

## **Appendix C**

# **ASSESSING COMPLIANCE FOR TRUCKS SUBJECT TO THE REGULATION**



## **ASSESSING ACTIONS TAKEN AND FUTURE COMPLIANCE OBLIGATIONS FOR TRUCKS SUBJECT TO THE TRUCK AND BUS REGULATION**

The Air Resources Board (ARB) conducted an analysis to better understand the number of trucks that need to comply with regulatory requirements in 2014, 2015, and 2016 using the most current available data in January 2014. These estimates are based on three data sources. The first is vehicle registration data from the California Department of Motor Vehicles (DMV), which provides information on every truck registered in California (CA). ARB receives a copy of portions of the DMV motor vehicle registration database twice per year in April and October. Staff used the latest data available from October, 2013. DMV registration data are not linked to Motor Carrier Permit data and so vehicles cannot be directly linked to permitted fleets. To compensate, staff conducted an analysis assuming trucks registered to the same address are in the same fleet. California-registered trucks can be classified by vehicle identification number (VIN), model year (MY), body type, gross vehicle weight rating (GVWR), and other factors.

The second is vehicle registration data from the International Registration Plan (IRP). This database provides registration information for trucks in fleets that report driving in California. This information is obtained through the DMV and covers all of the United States except Oregon and Oklahoma, and most Canadian territories. Staff used the latest data available for January to December, 2013. The database does not provide information on which vehicles in each fleet actually travel in California and based on surveys only some trucks in fleets reporting mileage in California actually travel in California. Trucks in this database are classified by reporting fleet, VIN, MY, weight, and other factors.

The third are ARB compliance databases that provide information on compliance status for both the Truck and Bus and Drayage Truck Regulation. These databases provide a linkage between a VIN representing a specific truck, whether or not the vehicle is equipped with a filter, and other compliance related information.

In combining these data sets we developed counts of heavier (>26,000 pound GVWR) and lighter trucks (14,000 to 26,000 pounds GVWR) that are subject to the Truck and Bus regulation. Due to time limitations, buses have not yet been considered.

Table C- 1 below provides an overview of the number of trucks in fleets that are registered to drive in California and are regulated by the Truck and Bus Regulation. The Truck and Bus Regulation defines separate requirements for heavier and lighter trucks. There are more than a million trucks that are registered to fleets reporting

operation in California. Of the one million trucks operating in California, over 370,000 have California-based registrations.

**Table C- 1. Trucks Subject to the Truck and Bus Regulation that Operate in California**

Source of Data	Heavy (>26k)	Light (<=26k)	Grand Total
*DMV - October 2013 Registered In-State Trucks (excluding solid waste and public fleets)	180,772	143,287	324,059
*IRP (2013) California Registered Inter-State Trucks	46,343	965	47,308
IRP (2013) Out-of-State (OOS) Registered Inter-State Trucks with California Address	46,973	912	47,885
IRP (2013) OOS Registered Inter-State Trucks without a California Address	578,832	21,028	599,860
Total Heavy Duty Diesel Trucks	852,920	166,192	1,019,112
<b>*Total CA Registered Heavy Duty Diesel Trucks</b>	<b>227,115</b>	<b>144,252</b>	<b>371,367</b>

\* California based trucks.

Staff developed a methodology to estimate the number of trucks that will need to take steps to comply with regulatory requirements. Methods were developed for lighter trucks and heavier trucks separately.

