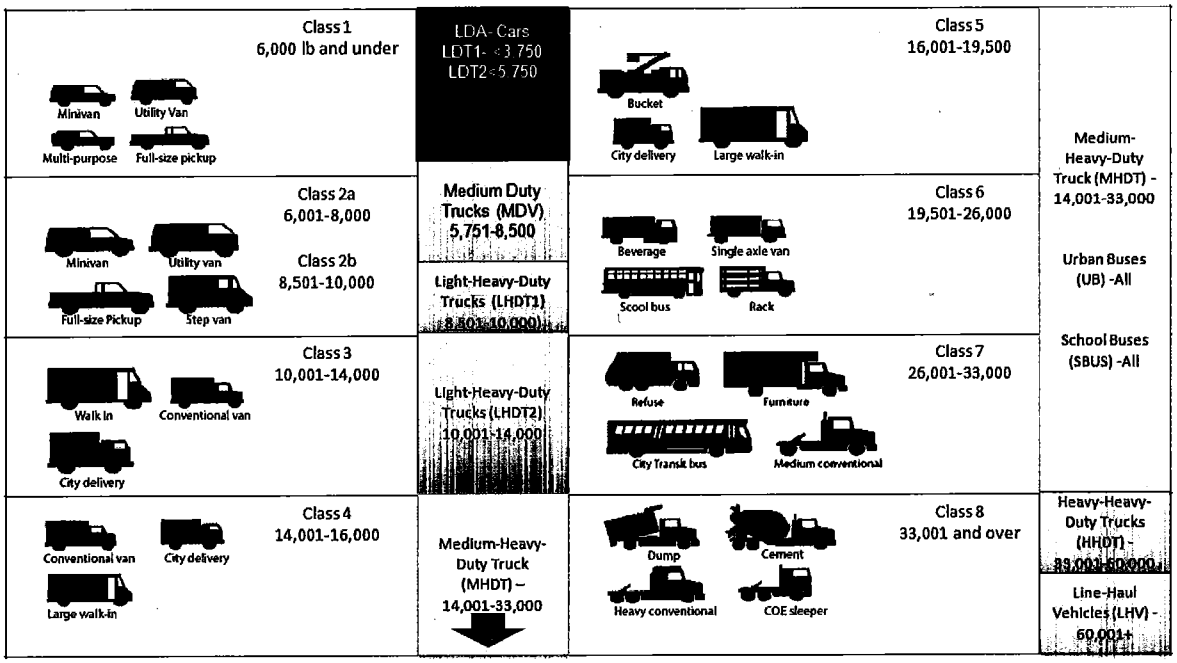
[4] http://www.arb.ca.gov/regact/2008/truckbus08/truckbus08.htm

CalHEAT Truck Model Analysis

The analysis included nearly 1.5 million trucks and buses, ranging in size from Class 2B to Class 8. This number is based upon California registration figures, for commercial trucks in the weight category 2B and above, via the Polk database. It does not represent out of state trucks operating in California, but does include trucks registered here that operate out of state. Future analysis will need to compensate for these factors, likely building on the work done at UC Davis.[6]

Some assumptions were made, particularly in class 2B, to attempt to separate commercial vehicles from non-commercial vehicles. The trucks in class 2B, registered to "Individuals," were eliminated under the assumption that most, if not all, were non-commercial vehicles.

Table 1: Vehicle Classes

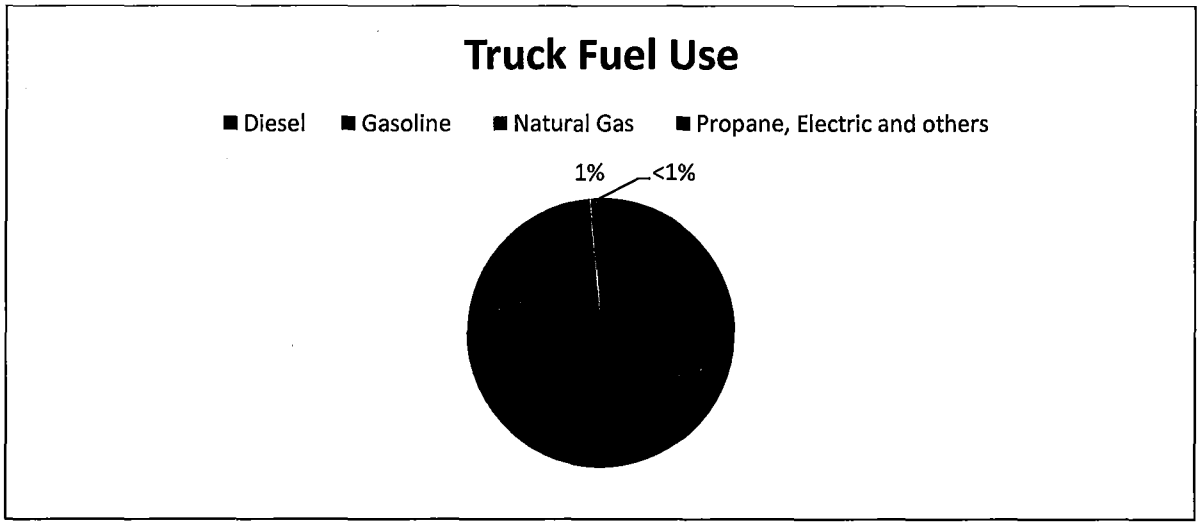


[5] http://www.arb.ca.gov/regact/2008/truckbus08/emissinv.xls
[6] http://pubs.its.ucdavis.edu/publication_detail.php?id=1176

Truck Fuel Use

As Figure 1 shows, the medium- and heavy-duty vehicle market uses more diesel than gasoline. This is not because there are more diesel trucks; in fact, there are more gasoline vehicles by total number. However, because the heaviest trucks use the most fuel, and are nearly 100% diesel, total diesel fuel use is higher. As one moves up the weight classes, the percentage of vehicles burning gasoline goes from being overwhelmingly gas on the light-duty end, to nearly 100% diesel in the Class 8 segment. The CEC reports there were about 15 billion gallons of gasoline used in CA in 2008 (mostly in light-duty passenger cars and light trucks), a number expected to decline by 3-6% annually through 2020. According to the same report, diesel fuel use, in contrast, is estimated at 3.6 billion gallons, and expected to increase by 1.5% annually in the same time period.[7] Commercial trucks and buses account for approximately 30 percent (5.8 billion gallons) of the 18.6 billion gallons of petroleum fuel used by vehicles in the State.[8]

Figure 1: Truck Fuel Use: Percentage by Fuel Type



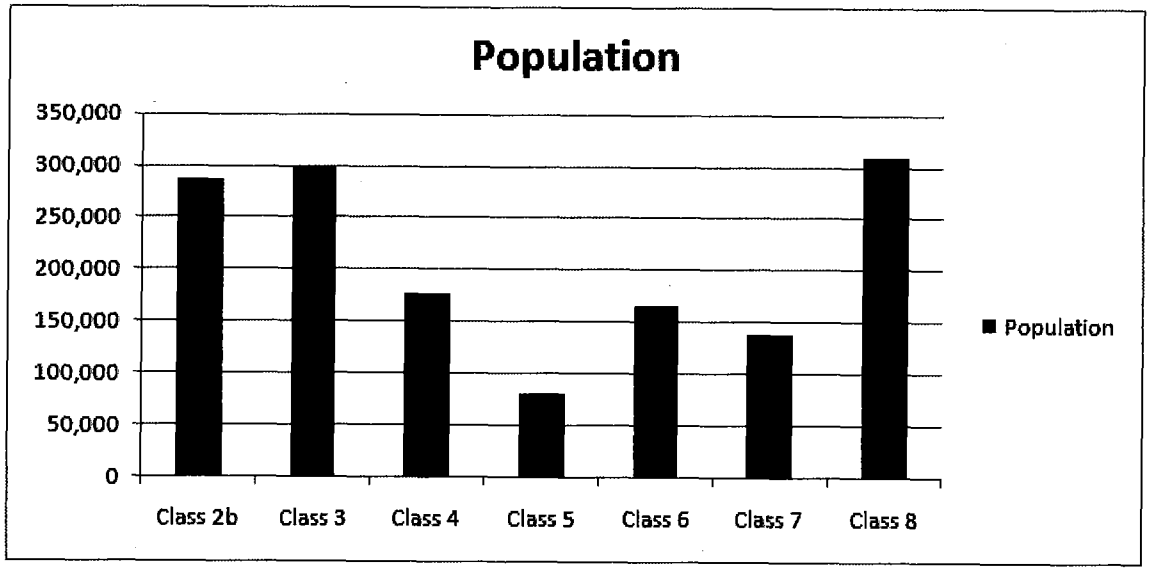
[7] http://ntl.bts.gov/lib/32000/32700/32779/DOT_Climate_Change_Report_-_April_2010_-_Volume_1_and_2.pdf

[8] California DOT, "2008 California Motor Vehicle Stock, Travel and Fuel Forecast", 2008

Truck Population by Weight Class

Of the nearly 1.5 million trucks in California, Class 2b, Class 3 and Class 8 have around 300,000 each. Class 5 has the fewest vehicles, with about 75,000.

Figure 2: Truck Population by Weight Class

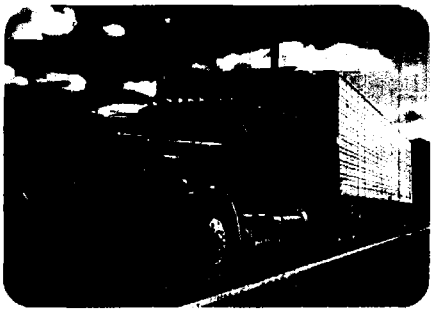


CalHEAT's Six Truck Categories

For the purposes of CalHEAT's roadmap data, it was apparent that the weight classes were not sufficient to evaluate the impact of technology. With significant input from the CalHEAT Technology Advisory Group and the CalHEAT Advisory Council, six categories of trucks were developed. The intent behind the formation of these categories was to lump together trucks that are used in similar ways, such that it could be assumed that there may be similar impacts from technologies. A Class 4 truck in heavy urban use might see a similar percent improvement from hybridization that a Class 6 truck in a similar use would. These trucks would be more similar in how they are affected by a given technology than a Class 4 Truck primarily used for long distance freeway driving.

The six truck categories, with primary defining guidelines, are as follows. (Pictures are merely representative and not meant to be inclusive.)

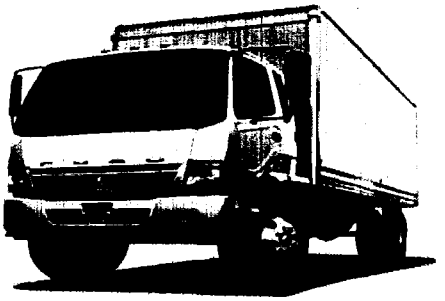
- Class 7-8 Over the Road (OTR)
  - Younger trucks
  - High annual VMT
  - Mostly higher average speed, highway driving



- Class 7-8 Short Haul/Regional
  - Between cities
  - Drayage
  - Day cabs
  - Includes second use trucks and trucks with smaller engines

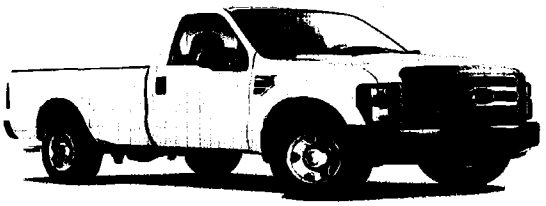
- Class 3-8 Urban
  - Cargo, freight, delivery collection
  - Lower VMT
  - Lower average speed
  - Lots of stop start

- Class 3-8 Rural/Intracity
  - Cargo, freight, delivery collection
  - Higher VMT
  - Higher average speed
  - Combination of urban and highway traffic



- Class 3-8 Work Site Support
  - Utility trucks, construction, etc.
  - Lots of idle time
  - Lots of PTO use

- Class 2b -3 Vans and Pickups



To better and more accurately characterize the fleet, vocational attributes were tracked in the data. By tracking vocation and calculating the impact of trucks in different vocations, weight classes and vehicle types, it is possible to accurately characterize the California fleet. By further identifying which segments of the population have the biggest impacts, technologies, market tools and opportunities can be identified for those populations.

With 1.5 million trucks in the database, no sorting process was going to be perfect in assigning trucks to the six categories. CalHEAT's process built a large matrix of attributes, with logic steps applied in a certain order, to assign each of the trucks to the category to which they were most likely to belong. The characteristics used for sorting included:

- Vocation
    - The registered business type of the owner sometimes gives clues as to how a truck might be used. Utility trucks would have a higher percentage of work site support. Agriculture registered Class 8 trucks are more likely used for rural and intercity delivery routes.
- Registered Truck Type and Size
    - From the original data set, certain attributes are known, e.g. box truck vs. stake bed vs. tractor vs. bus.
- Model Assessment
    - First, sorting the 1.5 million trucks by GVW, manufacture and model name and then filtering trucks with less than four examples in the fleet, left about 2400 model names. Each was looked up, researched and assigned to 24 truck types, e.g. work truck, fire truck, tractor or sleeper cab. Some model names applied only to one certain type of truck, others referred to a cab and chassis that might have many different final uses, so there was some degree of variability in the confidence of the assignment.
- Engine Size
- Age

No single variable was used for sorting; each truck was evaluated on multiple variables before being assigned to one of the six truck categories. Some percentage of trucks, mostly older trucks, had insufficient data to assign to any category.

Once the trucks were sorted, with this and other data, vehicle groups were assigned average weights and average fuel consumption, average vehicle miles travelled, and estimates of carbon emissions (per mile/hour) based on their class, body type and engine size.

Calculated aggregate results were compared with other published studies, and the results were consistent. This study calculated a 2010 estimate for million metric tons of $C0_2$ equivalent of 36.97 MMTCO2e, which is 106 percent of the 2008 ARB estimate of 34.79 MMTCO2e. This difference aligns with expected growth in fuel use, and also indicates that CalHEAT's calculations are in line with anticipated results. Similarly, the calculated annual VMT found in this study was compared with published numbers from the Air Resource Board for 2008, and found to be within a few percentage points of 2008 numbers.

Figure 3 provides a look at the relative size of the six categories. Class 2b/3 Vans/Pickups make up about one-third of the total.

Figure 3: Population by Truck Category

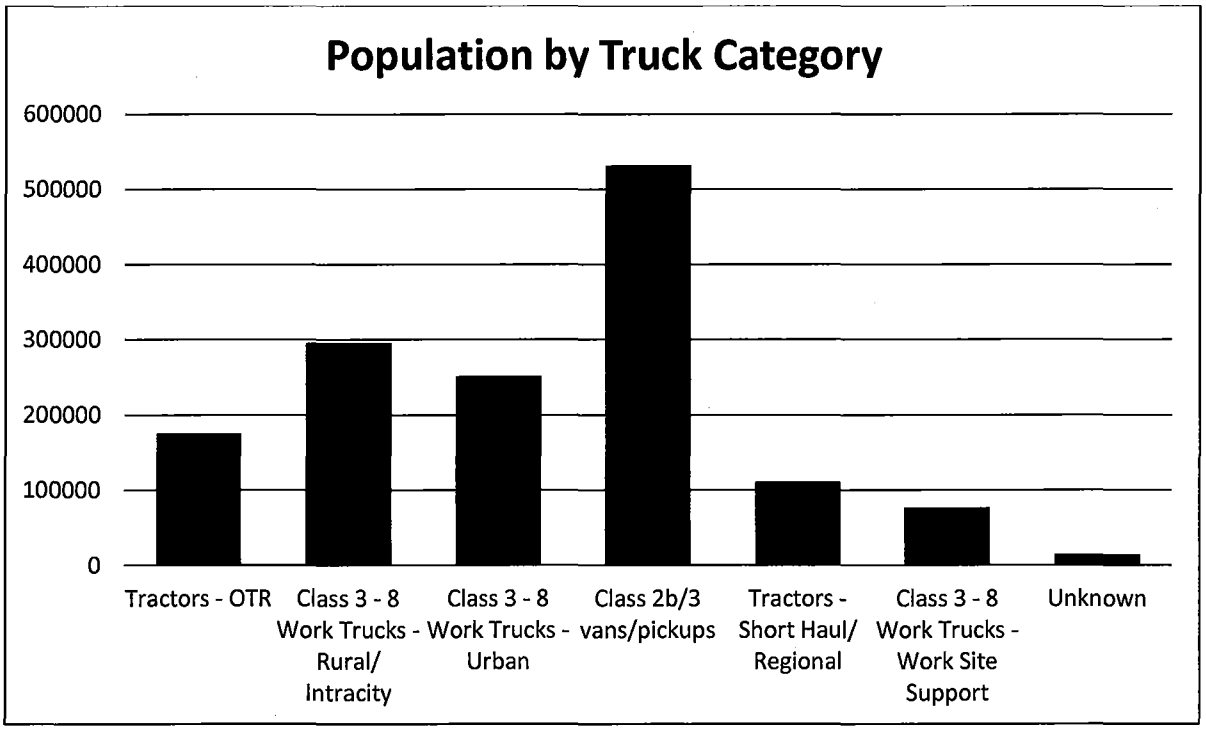
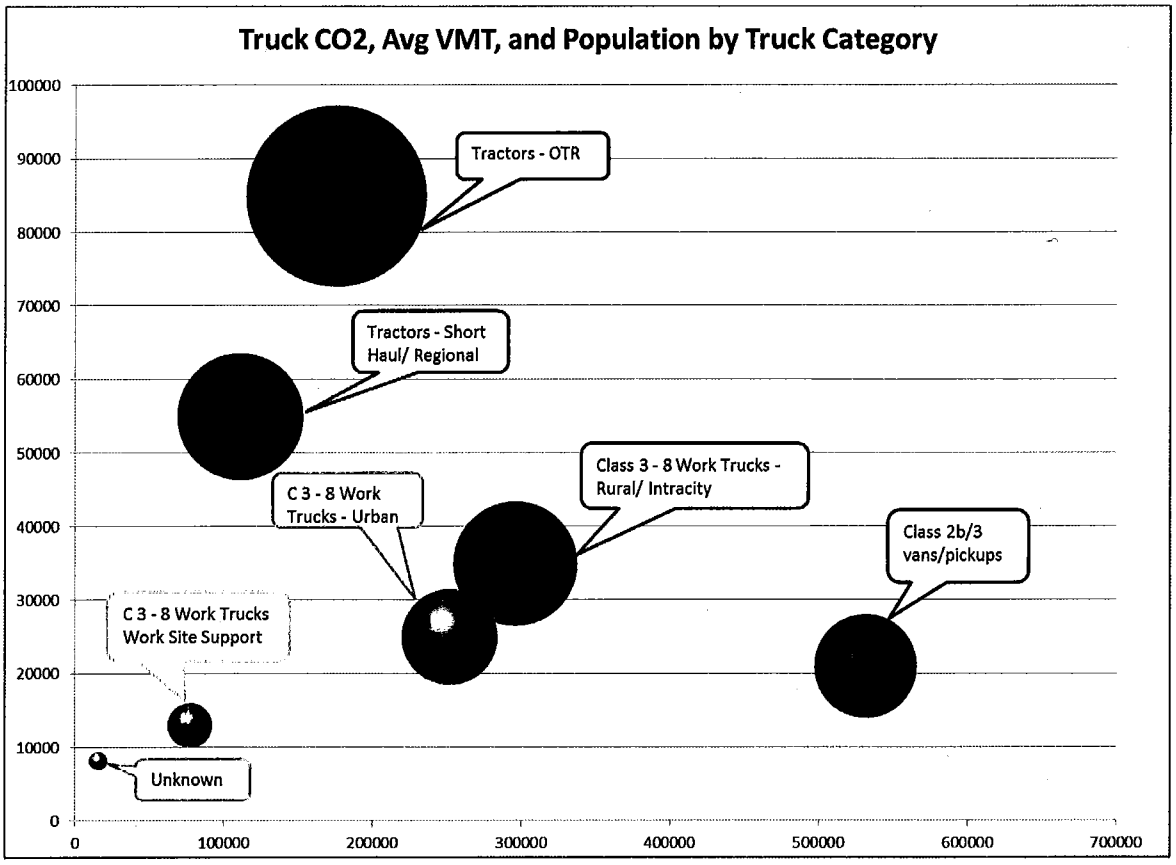


Figure 4 below is a visualization of one way to look at this data. Each bubble represents a vocation as tracked in the Polk Database – relative GHG emissions (as C02e) as the area of the circle, with vehicle miles travelled (VMT) as the y-axis and population as the x-axis. Here, for example, you can see that although the Category Class 2b/3 contains by far the largest number of trucks, OTR Tractors have much higher average VMT are responsible for much more CO_2.

Figure 4: Truck CO_2, Average VMT and Population by Truck Category



Current analysis indicates that although the Class 8 OTR category is clearly a large and important target, nearly every category plays a very significant role. As technologies are evaluated, it can be shown that a 20% gain in the Class 3-8 Work Trucks, applied across three segments, could impact the state population in similar amounts to a 10% reduction in OTR tractors.

The data set is structured in such a way as to allow sorting in many ways, among others by geography, vocation, vehicle class and particular pollutants. Additionally, this study gives us

the ability to look at where trucks are registered, which may assist in evaluating specific programs for certain regions or air districts. Figures 5, 6 and 7 provide just a few of the many ways these categories can be sorted and analyzed. Following these figures, Table 2 displays some of the database codes and their sources.