Light Truck Compliance Count Estimates

The methodology for estimating the number of lighter trucks that will need to take steps to comply is based strictly on the model year of the vehicle. For this analysis we evaluated California registered and non-California registered trucks. Of the total registered heavy duty diesel trucks shown in Table C- 1, over 166,000 (16%) are light heavy trucks of less than 26,001 pounds. Of these, over 144,000 (87%) are California based trucks (in-state or IRP) which would provide the majority of the vehicle miles travelled (VMT) in California for these light trucks. Unless they qualify for other special exemptions, the regulation requires unfiltered light heavy duty trucks with engine MY's older than 1996 to be replaced by January 1, 2015 and those with a 1996 engine MY to be replaced by January 1, 2016. Engine MYs were estimated as one year older than the vehicle MY, as ARB analysis has found this to be typical. Based on our assessment, as shown in Table C- 2, updated 2013 truck counts reflect over 18,000 trucks that might need replacement to comply with the regulation for calendar year (CY)

2015 and over 5,000 trucks that might need replacement to comply with the regulation for CY 2016. Some trucks may not need to be replaced if a diesel particulate matter (PM) filter has been installed, if they meet other special exemption requirements, or if an IRP fleet sends other compliant trucks for travel within California.

**Table C- 2. Estimated Number of Lighter Trucks That Would Need to Take Steps to Comply in 2015 and 2016**

<b>MY Group per Fleet Type</b>	<b>Total Trucks</b>	<b>Potential Replacements by 1/1/15 (&lt;MY 1996)</b>	<b>Potential Replacements by 1/1/16 (MY 1996)</b>
<b><i>In-State</i></b>	<b>143,287</b>	<b>18,546</b>	<b>5,076</b>
<MY1996	18,546	18,546	-
MY1996	5,076	-	5,076
>MY1996	119,446	-	-
Unknown	219	-	-
<b><i>CA IRP</i></b>	<b>965</b>	<b>38</b>	<b>11</b>
<MY1996	38	38	-
MY1996	11	-	11
>MY1996	916	-	-
<b><i>OOS IRP</i></b>	<b>21,940</b>	<b>337</b>	<b>99</b>
<MY1996	337	337	-
MY1996	99	-	99
>MY1996	21504	-	-
<b>TOTALS</b>	<b>166,192</b>	<b>18,921</b>	<b>5,186</b>
<b><i>CA Registered Totals</i></b>	<b>144,252</b>	<b>18,584</b>	<b>5,087</b>

*Heavy Truck Compliance Count Estimates*

To assess the number of heavy trucks that need to comply, we used a step wise process. In the first step in the process, we grouped vehicles by age. We assumed engine MYs were one year older than vehicle MY based on assessments of available data sets, such as the Drayage Truck Registry, where both engine and vehicle MYs are reported. Over 375,000 (44 percent) of these trucks with engine MYs of 2007 or newer should be equipped with original equipment manufacturer (OEM) filters and already comply with PM filter requirements, as shown in Table C- 3.

**Table C- 3. Heavy Vehicle Counts (All Registrants) by Age**

Combined Heavy Duty Diesel Truck Counts						
Truck Weight Category	Engine Model Year Groups					Totals
	Pre-MY1994	MY1994-1995	MY1996-2006	*MY2007+	Unknown MY	
Heavy (>26k)	47,645	23,871	405,159	375,621	624	<b>852,920</b>
<i>*Already meets PM Filter Requirements (OEM)</i>						375,621
Total CA & OOS Registered Diesel Trucks Potentially Subject to Rule for CY2014, CY2015 & CY2016 =						477,299

There were over 180,000 in-state trucks in the October 2013 DMV update. Over 31,000 (18 percent) of these in-state trucks should have OEM filters and already comply with PM filter requirements with no further actions needed, as shown in Table C- 4.

**Table C- 4. California Registered Intrastate Heavy Trucks by Age**

In-State Heavy Duty Diesel Truck Counts						
Truck Weight Category	Engine Model Year Groups					Totals
	Pre-MY1994	MY1994-1995	MY1996-2006	*MY2007+	Unknown MY	
Heavy (>26k)	37,925	14,389	96,191	31,643	624	<b>180,772</b>
<i>*Already meets PM Filter Requirements (OEM)</i>						31,643
Total California Registered Diesel Trucks Potentially Subject to Rule for CY2014, CY2015 & CY2016 =						149,129

There were over 46,000 CA IRP trucks and over 21,000 (46%) of these trucks should already be equipped with OEM filters and comply with PM filter requirements, as shown in Table C- 5.