Figure 5: Percent Fuel Use by Type and Truck Category

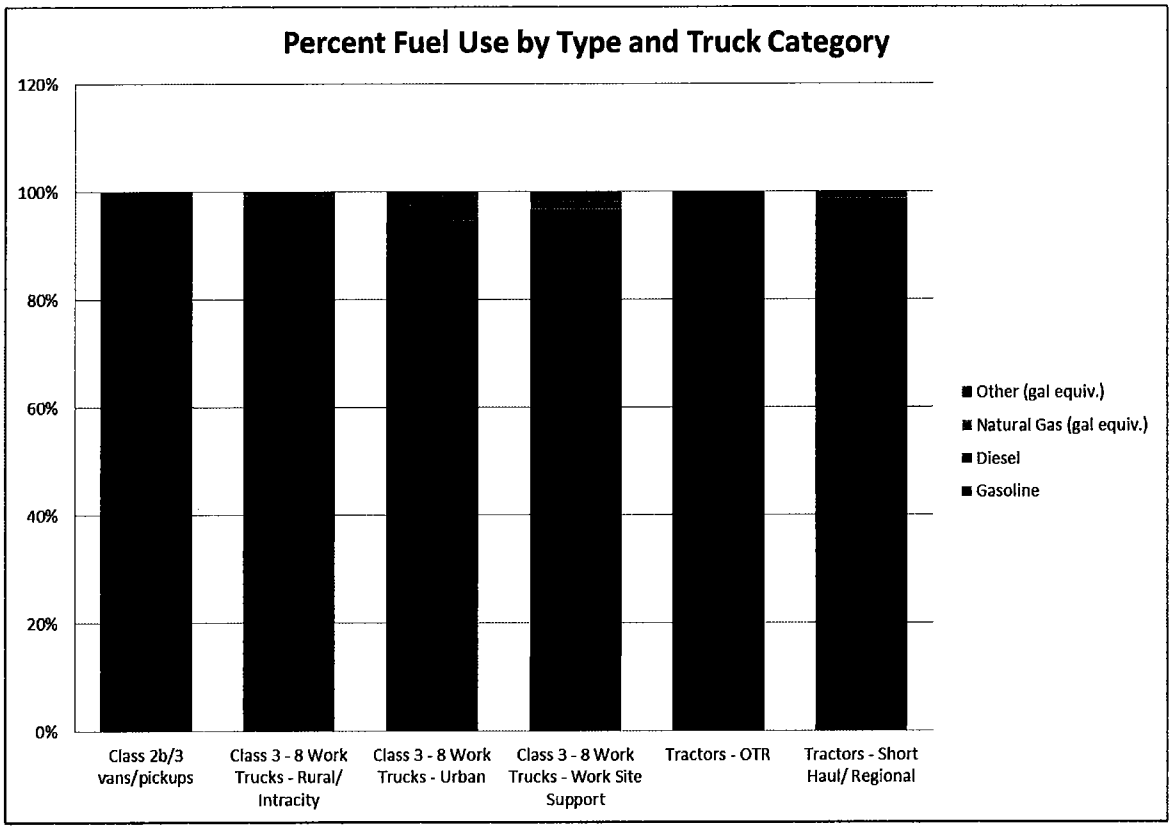


Figure 6: Truck Age Distribution by Decade

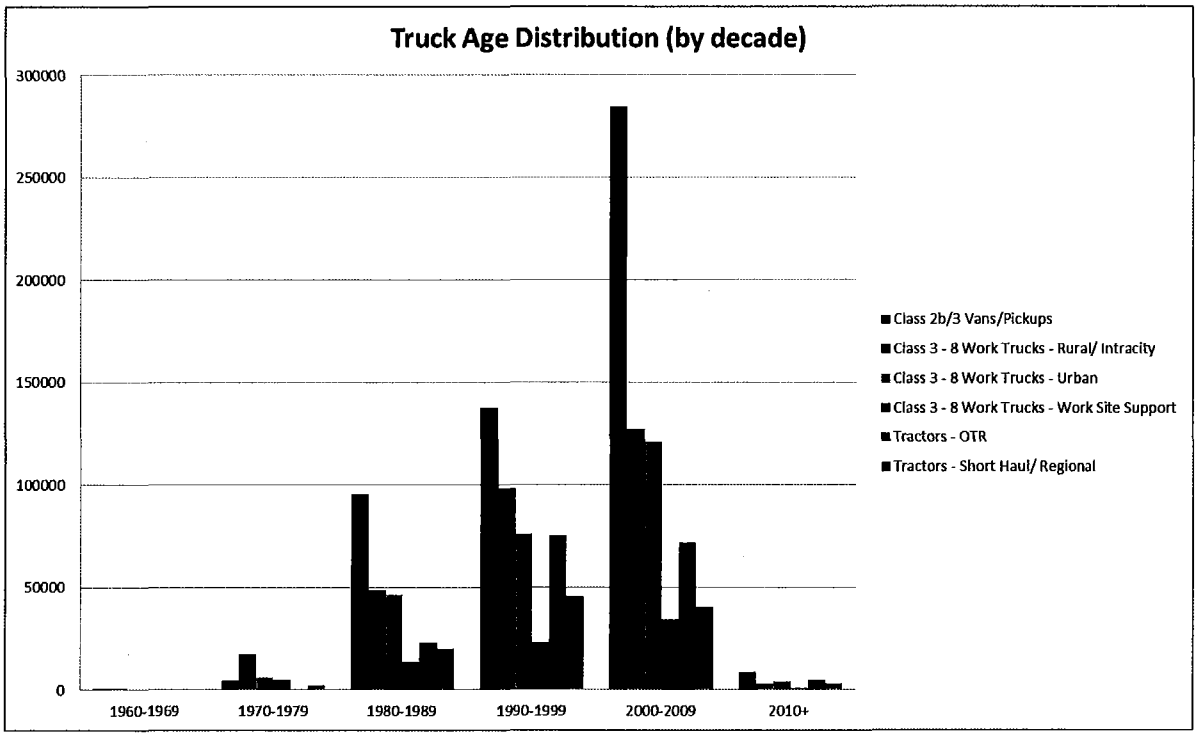


Figure 7: Truck Categories by Gross Vehicle Weight

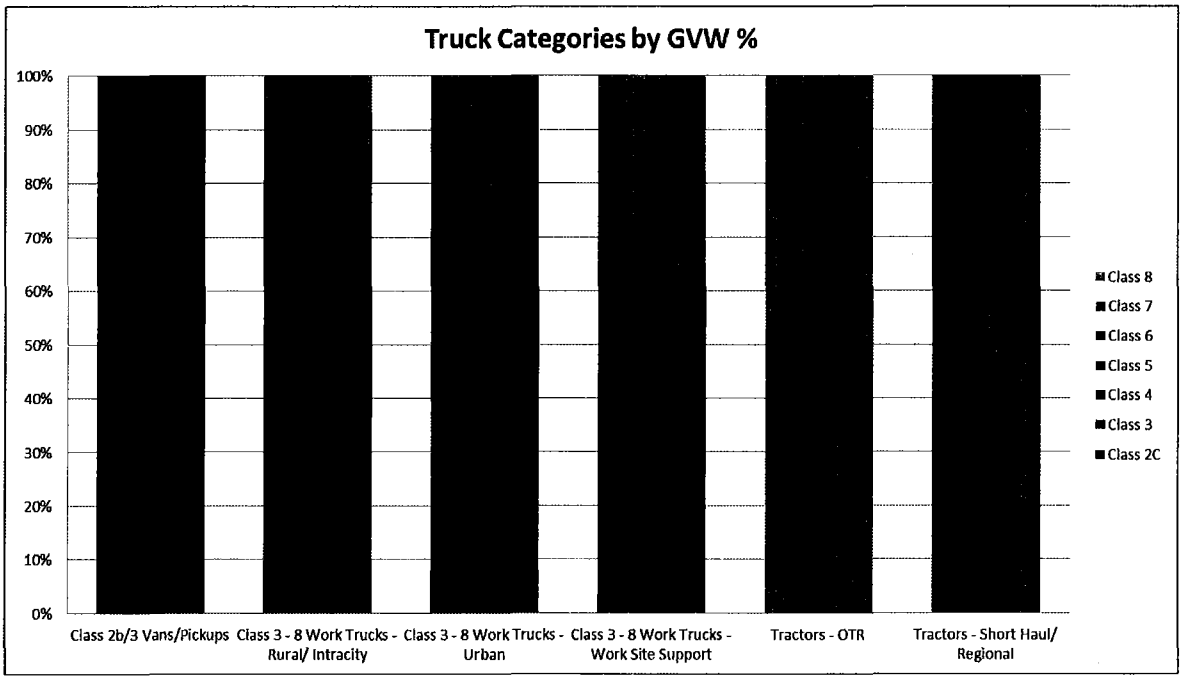


Table 2: Database Codes and Sources

Database Code	Meaning	Source
MSA	Location	Data
Reg Zip Bas	First three digits of the zip code	Data
VGVW	Weight Classification	Data
YM	Year of Manufacture	Data
Cab	Info regarding the cab type of the vehicle -- limited value	Data
VType	Info regarding the vehicle type -- sometimes useful, but some categories are very broad	Data
Make	Manufacture	Data
Veh Model	Model Name	Data
Veh Series	Model Series	Data
E Mfr	Engine Manufacture	Data
Engine Model	Engine Model	Data
Liters	Engine Size	Data
Cyl	Number of Cylinders	Data
CID	Cubic Inch Displacement	Data
Fuel	Fuel Type	Data
Reg CT	Registered Carrier type (private, individual, govt or for lease)	Data
Reg Voc	Registered "Vocation" -- the tax code business type of the owner	Data
Std Cnt	The number of vehicles in a registration row -- mostly 1	Data
make/model concat	Sorting Tool	Assigned
Code assigned	Code assigned by CalHEAT	Assigned
Cat1-10	Sorting Tool	Assigned
Cat1-6	CalHEAT Categories by Number	Assigned
Names	CalHEAT Categories by Name	Assigned
Adjustment	Adjustment to estimates to account for usage type	Assigned
VMT (orig)	VMT assigned based strictly on truck type	Assigned
VMT (revised)	VMT assigned based on truck type and estimated usage	Assigned
Gal gasoline /yr	Gal Gasoline used per year	Calculated
Gal Diesel /yr	Gal Diesel used per year	Calculated
NG	Natural Gas used per year	Calculated
Gal Natural Gas /yr	Gal Equivalent NG per year	Calculated
Gal Other Fuel /yr	Gal Equivalent other fuel	Calculated
g N2O /yr	Grams N0X per year	Calculated
g CH4 /yr	Grams CH4 per year	Calculated
kg CO2 /yr	kg C02 per year	Calculated
Liter multiplier	Sorting tool	Calculated
veh type id	Sorting tool	Calculated
mileage id	Sorting Tool	Calculated
Idling hours/yr	Sorting Tool	Calculated

Summary

This detailed characterization will play an important role in the next phase of the roadmap development. Should it prove fruitful, it is possible to subdivide the above classifications to gain greater insight into the various sub-categories. That is, if a technology was known to apply to Box Trucks used in intercity routes, the number and impact of trucks in that category can be estimated. This detailed analysis is and will be a key component of estimating the impact of various technologies as the CalHEAT roadmap is developed.

NGVAmerica Facts about Natural Gas Vehicles

http://www.ngvamerica.org/ 10-26-15

- There are about 153,000 NGVs on U.S. roads today and more than 15.2 million worldwide.
- There are 1,564 CNG and 111 LNG fueling stations in the U.S., and refueling appliances are available for home use.
- In the U.S., about 50 different manufacturers produce 100 models of light, medium, and heavy-duty vehicles and engines.

http://www.ngvamerica.org/vehicles/
10-26-15

Heavy-Duty Truck OEMs

- Freightliner Truck
- Volvo
- International
- Kenworth
- Peterbilt
- Mack

Heavy-Duty Vocational OEMs

- Mack
- Peterbilt
- Crane Carrier
- Autocar Truck
- ALF Condor
- Elgin
- Johnston
- Schwarze
- Tymco
- Capacity
- Ottawa

Heavy-Duty Bus OEMs

- Thomas Built Bus
- Blue Bird Bus
- Optima/NABI
- El Dorado
- New Flyer
- Motor Coach Ind.
- Gillig
- DesignLine

Heavy-Duty Retrofit/Repowers

- American Power Group
- Clean Air Power
- Fyda Energy Solutions
- NGV Motori
- Omnitek Engineering
- Diesel 2 Gas

Medium-Duty/Heavy-Duty Retrofits

- Altech-Eco
- Landi Renzo USA/Baytech
- IMPCO Automotive
- Westport/BAF Technologies
- Crazy Diamond Performance
- NGV Motori USA
- M-Tech Solutions
- STAG
- NatGasCar
- AGA Systems
- Greenkraft
- PowerFuel Conversions
- World CNG
- Zavoli

A-1 Alternative Fuel Systems Information

Personal communication 10-27-2015 – Colby Morrow, SoCalGas with Mark Gilio, President of A-1 Alternative Fuel Systems. Mr. Gilio's contact information is below.

A-1 Alternative Fuel Systems designs, manufactures, and installs CNG/LNG fuel integration systems for medium-heavy and heavy duty vehicles and specializes in natural gas conversions. They have two corporate locations, one in Fresno, California and one in Elkhart, Indiana in addition to an installation and repair facility in Long Beach, California.

Mark Gilio, President
2320 Stanislaus
Fresno, Ca. 93721
559-485-4427 ext: 115
559-288-6234 Cell
mark@a1altfuels.com
www.a1altfuels.com

- Approximately how many CNG vehicles in class 4-8 do you produce per year for the last five years?
  - 275 per year

- How many for the California market?
  - 125 per year

- How many for other states?
  - 150 per year

- What are the models/types of the vehicles? For example, urban bus, vocational use, refuse, etc.
  - Ford E-450 shuttle bus 6.8L, 14,000 GVWR
  - Ford E-450 cab and chassis 6.8L (box truck etc.), 14,000 GVWR
  - Ford F450-550 shuttle bus 6.8L,
  - Ford F450-550 cab and chassis 6.8L truck applications 14,000-19,500 GVWR (box truck, aerial truck, utility truck, flat bed, refuse truck, street sweeper, paint truck, dump truck, tow truck etc.).
  - Ford F-53 incomplete vehicle 6.8L (trolleys, laundry trucks, delivery trucks like UPS and Federal Express, etc.) 16,000-26,000 GVWR
  - Ford F650-750 shuttle bus 22,000-33,000 GVWR 6.8L (luxury limo style or traditional)
  - Ford F650-750 cab and chassis 22,000-33,000 GVWR 6.8L (numerous truck applications)
  - General Motors G-4500 shuttle bus 6.0L (14,000 GVWR)
  - Isuzu NPR 6.0L (flat bed, utility body, dump body, box truck, etc.) 14,000 GVWR
  - Class 5-8 trucks 6.7L, 8.9L & 12.0L Cummins natural gas engine (all truck applications and body applications)

- Are you identified as an OEM, or do you assemble OEM parts and systems?
  - When dealing with class 4-6 vehicles, Ford Motor Company has a strict "QVM" (Quality Vehicle Modifier) program. This program is recognized by Ford to be O.E.M. A-1 Alternative Fuel Systems is a Ford "QVM". This means, anything we do is supported by Ford Motor Company and the Ford warranty stays intact. Being Ford "QVM", A-1

supplies the high pressure package (cylinders, valves, pressure relief devices, receptacles, regulators, brackets, cradles, cylinder cabinets, plumbing, electrical, etc.). These high pressure kits all undergo strict engineering criteria, R&D, and stress analyses as per Ford guidelines. We are also associated with Ford "QCM" (Quality calibration modifiers). These QCM's make up the low pressure side of the package. In order to be fully compliant to Ford, you need both Ford "QVM" and Ford "QCM" to be compliant. All of our California conversions are compliant to Fords strict O.E.M. policy.

CNG Conversion Companies

http://alternativefuels.about.com/od/professionalservice/a/Compressed-Natural-Gas-Conversion-Companies.htm (10-26-15)

A-1 Alternative Fuel Systems claims to have all that's necessary to convert your vehicle to CNG. They are based in Fresno, California. For more information, visit A-1 Alternative Fuel Systems.

Agility Fuel Systems provides engines and conversion kits that are both EPA- and CARB-certified. They have products available for most GM and Ford vehicles. Visit Agility Fuel Systems to learn more.

Alternative Fuel Systems of St. Louis specializes in CNG and LP vehicle conversions and compression systems. Learn more at Alternative Fuel Systems of St. Louis.

BAF Technologies Inc. is a subsidiary of Clean Energy Company. Its alternative fuel vehicle upfitting capabilities include aftermarket CNG conversions of Ford-manufactured vans, cutaway shuttles, taxis, pick-ups and light-duty trucks. Learn more at BAF Technologies.

Baker Equipment is based in Richmond, Va., and converts OEM gasoline engines to run on CNG, offering sales, installation and services throughout the eastern US. Learn more at Baker Equipment.

Clean Fuel converts fleet and personal vehicles to run on CNG, specializing in EPA-certified conversions for sedans and light-duty pick-up trucks and vans. It operates conversion facilities in Texas and Oklahoma. Learn more at Clean Fuel.

CNG Interstate notes that its compressed natural gas systems are after market performance parts and do not change your vehicle's current fuel injection system nor do they tamper with the Federal Emission Standards. CNG Interstate must equip your vehicle with your new kit. For more information, visit them at CNG Interstate.

Energy and Water Solutions offers two types of conversion kits for gasoline engines and a low-cost kit for diesel engines. Find out more at Energy and Water Solutions.

Environmental Vehicle Outfitters designs and installs alternative systems for fleet and consumer cars, SUVs and trucks. Based in Marina del Rey, Calif., you can find more information at Environmental.

FuelTek Conversion Corporation's core business is conversion of on- and off-road vehicles to CNG or LPG vehicles. Although located in the Denver metro area, they work with a network of providers in a number of states. Learn more at FuelTek Conversion Corp.

Hendrix Industrial Gastrux provides EPA-certified conversion kits for a number of vehicles. They do not offer do-it-yourself kits; conversions must be done at their facility. Learn more at Hendrix.

IMPCO Technologies is a business unit of Fuel System Solutions, Inc., and designs, manufactures and supplies alternative fuel components and systems. For a full line of products and services available, visit IMPCO Automotive.

Landi Renzo USA has aquired Baytech Corporation and now offers a dedicated CNG kit for GM 6.0L and 8.1L engines, as well as the Ford 5.4L engine. The company installs, calibrates, and provides extended service for its EPA and CARB certified systems. Learn more at Landi Renzo.

NatGasCar Company has introduced a Dodge Ram 4.7L Conversion System, beginning with the 2010 model. To learn more, visit NatGasCar Company.

NaturalDrive operates in Arizona and offers OEM-style retrofits with no underhood wiring modifications. They partner with a number of automotive facilities to offer CNG retrofits and warranty service in several states. Learn more at NaturalDrive.

Omnitek Advanced Technologies offers proprietary technology for converting diesel engines to natural gas. The company says it has 5,000 systems installed worldwide. Visit Omnitek Engineering, Corp. for more information.

Productive Concepts International is based in Union City, Ind., and claims to be the only high-volume production line in the US capable of almost any alternative fuels conversion, including CNG. For more information, go to PCI's website.

Phoenix Energy Corporation offers CNG conversion, installation and refueling equipment in Alabama and surrounding states. They are a registered contractor for the federal government. For more information, visit Phoenix Energy Corp.

RGR Alternative Fuels is a Nevada-based certified dealer and installer of EPA-certified bi-fuel CNG conversion systems. For more, visit RGR Alternative Fuels.

Thigpen Energy Services, LLC provides CNG conversion services. Learn more about this Texas-based company at Thigpen Energy Services.

NGVAMERICA

Natural Gas Vehicles for America

Available Certified or Approved NGV Aftermarket Conversion Systems: Heavy-Duty Engines

The information contained in this document covers aftermarket conversion systems that consumers and businesses may purchase in order to modify new or used vehicles so that they can operate on natural gas. Some of these systems may be ordered directly through automotive dealerships when placing an order for a new vehicle. However, all of the systems listed here are aftermarket from the standpoint that they are offered as modifications to original equipment manufacturer (OEM) gasoline or diesel fueled vehicles.

The information is organized by certified or approved heavy-duty engine. Light-duty vehicles and heavy-duty chassis are now listed in a separate document. The individual sheets are further organized by OEM, model year, and engine size, so that persons interested in a conversion system for a particular vehicle may quickly locate it. All of the systems listed have been either certified or approved by the U.S. Environmental Protection Agency (EPA) or the California Air Resources Board (CARB). Please do not contact NGVAmerica regarding the availability of aftermarket systems. NGVAmerica does not sell conversion systems or provide any services related to the installation of such systems.

Please review the listings of available systems and also the websites of the companies who offer them. All of these companies are dealing with a large number of inquiries and a significant demand for NGVs, so please review all available materials before making inquiries about particular vehicles, systems, or engines.

For future updates of these documents, visit the NGVAmerica website.

List of abbreviations:

EPA Cert.....U.S. EPA Certified

CARB.....California Air Resources Board

Int Appr.....Intermediate Approval by U.S. EPA

OUL.....Outside Useful Life

OEM	Original Model Year	Eng Disp (L)	Conversion Models Covered	Converted to Operate On	Original Fuel	Conversion Manufacturer	OEM Engine Families(s)/OEM Test Groups	OEM Evap Families (if applicable)	Conversion Exhaust Certificate Number	Conversion Evap Family	Conversion Engine Family/ Conversion Test Group	Compliance Status
Caterpillar	2004 - 2006	15.2	C15	Diesel or Diesel/CNG	Diesel	American Power Group, Inc.	4CPXH0928EBK, 5CPXH0928EBK, 6CPXH0928EBK				BAPGH15.2CP4	OUL
Caterpillar	2004 - 2006	11.1, 12.5	C11, C13	Diesel or Diesel/CNG	Diesel	American Power Group, Inc.	4CPXH0680EBK, 4CPXH0763EBK, 5CPXH0680EBK, 5CPXH0763EBK, 6CPXH0680EBK, 6CPXH0763EBK				CAPGH12.5CP4	OUL
Caterpillar	1998 to 2002	10.3	C-10	Diesel/CNG	Diesel	Clean Air Power, Inc.	WCPXH0629ERK, XCPXH0629ERK, YCPXH0629ERK, 1CPXH0629ERK, 2CPXH0629ERK				DCLAH0629E6J	OUL
Caterpillar	1998 to 2002	11.9	C-12	Diesel/CNG	Diesel	Clean Air Power, Inc.	WCPXH0729ERK, XCPXH0729ERK, YCPXH0729ERK, 1CPXH0729ERK, 2CPXH0729ERK				BCLAH0729E6J	OUL
Caterpillar	1998 to 2002	14.6	C-15	Diesel/CNG	Diesel	Clean Air Power, Inc.	WCPXH0893ERK, XCPXH0893ERK, YCPXH0893ERK, 1CPXH0893ERK, 2CPXH0893ERK				CCLAH0893E6J	OUL
Caterpillar	1996 to 2003	10.3, 11.9	C-10, C-12	Diesel or Diesel/CNG Diesel/LNG	Diesel	American Power Group, Inc.	WCPXH0629ERK, WCPXH0729ERK, XCPXH0629ERK, XCPXH0729ERK, YCPXH0629ERK, YCPXH0729ERK, 1CPXH0629ERK, 1CPXH0729ERK, 2CPXH0629ERK, 2CPXH0729ERK, 3CPXH0629EBV, 3CPXH0629EBX, 3CPXH0729EBV, 3CPXH0729EBX, TCP629EZDARK, TCP629EZDARM, TCP729EZDARL, VCP629EZDARK, VCP629EZDARX, VCP729EZDARX				CAPGH11.9CP4	OUL
Caterpillar	1993 to 2003	14.6, 15.8	C-15, C-16	Diesel or Diesel/CNG or Diesel/LNG	Diesel	American Power Group, Inc.	WCPXH0893ERK, WCPXH0967ERK, XCPXH0893ERK, XCPXH0967ERK, YCPXH0893ERK, YCPXH0967ERK, 1CPXH0893ERK, 1CPXH0967ERK, 2CPXH0893ERK, 2CPXH0967ERK, 3CPXH0893EBV, TCP893EZDARW , TCP893EZDARK , VCP893EZDARA , VCP893EZDARX , VCP967EZDARK , PCT0893FPB7, PCT0893FZE3, RCP893EZDARA, SCP893EZDARK				CAPGH15.8CP4	OUL
Cummins	2010 - 2012	14.9	ISX	Diesel/CNG	Diesel	ECG	ACEXH0912XAP, ACEXH0912XAQ, ACEXH0912XAR, BCEXH0912XAP, BCEXH0912XAQ, BCEXH0912XAR, CCEXH0912XAP, CCEXH0912XAQ, CCEXH0912XAR				ESKGH0912ISX	EPA cert
Cummins	2007 - 2009	10.8	ISM	Diesel or Diesel/CNG or Diesel/LNG	Diesel	American Power Group, Inc.	7CEXH0661MAA, 7CEXH0661MAB, 7CEXH0661MAY, 7CEXH0661MAZ, 8CEXH0661MAA, 8CEXH0661MAY, 8CEXH0661MAZ, 9CEXH0661MAD, 9CEXH0661MAE, 9CEXH0661MAF, 9CEXH0661MAY, 9CEXH0661MAZ				DAPGH10.8CM7	OUL
Cummins	2007 - 2009	14.9	ISX	Diesel or Diesel/CNG or Diesel/LNG	Diesel	American Power Group Inc	7CEXH0912XAK, 8CEXH0912XAK, 9CEXH0912XAK, 9CEXH0912XAP, 9CEXH0912XAQ, 7CEXH0912XAL, 7CEXH0912XAM, 8CEXH0912XAL, 8CEXH0912XAM, 9CEXH0912XAL, 9CEXH0912XAM, 9CEXHO912XAN				DAPGH14.9CM7	OUL
Cummins	2007 - 2009	15	ISX 435ST, ISX 435, ISX 425ST, ISX 425, ISX 400ST, ISX 400, ISX 385ST, ISX 435V, ISX 450ST, ISX 450	Diesel/CNG	Diesel	SkyGo, LLC	7CEXH0912XAK, 8CEXH0912XAK, 9CEXH0912XAK				ESKGH0912ISX	OUL

OEM	Original Model Year	Eng Disp (L)	Conversion Models Covered	Converted to Operate On	Original Fuel	Conversion Manufacturer	OEM Engine Families(s)/OEM Test Groups	OEM Evap Families (if applicable)	Conversion Exhaust Certificate Number	Conversion Evap Family	Conversion Engine Family/ Conversion Test Group	Compliance Status
Cummins	2006 - 2009	8.3, 8.9	ISC, ISL	Diesel, or Diesel/CNG, or Diesel/LNG	Diesel	American Power Group, Inc.	6CEXH0505CAZ, 6CEXH0540LAL, 7CEXH0505CAA, 7CEXH0505CAZ, 7CEXH0540LAL, 7CEXH0540LAM, 7CEXH0540LAO, 8CEXH0505CAA, 8CEXH0505CAZ, 8CEXH0540LAL, 8CEXH0540LAM, 8CEXH0540LAO, 9CEXH0505CAA, 9CEXH0505CAB, 9CEXH0505CAC, 9CEXH0505CAZ, 9CEXH0540LAL, 9CEXH0540LAM, 9CEXH0540LAO				DAPGH08.9CM7	OUL
Cummins	2004 - 2009	10.8, 14.9	ISX, ISM	Diesel or Diesel/CNG/ LNG	Diesel	EcoDual Group LP	9CEXH0912XAK, 9CEXH0912XAL, 9CEXH0912XAM, 8CEXH0912XAK, 8CEXH0912XAL, 8CEXH0912XAM, 7CEXH0912XAK, 7CEXH0912XAL, 7CEXH0912XAM, 6CEXH0912XAK, 6CEXH0912XAL, 6CEXH0912XAM, 6CEXH0912XAH, 6CEXH0912XAJ, 5CEXH0912XAH, 5CEXH0912XAJ, 4CEXH0912XAH, 4CEXH0912XAJ, 9CEXH0661MAC, 9CEXH0661MAD, 9CEXH0661MAE, 9CEXH0661MAF, 9CEXH0661MAY, 9CEXH0661MAZ, 8CEXH0661MAA, 8CEXH0661MAB, 8CEXH0661MAC, 8CEXH0661MAY, 8CEXH0661MAZ, 7CEXH0661MAA, 7CEXH0661MAB, 7CEXH0661MAC, 7CEXH0661MAY, 7CEXH0661MAZ, 6CEXH0661MAA, 6CEXH0661MAT, 6CEXH0661MAU, 6CEXH0661MAX, 6CEXH0661MAY, 6CEXH0661MAZ, 5CEXH0661MAT, 5CEXH0661MAU, 5CEXH0661MAV, 5CEXH0661MAX, 4CEXH0661MAT, 4CEXH0661MAU, 4CEXH0661MAV				BEDGE14.9ISX	OUL
Cummins	2004 - 2009	14.9	ISX 325V, ISX 400, ISX 400ST2, ISX 450, ISX 450ST2, ISX 465V, ISX 475, IXS 475ST, ISX 500, ISX 500ST, ISX 500ST2, ISX 525, ISX 530, ISX565, ISX 385ST, ISX 400ST, ISX 435, ISX 435ST, ISX 435V, ISX 450, ISX 450ST, ISX 465V, ISX 565, ISX 600, ISX 400ST, ISX 425, ISX 425ST, ISX 435ST, ISX 485, ISX 485ST, ISX 500V, ISX 550, ISX 600, ISX 455ST, ISX 485, ISX 485ST, ISX 500, ISX 500ST, ISX 500V, ISX 485ST, ISX 15 400, ISX 15 400ST, ISX 15 425, ISX 15 425ST, ISX 15 435V, ISX 15 450, ISX 15 450ST	Diesel/LNG	Diesel	Clean Fuel Technologies II LLC	4CEXH0912XAH, 4CEXH0912XAJ, 5CEXH0912XAH, 5CEXH0912XAJ, 6CEXH0912XAH, 6CEXH0912XAJ, 6CEXH0912XAK, 6CEXH0912XAL, 6CEXH0912XAM, 7CEXH0912XAK, 7CEXH0912XAL, 7CEXH0912XAM, 8CEXH0912XAK, 8CEXH0912XAL, 8CEXH0912XAM, 9CEXH0912XAK, 9CEXH0912XAL, 9CEXH0912XAM, 9CEXH0912XAN, 9CEXH0912XAP	N/A			ECFTH14.9LNG	OUL
Cummins	2002 - 2006	10.8	ISM	Diesel/LNG + Diesel	Diesel	American Power Group, Inc.	2CEXH0661MAT, 3CEXH0661MAT, 3CEXH0661MAU, 4CEXH0661MAT, 4CEXH0661MAU, 5CEXH0661MAX, 5CEXH0661MAT, 5CEXH0661MAU, 6CEXH0661MAT, 6CEXH0661MAU, 6CEXH0661MAX, 6CEXH0661MAY, 6CEXH0661MAZ, 6CEXH0661MAA				CAPGH10.8CM2	OUL

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Cummins	2002 - 2006	14.9	ISX	Diesel or Diesel/CNG	Diesel	American Power Group, Inc.	2CEXH0912XAG, 3CEXH0912XAH, 3CEXH0912XAJ, 4CEXH0912XAH, 4CEXH0912XAJ, 5CEXH0912XAH, 5CEXH0912XAJ, 6CEXH0912XAH, 6CEXH0912XAJ, 6CEXH0912XAM, 6CEXH0912XAK, 6CEXH0912XAL				CAPGH14.9CM2	OUL
Cummins	1991 - 2002	10, 10.8	L10, M11, ISM	Diesel, or Diesel/CNG, or Diesel/LNG	Diesel	American Power Group, Inc	MCE0611FZA2, MCE0611FZB3, NCE0611FZA2, NCE0611FZB2, NCE0611FZD4, PCE0611FZAX, PCE0611FZB0, PCE0611FZE3, PCE0661FZA2, PCE0661FZB3, RCE661EJDARA, RCE661EJDARC, RCE661EJDARW, SCE611EGDARW, SCE661EJDARA, SCE661EJDARC, SCE661EJDARW, SCE661EJDASW, SCE661EJDATW, TCE611EGDARW, TCE661EJDARA, TCE661EJDARB, TCE661EJDARC, TCE661EJDASW, TCE661EJDATW, VCE611EGDARW, VCE661EJDARB, VCE661EJDARC, VCE661EJDASA, VCE661EJDATW, WCEXH0611LAA, WCEXH0661MAA, WCEXH0661MAB, WCEXH0661MAD, WCEXH0661MAE, WCEXH0661MAF, XCEXH0661MAH, XCEXH0661MAI, YCEXH0661MAH, YCEXH0661MAI, 1CEXH0661MAQ, 1CEXH0661MAR, 2CEXH0661MAS				DAPGH10.8CM1	OUL
Cummins	1991 - 2002	14, 14.9	N14, ISX	Diesel, or Diesel/CNG, or Diesel/LNG	Diesel	American Power Group, Inc	MCE0855FZA6, MCE0855FZB7, MCE0855FZC8, MCE0855FZD9, NCE0855FZA5, NCE0855FZB6, NC0855FZC7, NCE0855FZD8, NCE0855FZFX, NCE0855FZG0, PCE085FZA3, PCE0855FZB4, PCE0855FC5, PCE0855FZD6, PCE0855FZF8, RCE855EJDARW, RCE855EJDASW, SCE855EJDARA, SCE855EJDARB, SCE855EJDARW, SCE855EJDASW, SCE855EJDATW, TCE855EJDARA, TCE855EJDARB, TCE855EJDARW, TCE855EJDASW, TCE855EJDATW, VCE855EJDARA, VCE855EJDARB, VCE855EJDARC, VCE855EJDATW, WCEXH0855NAA, WCEXH0855NAB, WCEXH0855NAC, WCEXH0912XAA, XCEXH0855NAD, XCEXH0855NAE, XCEXH0855NAF, XCEXH0912XAB, XCEXH0912XAD, YCEXH0855NAD, YCEXH0855NAE, YCEXH0855NAF, YCEXH0912XAC, YCEXH0912XAD, YCEXH0912XAE, 1CEXH0855NAD, 1CEXH0855NAE, 1CEXH0855NAF, 1CEXH0912XAC, 1CEXH0912XAD, 1CEXH0912XAE, 2CEXH0855NAA, 2CEXH0912XAF				DAPGH14.9CM1	OUL

OEM	Original Model Year	Eng Disp (L)	Conversion Models Covered	Converted to Operate On	Original Fuel	Conversion Manufacturer	OEM Engine Families(s)/OEM Test Groups	OEM Evap Families (If applicable)	Conversion Exhaust Certificate Number	Conversion Evap Family	Conversion Engine Family/ Conversion Test Group	Compliance Status
Cummins	1991 - 2002	8.3, 8.9	C8.3, ISC, ISL	Diesel, or Diesel/CNG, or Diesel/LNG	Diesel	American Power Group, Inc	MCE0505FAA2, NCE0505FAA1, NCE0505FAB2, PCE0505FAAX, PCE0505FAB0, RCE505D6DARW, SCE505D6DARW, TCE505D6DAAA, TCE505D6DAAW, TCE505D6DABW, TCE505D6DARW, TCE505F6DAAW, TCE505F6DABW, VCE505D6DAAA, VCE505D6DAAW, VCE505D6DABW, VCE505D6DARW, VCE505F6DAAW, VCE505F6DABW, WCEXH0505CAA, WCEXH0505CAC, WCEXH0505CAD, WCEXH0505CAE, WCEXH0505CAF, XCEXH0505CAC, XCEXH0505CAD, XCEXH0505CAE, XCEXH0505CAF, YCEXH0505CAF, YCEXH0505CAG, YCEXH0505CAH, YCEXH0505CAI, YCEXH0540LAA, 1CEXH0505CAM, 1CEXH0505CAN, 1CEXH0505CAO, 1CEXH0505CAP, 1CEXH0540LAA, 1CEXH0540LAB, 1CEXH0540LAC, 2CEXH0505CAM, 2CEXH0505CAN, 2CEXH0505CAQ, 2CEXH0540LAB, 2CEXH0540LAC, 3CEXH0505CAM, 3CEXH0505CAN, 3CEXH0505CAQ, 3CEXH0540LAB, 3CEXH0540LAC, 4CEXH0505CAR, 4CEXH0505CAS, 4CEXH0505CAU, 4CEXH0540LAE, 5CEXH0540LAG, 5CEXH0505CAV, 5CEXH0505CAW, 5CEXH0505CAX, 5CEXH0505CAR, 5CEXH0540LAE, 5CEXH0505CAY, 5CEXH0540LAH, 5CEXH0540LAI, 6CEXH0540LAJ, 6CEXH0540LAG, 6CEXH0505CAV, 6CEXH0505CAW, 6CEXH0505CAX, 6CEXH0505CAY, 6CEXH0540LAI				DAPGH08.9CM1	OUL
Daimler Chrysler	2004 - 2006	12.8	OM 460 LA	Diesel/CNG	Diesel	FYDA Energy Solutions and The Hardstaff Group	4MBXH12.8DJA, 5MBXH12.8DJA, 6MBXH12.8DJA				DFYDT12.8MBX	OUL
Daimler Chrysler	2000 - 2003	12, 12.8	OM457LA, OM460LA	Diesel or Diesel/CNG or Diesel/LNG	Diesel	American Power Group, Inc	YMBXH12.0DJA, 1MBXH12.0DJA, 1MBXH12.8DJA, 2MBXH12.0DJA, 2MBXH12.8DJA, 3MBXH12.0DJA, 3MBXH12.8DJA				DAPGH12.8DC1	OUL
Daimler Chrysler	2006	6.37	OM 906	CNG	Diesel	NGV Motori	6MBXH6.37DJA				BNGCH6.37DJD	Int Appr
Daimler Chrysler	2005	6.37	OM 906	CNG	Diesel	NGV Motori	5MBXH6.37DJA				BNGCH6.37DJC	Int Appr
Daimler Chrysler	2004	6.37	OM 906	CNG	Diesel	NGV Motori	4MBXH6.37DJA				BNGCH6.37DJB	Int Appr
Daimler Chrysler	2003	6.37	OM 906	CNG	Diesel	NGV Motori	3MBXH6.37DJA				BNGCH6.37DJA	Int Appr
Detroit Diesel	2004 - 2006	12.7, 14	DDC Series 60	Diesel/CNG	Diesel	Diesel 2 Gas Inc.	4DDXH12.7EGY, 4DDXH14.0ELY, 5DDXH12.7EGY, 5DDXH14.0ELY, 6DDXH12.7EGY, 6DDXH14.0ELY				DDSLH14.0DD2	OUL
Detroit Diesel	2003 to 2006	12.7	DD60-12.7	Diesel/CNG	Diesel	NGV Motori LLC	6DDXH12.7EGY, 5DDXH12.7EGY, 4DDXH12.7EGY, 3DDXH12.7EGY				ENGCH12.7DDF	OUL

OEM	Original Model Year	Eng Disp (L)	Conversion Models Covered	Converted to Operate On	Original Fuel	Conversion Manufacturer	OEM Engine Families(s)/OEM Test Groups	OEM Evap Families (if applicable)	Conversion Exhaust Certificate Number	Conversion Evap Family	Conversion Engine Family/ Conversion Test Group	Compliance Status
Detroit Diesel	2002 - 2009	12.7, 14.0, 12.8, 14.8	SERIES 60 12.7L, SERIES 60 14L, OM460LA, MBE 4000, DD15, DD13	Diesel/CNG + Diesel	Diesel	American Power Group, Inc.	2DDXH12.7EGL, 2DDXH14.0ELL, 3DDXH12.7EGY, 3DDXH14.0ELY, 4DDXH12.7EGY, 4MBXH12.8DJA, 4DDXH14.0ELY, 5DDXH12.7EGY, 5MBXH12.8DJA, 5DDXH14.0ELY, 6DDXH12.7EGY, 6MBXH12.8DJA, 6DDXH14.0ELY, 7DDXH12.8DJA, 7DDXH14.0ELY, 8DDXH12.8DJA, 8DDXH14.0ELY, 8DDXH12.8TER, 8DDXH14.8EEY, 9DDXH12.8DJA, 9DDXH12.8FED, 9DDXH12.8TER, 9DDXH14.0ELY, 9DDXH14.8EEY, 9DDXH12.8DJD, 9DDXH12.8FEY, 9DDXH14.0ELD, 9DDXH14.8EED				CAPGH14.8DD8	OUL
Detroit Diesel	1998 - 2002	11.1, 12.7	Series 60	Diesel/CNG	Diesel	Landi Renzo USA Corporation	WDDXH11.1EHD, WDDXH12.7EGD, XDDXH11.1EHL, XDDXH12.7EGL, YDDXH12.7EGL, 1DDXH12.7EGL, 2DDXH12.7EGL				DLDRH12.7DD1	OUL
Detroit Diesel	1990 - 1999	11.1, 11	SERIES 60	Diesel or Diesel/CNG or Diesel/LNG	Diesel	American Power Group, Inc	LDD11.1FZA3, MDD11.1FZA2, NDD11.1FZA1, PDD11.1FZD2, PDD11.1FZAX, RDD11.EJDARA, SDD11.EJDARA, TDD11.EJDARA, VDD11.EJDARA, WDDXH11.1EHD, XDDXH11.1EHL				DAPGH11.1DD1	OUL
Detroit Diesel	1987 - 2002	12.7, 12, 14	SERIES 60	Diesel or Diesel/CNG or Diesel/LNG	Diesel	American Power Group, Inc	HGM12.7FZA0, JDD12.7FZA2, KDD12.7FZA1, LDD12.7FZA0, MDD12.7FZAX, NDD12.7FZA9, PDD12.7FZA7, PDD12.7FZDX, RDD12.EJDARA, RDD12.EJDASW, SDD12.EJDARA, SDD12.EJDASW, TDD12.EJDASW, TDD12.EJDARA, TDD12.EJDATW, VDD12.EJDARA, VDD12.EJDATA, WDDXH12.7EGD, XDDXH12.7EGL, XDDXH14.0ELL, YDDXH12.7EGL, YDDXH14.0ELL, 1DDXH12.7EGL, 1DDXH14.0ELL, 2DDXH12.7EGL, 2DDXH14.0ELL				DAPGH14.0DD1	OUL
ESI Phoenix	2010, 2011, 2012	7.6	DT 466 MHDD	CNG	CNG	NGV Motori	AEMSH07.6NGE, BEMHS07.6NGE, CEMSH07.6NGE		NGC-ONHWY-14-02		ENGCH07.6NGE	EPA

OEM	Original Model Year	Eng Disp (L)	Conversion Models Covered	Converted to Operate On	Original Fuel	Conversion Manufacturer	OEM Engine Families(s)/OEM Test Groups	OEM Evap Families (if applicable)	Conversion Exhaust Certificate Number	Conversion Evap Family	Conversion Engine Family/ Conversion Test Group	Compliance Status
Ford	2015	6.0	V8/605851111 323, 322, 323, 323, 307 hp	CNG	Gasoline	Greenkraft Inc			EO A-398-0013		FGKTE06.0GM2	CARB
Ford	2015	6.8	V-10/BAFA683C, 285 hp	CNG	Gasoline	BAF Technologies			EO A-364-0051		FBAFE06.83NN	CARB
Ford	2015	6.8	V-10/BAFA68C, 242 hp	CNG	Gasoline	BAF Technologies			EO A-364-0052		FBAFE06.89NN	CARB
Ford	2015	6.8	F-Series/FZ9X06.8F3, 308 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0069		FZ9XE06.8DC3	CARB
Ford	2015	6.8	E-Series/F6.8DC2 251 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0070		FZ9XE06.8DC2	CARB

OEM	Original Model Year	Eng Disp (L)	Conversion Models Covered	Converted to Operate On	Original Fuel	Conversion Manufacturer	OEM Engine Families(s)/OEM Test Groups	OEM Evap Families (if applicable)	Conversion Exhaust Certificate Number	Conversion Evap Family	Conversion Engine Family/ Conversion Test Group	Compliance Status
Ford	2015	6.8	V10/DFA18N05 362 hp, V10	CNG	Gasoline	Greenkraft Inc			EO A-398-0012		FGKTE06.8FM1	CARB
Ford	2015	6.8	F450/550 Chassis Cab/FFA18N05, FFA18SOM; Step Van/DFA18R05, DFA18SO5; Motor Home/DFA18Q05; F650 Chassis Cab/DFA18A05 (362 for all codes)	CNG	Gasoline	Landi Renzo USA Corporation			EO A-400-0014		FLDRE06.8C10	CARB
Ford	2014	6.8	E-450 Incomplete/DE418N05, DE418M05, V-10, 224 hp	CNG	Gasoline	Landi Renzo USA Corporation			EO A-400-0013		ELDRE06.8B10	CARB
Ford	2014	6.8	V-10, 285 hp	CNG	Gasoline	BAF Technologies			EO A-364-0048		EBAFE06.83NN	CARB

OEM	Original Model Year	Eng Disp (L)	Conversion Models Covered	Converted to Operate On	Original Fuel	Conversion Manufacturer	OEM Engine Families(s)/OEM Test Groups	OEM Evap Families (if applicable)	Conversion Exhaust Certificate Number	Conversion Evap Family	Conversion Engine Family/ Conversion Test Group	Compliance Status
Ford	2014	6.8	V-10, 242 hp	CNG	Gasoline	BAF Technologies			EO A-364-0049		EBAFE06.89NN	CARB
Ford	2014	6.8	E-Series/E6.8DC2, 251 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0065		EZ9XE06.8DC2	CARB
Ford	2013	6.8	V-10, 285 hp	CNG	Gasoline	BAF Technologies			EO A-364-0037		DBAFE06.83NN	CARB
Ford	2013	6.8	V-10, 242 hp	CNG	Gasoline	BAF Technologies			EO A-364-0038		DBAFE06.89NN	CARB
Ford	2013	6.8	V-10/ 362 hp	CNG	Gasoline	Greenkraft Inc			EO A-398-0006		DGKTE06.8FM1	CARB
Ford	2013	6.8	V-10/362 hp	CNG	Gasoline	Landi Renzo USA Corporation			EO A-400-0006		DLDRE06.8C10	CARB
Ford	2013	6.8	V-10, 251 hp	CNG	Gasoline	IMPCO Technologies			EO-A-328-0063		DZ9XE06.8DC2	CARB
Ford	2012	6.8	V-10/285 hp	CNG	Gasoline	BAF Technologies			EO A-364-0031		CBAFE06.83NN	CARB
Ford	2012	6.8	V-10, 242 hp	CNG	Gasoline	BAF Technologies			EO A-364-0032		CBAFE06.89NN	CARB
Ford	2012	6.8	V-10, F-450/550/650 Chassis Cab and F53/F59 Step Van Chassis	CNG	Gasoline	Landi Renzo USA Corporation	CFMXE6.8BWS		LDR-ONHWY-12-01		CLDRE06.8C10	EPA Cert, CARB
Ford	2012	6.8	V-10/362 hp	CNG	Gasoline	Landi Renzo USA Corporation			EO A-400-0004		CLDRE06.8C10	CARB
Ford	2012	6.8	E450, 251 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0052		CZ9XE06.8CA1	CARB
Ford	2012	6.8	F450, 308 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0053		CZ9XE06.8CA2	CARB
Ford	2011	6.8	V-10/285 hp	CNG	Gasoline	BAF Technologies			EO A-364-0027		BBAFE06.83NN	CARB
Ford	2011	6.8	V-10/231 hp	CNG or HCNG	Gasoline	BAF Technologies			EO A-364-0025		BBAFE06.89CH	CARB

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Ford	2011	6.8	V-10, 242 hp	CNG	Gasoline	BAF Technologies			EO A-364-0028		BBAFE06.89NN	CARB
Ford	2011	6.8	E450, 251 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0046		BZ9XE06.8C1A	CARB
Ford	2011	6.8	F450, 308 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0047		BZ9XE06.8C2A	CARB
Ford	2010	6.8	E-450, 242 hp, 285 hp	CNG	Gasoline	BAF Technologies	AFMXE06.8BWX	AFMXF0265NAT	BAF-ONHWY-10-01	ABAFF0000001	ABAFE06.89FN	EPA Cert, CARB
Ford	2009	6.8	V-10/231 hp	CNG or HCNG	Gasoline	BAF Technologies			EO A-364-0020		9BAFE06.89CH	CARB
Ford	2009	6.8	E-450	CNG	Gasoline	BAF Technologies	9FMXE06.8BWX	9FMXF0265NAT	BAF-ONHWY-09-01	9BAFF0000001	9BAFE06.89FN	EPA Cert, CARB
Ford	2009	6.8	E450, E450 CUTAWAY, E450 INCOMPLETE CHASSIS	CNG	Gasoline	NGV Motori	9FMXE06.8BWK	9FMXF0265NAT		BNGCR0000001	BNGCT06.8NG2	Inter Appr
Ford	2009	6.8	E450	CNG	Gasoline	NGV Motori	8FMXH06.8AS4	8FMXE0265GAT		BNGCR0000001	BNGCT06.8NG3	Inter Appr
Ford	2009	6.8	E450, E450 CUTAWAY, E450 INCOMPLETE CHASSIS	CNG	Gasoline	NGV Motori	9FMXE06.8AFA	9FMXF0265NAT		BNGCR0000001	BNGCT06.8NG4	Inter Appr
Ford	2008	6.8	E450	CNG	Gasoline	NGV Motori	8FMXH06.8BST	8FMXE0265GAT		BNGCR0000001	BNGCT06.8NG1	Inter Appr
General Motors	2015	6	L96/40 (324 hp), LC8/45 (324 hp), L96/80 (293 hp), LC8/85 (293 hp)	CNG	Gasoline	Landi Renzo USA Corporation			EO A-400-0015		FLDRE06.0C10	CARB
General Motors	2014	6	L96/40 (324 hp), LC8/45, 324 hp, L96/50 (308 hp, LC8/55 (308 hp), L96/80 (293 hp), LC8/85 (293 hp)	CNG	Gasoline	Landi Renzo USA Corporation			EO A-400-0012		ELDRE06.0C10	CARB
General Motors	2014	6	6.0 DCNG/9, 265 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0064		EZ9XE06.0DCA	CARB
General Motors	2013	6	V8/model 605851111, engine codes 20, 30, 40, 50, 60	CNG	Gasoline	Greenkraft Inc			EO-398-0005		DGKTE06.0GM2	CARB

OEM	Original Model Year	Eng Disp (L)	Conversion Models Covered	Converted to Operate On	Original Fuel	Conversion Manufacturer	OEM Engine Families(s)/OEM Test Groups	OEM Evap Families (if applicable)	Conversion Exhaust Certificate Number	Conversion Evap Family	Conversion Engine Family/ Conversion Test Group	Compliance Status
General Motors	2013	6	GM 6.0L/323 hp	CNG	Gasoline	Landi Renzo USA Corporation			EO-A-400-0005		DLDRE06.0C10	CARB
General Motors	2013	6	GM 6.0L/ 323	CNG	Gasoline	Landi Renzo USA Corporation			EO-A-400-008		DLDRE06.0C11	CARB
General Motors	2013	6	GM 6.0/265 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0059		DZ9XE06.0DCA	CARB
General Motors	2012	4.8	L20/model 48581201110, engine codes 20, 40, 50	CNG	Gasoline	Greenkraft Inc			EO A-398-0004		CGKTE04.8GM1	CARB
General Motors	2012	6	GM 6.0L/323 hp	CNG	Gasoline	Baytech Corporation			EO A-330-0233		CBYTE06.0C10	CARB
General Motors	2012	6	GM 6.0/323 hp	CNG	Gasoline	Baytech Corporation			EO A-330-0234		CBYTE06.0C11	CARB
General Motors	2012	6	Engine V8/ model 605840211, engine codes 20,30,40,50,60	CNG	Gasoline	Greenkraft Inc			EO A-398-0002		CGKTE06.0GM1	EPA, cert CARB
General Motors	2012	6	Engine V8/ model 605851111, engine codes 20,30,40,50,60	CNG	Gasoline	Greenkraft Inc			EO A-398-0003		CGKTE06.0GM2	EPA cert, CARB
General Motors	2012	6	Van 265 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0051		CZ9XE06.0DCA	CARB
General Motors	2011	4.8	Van 237 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0044		BZ9XE04.8C1A	CARB
General Motors	2011	6	GM 6.0L/266 hp	CNG	Gasoline	Baytech Corporation			EO A-330-0230		BBYTE06.0613	CARB
General Motors	2011	6	Engine models 605840211, engine codes 20,30,40,50,60	CNG	Gasoline	Greenkraft Inc	BGMXE06.0584	N/A	GKT-ONHWY-11-01.1	N/A	BGKTE06.0GM1	EPA Cert, CARB
General Motors	2011	6	Van 265 hp	CNG	Gasoline	IMPCO Technologies			EO A-328-0045		BZ9XE06.0C1A	CARB
General Motors	2010	6	GM 6.0L/266 hp	CNG	Gasoline	Baytech Corporation			EO A-330-0218		ABYTE06.0613	CARB
General Motors	2010	8.1	GM 8.1L/256 hp	CNG	Gasoline	Baytech Corporation			EO A-330-0222		ABYTE08.1C12	CARB
General Motors	2010	8.1	GM 8.1L/283 hp	CNG	Gasoline	Baytech Corporation			EO A-330-0221		ABYTE08.1C13	CARB
General Motors	2009	6	GM 6.0L/266 hp	CNG	Gasoline	Baytech Corporation			EO A-330-0205		9BYTE06.0613	CARB
General Motors	2009	6	GM 6.0L/266 hp CNG, 287 hp gasoline	CNG or Gasoline	Gasoline	Baytech Corporation			EO A-330-0216		9BYTE06.0623	CARB
General Motors	2009	8.1	GM 8.1L/256 hp	CNG	Gasoline	Baytech Corporation			EO A-330-0211		9BYTE08.1C12	CARB
General Motors	2009	8.1	GM 8.1L/283 hp	CNG	Gasoline	Baytech Corporation			EO A-330-0208-1		9BYTE08.1C13	CARB
General Motors	2009	8.1	GM 8.1L/283 hp CNG, 317 hp gasoline	CNG or Gasoline	Gasoline	Baytech Corporation			EO A-330-0212		9BYTE08.1C23	CARB
General Motors	2009	8.1	C4: Chevrolet Kodiak C4500, GMC Topkick C4500; 283 hp CNG, 317 gasoline	CNG or Gasoline	Gasoline	Baytech Corporation			EO A-330-0213		9BYTF0300998	CARB

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General Motors	2009	8.1	Workhorse Custom Chassis W30, W62 (283 hp CNG, 317 hp gasoline)	CNG or Gasoline	Gasoline	Baytech Corporation			EO A-330-0213		9BYTF0407000	CARB
International Truck and Engine Corp.	2006	466	6NVHX0466AEA	CNG	Diesel	NGV Motori	6NVHX0466AEA				CNGCH0466AEA	Inter Appr
International Truck and Engine Corp.	2005	466	5NVHX0466AEA	CNG	Diesel	NGV Motori	5NVHX0466AEA				CNGCH0466AEB	Inter Appr
International Truck and Engine Corp.	2004	466	4NVXH0466AEA	CNG	Diesel	NGV Motori	4NVXH0466AEA				CNGCH0466AEC	Inter Appr
Mack	2004 - 2006	11.9	AC-460P, AC-460E, AC-427, AC-400, AC-355/380, AC-350, AC-330/350, AC-380/410, AC-310/330	Diesel/CNG	Diesel	FYDA Energy Solutions and The Hardstaff Group	4MKXH11.9H70, 5MKXH11.9H70, 6MKXH11.9H70, 4MKXH11.9H64				DFYDT11.9MAC	OUL

OEM	Original Model Year	Eng Disp (L)	Conversion Models Covered	Converted to Operate On	Original Fuel	Conversion Manufacturer	OEM Engine Families(s)/OEM Test Groups	OEM Evap Families (if applicable)	Conversion Exhaust Certificate Number	Conversion Evap Family	Conversion Engine Family/ Conversion Test Group	Compliance Status
Mack	1996 - 2007	12	E7 Engine	CNG or LNG	Diesel	Omnitek Engineering Corp.	1MKXH11.9H56, 1MKXH11.9H59, 1MKXH11.9V57, 1MKXH11.9V60, 1MKXH11.9V61, 2MKXH11.9H59, 2MKXH11.9H63, 2MKXH11.9H64, 2MKXH11.9V60, 2MKXH11.9V61, RMK728EJDARW, RMK728EJDASW, RMK728EJDATW, SMK12.EJDARW, SMK12.EJDASW, SMK12.EJDATW, SMK728EGDARA, SMK728EGDASW.6MKXH11.9V75, RMK12.EJDARW,		EOMNH11.9E71			EPA
Mack	1996 - 2002	12, 11.9, 12.15	E7, EM7, VE D12	Diesel, or Diesel/CNG, or Diesel/LNG	Diesel	American Power Group, Inc	TMK12.EJDARW, TMK12.EJDASW, TMK12.EJDATW, TMK728EGDARA, TMK728EGDARW, TMK728EGDASW, TMK728EGDATW, TMK728EJDARA, TMK728EJDARW, TMK728EJDASW, TMK728EJDATW, TVT12.EJDBRA, VMK12.EJDARW, VMK12.EJDASW, VMK12.EJDATW, VMK728EGDARA, VMK728EGDARW, VMK728EGDASW, VMK728EGDATW, VMK728EJDARA, VMK728EJDARW, VMK728EJDASW, VMK728EJDATW, VMK728EJDAYW, VMK728EJDAZW, VVT12.EJDBRA, WMKXH0728V40, WMKXH0728V41, WMKXH0728V43, WMKXH11.9E51, WMKXH11.9E52, WMKXH11.9E53, WMKXH0728M44, WVTXH12.150S, XMKXH11.9E54, XVTXH12.150S, YMKXH11.9H56, YMKXH11.9V57, YVTXH12.150S, 1MKXH11.9H56, 1MKXH11.9V57, 1MKXH11.9H59, 1MKXH11.9V60, 1MKXH11.9V61, 1VTXH12.150S, 2MKXH11.9H59, 2MKXH11.9H63, 2MKXH11.9V60, 2MKXH11.9V61, 2VTXH12.150S				DAPGH12.1VP1	OUL
Navistar	2000 - 2003	7.6	C175, C195, CH195, CH215, CL215, C215, C230, CH230, C250, CH250	CNG	Diesel	Omnitek Engineering Corp.	1NVXH0466ANA, 2NVXH0466ANA, 3NVXH0466ANA, YNVXH0466ANA, 1NVXH0466ANB, 2NVXH0466ANB, 3NVXH0466ANB, YNVXH0466ANB				DOMNH07.6466	OUL
Navistar	1996 - 2003	8.7	BT250, A250C, A250F, AL275C, AL275F, C275, CG275, AB275F, AF275C, AF275F, BT275, CH275, A275, A275C, A275F, BH275, CT280, C280, CV280, C300, AL300C, AL300F, CL300, AF300C, AF300F, A300, A300C, A300F, CH300, CV300, AF320C, AF320F, A330C, A330F, C330, CV320, A330, BH330, CH330, CV340	CNG	Diesel	Omnitek Engineering Corp.	XNVXH0530ACT, WNVXH0530CCB, WNVXH0530FNA, 1NVXH0530ANA, 1NVXH0530ATA, 2NVXH0530ANA, 2NVXH0530ATA, 3NVXH0530ANA, 3NVXH0530ATA, VNV530F8DAAA, TNV530D8DARA, VNV530D8DARA, XNVXH0530ANA, 1NVXH0530ACT, 2NVXH0530ACT, 3NVXH0530ACT, YNVXH0530ANA, YNVXH0530ACT, 2NVXH0530ANC, 3NVXH0530ANC, 2NVXH0530ANB, WNVXH0530CCD, WNVXH0530FNC, 1NVXH0530ANB, 3NVXH0530ANB, TNV530E8DASA, VNV530E6DASA, VNV530E8DASA, XNVXH0530ANB, YNVXH0530ANB				DOMNH08.7530	OUL
Navistar	1996 - 1999	7.6	A175, A175C, A175F, A190, A190C, A190F, A195, A195C, A195F, A210, A 210F, A210C, A210F, BH210, A230, A230C, A230F, A250, AB250F, A250C, A250F, B250	CNG	Diesel	Omnitek Engineering Corp.	VNV466D8DARW, WNVXH0466CCB, WNVXH0466FNA, XNVXH0466ANA, TNV466D8DARB, VNV466D8DASA, WNVXH0466CCD, WNVXH0466FNC, TNV466D8DATB, VNV466F8DAAA, XNVXH0466ANB				DOMNH07.6465	OUL

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Navistar	2004	7.6	ALL	CNG	Diesel	North American Repower	4NVXH0466ANA, 4NVXH0466ANB, 3NVXH0466ANA, 3NVXH0466ANB, 2NVXH0466ANA, 2NVXH0466ANB, 1NVXH0466ANA, 1NVXH0466ANB, YNVXH0466ANA, YNVXH0466ANB, XNVXH0466ANA, XNVXH0466ANB			ENARE0000CNG	ENARH0466CNG	OUL
Volvo	2006 - 2009	10.8	MP7, D11	Diesel or Diesel/CNG or Diesel/LNG	Diesel	American Power Group, Inc	6MKXH10.8C02, 6VPTH10.8H01, 6VPTH10.8H02, 7VPTH10.8H03, 7VPTH10.8H04, 8VPTH10.8H03, 8VPTH10.8H04, 9VPTH10.8H03, 9VPTH10.8H04				DAPGH10.8VP7	OUL
Volvo	2006 - 2009	16.1	D16	Diesel or Diesel/CNG or Diesel/LNG	Diesel	American Power Group, Inc	6VTXH16.1C01, 7VPTH16.1H01, 8VPTH16.1H01, 9VPTH16.1H01				DAPGH16.1VP7	OUL
Volvo/Mack	2004 to 2012	11.9, 12.1, 12.8	D-12, FAMILY 64, FAMILY 70, FAMILY 73, FAMILY 65, FAMILY 67, FAMILY 71, FAMILY 74, MP8	Diesel or Diesel/CNG or Diesel/LNG	Diesel	American Power Group, Inc.	4VTXH12.150S, 4MKXH11.9H64, 4MKXH11.9H70, 4MKXH11.9H73, 4MKXH11.9V65, 4MKXH11.9V67, 4MKXH11.9V71, 5VTXH12.150S, 5MKXH11.9V71, 5MKXH11.9V65, 5MKXH11.9V74, 5MKXH11.9V67, 5MKXH11.9H70, 5MKXH11.9H73, 6VTXH12.150S, 6MKXH11.9V71, 6MKXH11.9V74, 6MKXH11.9V67, 6MKXH11.9V65, 6MKXH11.9H70, 6MKXH11.9H73, 6VPTH12.8H01, 7VPTH12.8H02, 8VPTH12.8H02, 9VPTH12.8H02, AVPTH12.8S01, BVPTH12.8S01, CVPTH12.8S01				EAPGH12.8VPA	Inter Appr
Volvo	2002 - 2009	11.9, 12.1, 12.8	E7, D12, MP8, D13	Diesel or Diesel/CNG or Diesel/LNG	Diesel	American Power Group, Inc	2MKXH11.9H64, 2MKXH11.9V65, 2MKXH11.9V66, 2MKXH11.9V67, 3MKXH11.9H64, 3MKXH11.9H70, 3MKXH11.9V65, 3MKXH11.9V67, 3MKXH11.9V68, 4VTXH12.150S, 4MKXH11.9H64, 4MKXH11.9H70, 4MKXH11.9H73, 4MKXH11.9V65, 4MKXH11.9V67, 4MKXH11.9V71, 5VTXH12.150S, 5MKXH11.9V71, 5MKXH11.9V65, 5MKXH11.9V74, 5MKXH11.9V67, 5MKXH11.9H70, 5MKXH11.9H73, 6VTXH12.150S, 6MKXH11.9V71, 6MKXH11.9V74, 6MKXH11.9V67, 6MKXH11.9V65, 6MKXH11.9H70, 6MKXH11.9H73, 6MKXH11.9V75, 6VPTH12.8H01, 7VPTH12.8H02, 8VPTH12.8H02, 9VPTH12.8H02				DAPGH12.8VP7	OUL

Company	Address	Name	Phone	Email	Website
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American Power Group	2503 E Poplar Street, Algona, IA 50511	Nicole Fritz-Kemna	(515) 395-1360 x190	nkemna@americanpowergroupinc.com	americanpowergroupinc.com
BAF Technologies	2176 French Settlement, Dallas, TX 75212	Mark Aubrey	(214) 231-1450	maubry@baftechnologies.com	baftechnologies.com
Clean Air Power	13615 Stowe Drive, Poway, CA 92064	Kevin Campbell	(909) 393-7933	kcampbell@cleanairpower.com	cleanairpower.com
AGA Systems	350 N 650 W, Kaysville, UT 84037	Bryan Wilcox	(866) 931-8940	support@autogasamerica.com	autogasamerica.com
Diesel 2 Gas					
EcoDual	601 Bay Street, Beaufort, SC 29902	Doug Thomson	(617) 855-7999	doug.thomson@ecodual.com	ecodual.com
FYDA Energy Solutions and The					
Hardstaff Group	20 Fyda Drive, Canonsburg, PA 15317		(800) 393-2556	info@fydaenergy.com	fydaenergy.com
Go Natural CNG	2023 South 625 West, Woods Cross, UT 84087	Lucas Kjar	(801) 281-4766	lkjar@gonaturalcng.com	gonaturalcng.com
Greenkraft Inc	2530 S. Birch Street, Santa Ana, CA 92707	Sosi Bardakjian	(714) 545-7777	sosi@greenkraftinc.com	greenkraftinc.com
High Pressure Group	1468 James Road, Gardnerville, NV 89460	Trent Colbert	(775) 455-4059	info@highpressuregroup.com	highpressuregroup.com
IMPCO Automotive/ Evotek/Natural					
Drive	1274 South State Road 32, Union City, IN 47390	Beverly Osborne	(765) 305-2091	bosborne@impcoautomotive.com	impcoautomotive.com
Landi Renzo USA/Baytech	23535 Telo Avenue, Torrance, CA 90505	Barry Carr	(315) 278-2061	bcarr@landiusa.com	landiusa.com
M-tec Solutions Inc.			(734) 344-2811	igor@m-techsolutions.com	mtechsolutionsinc.com
NatGasCar	17000 St. Clair Avenue, Cleveland, OH 44110	Joe Wray	(216) 692-3700	jwray@natgascar.com	natgascar.com
NGV Motori	5589 Callcott Way, Suite 1416, Alexandria, VA 22312	Michelle Guzzone	(866) 636-2289	michelle@ngvus.com	ngvus.com
Omnitek Engineering	1333 Keystone Way, #101, Vista, CA 92801	James Cole	(760) 591-0089	jimcole@omnitekcorp.com	omnitekcorp.com
Parnell	1518 W Knudsen Dr Suite 100, Phoenix, AZ 85027	Todd Campbell	(623) 581-8335	www.info@usealtfuels.com	usealtfuels.com
Peake Fuel Solutions	6200 N. Western Avenue, Oklahoma City, OK 73118	Bryan Curtis	(405) 935-9528	bryan.curtis@chk.com	peakefuelsolutions.com
Westport LD	14900 Galleon Court, Plymouth, MI 48170	Jamie Henry	(731) 233-6751	jhenry@westport.com	wingpowersystem.com
Wise Gas	PO Box 266774, Weston, FL 33326	Sara Neal	(954) 636-4291	sara@wisegasinc.com	wisegasinc.com
World CNG	20620 84th Avenue South, Kent, WA 98032	Josh Hosford	(866) 306-0804	josh@worldcng.com	worldcng.com

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