**Table C- 5. California Registered Interstate Heavy Trucks by Age**

CA IRP Heavy Duty Diesel Truck Counts					
Truck Weight Category	Engine Model Year Groups				Totals
	Pre-MY1994	MY1994-1995	MY1996-2006	*MY2007+	
Heavy (>26k)	932	989	23,272	21,150	<b>46,343</b>
					21,150
Total California Registered Diesel Trucks Potentially Subject to Rule for CY2014, CY2015 & CY2016 =					25,193

There were over 625,000 Out-of-State (OOS) IRP trucks and almost 52% of these trucks should already be equipped with OEM filters and comply with PM filter requirements, as shown in Table C- 6.

**Table C- 6. OOS Registered Interstate Heavy Trucks by Age**

OOS IRP Heavy Duty Diesel Truck Counts					
Truck Weight Category	Engine Model Year Groups				Totals
	Pre-MY1994	MY1994-1995	MY1996-2006	*MY2007+	
Heavy (>26k)	8,788	8,493	285,696	322,828	625,805
<i>*Already meets PM Filter Requirements (OEM)</i>					322,828
Total OOS Registered Diesel Trucks Potentially Subject to Rule for CY2014, CY2015 & CY2016 =					322,828

Similar to previous analysis results, taken together these data demonstrate as expected the average age of the in-state fleet to be significantly older than the IRP fleet groups, as shown in Table C- 7. The non-neighboring OOS registered IRP trucks are the newest.

**Table C- 7. Comparison of Average Age by Heavy Truck Registration Type**

Fleet Type	Engine Model Year Grouping				Totals	Average Vehicle MY
	<1996MY	1996-2006MY	>2006MY	Unknown		
In-State	28.9%	53.2%	17.5%	0.3%	100.0%	2000.1
CA IRP	4.1%	50.2%	45.6%	0.0%	100.0%	2006.3
OOS IRP neighboring states	7.4%	51.0%	41.5%	0.0%	100.0%	2006.0
OOS IRP non-neighboring states	2.6%	45.5%	51.9%	0.0%	100.0%	2007.8
Total >26 Trucks	8.4%	47.5%	44.0%	0.1%	100.0%	2006.1

More than 600,000 of the total heavy trucks are registered to large fleets outside of California. Although these trucks are in fleets authorized to operate in California, not all of these individual vehicles in these fleets may actually come into California. Previous studies have demonstrated that only a fraction of trucks in fleets participating in the IRP program and in fleets reporting mileage in California actually operate in California. Further, these trucks entering California from other states are on average around two to three years old based on previous studies (Lutsey, 2007). Under the Truck and Bus regulation large fleet OOS trucks may choose to comply by dispatching compliant trucks. Therefore, we focused the remainder of our compliance analysis on California-registered trucks.

The second step in the process to assess the number of heavy trucks that may need to comply was to group vehicles by fleet size. DMV and IRP data fields were used to develop the fleet sizes needed to assess compliance requirements. For IRP fleets, by definition, a combination of fields denotes a specific fleet. For DMV data, there are no fields in the records to denote a specific fleet or identify a common owner. To estimate fleet sizes, addresses were scrubbed to make them more consistent and reduce the number of possible permutations for the same address. Then long, concatenated address fields were created (5-digit zip code, city, address line 1, address line 2), with

special characters and spaces removed. Each unique concatenated long address field was used to represent a fleet for the purposes of determining fleets sizes to assess compliance status truck counts.

This process will result in an accurate accounting of trucks by fleet size for many fleets. However, large fleets with multiple registered addresses may appear in the database as multiple fleets, and errors in addresses may inadvertently result in parsing of a single fleet into several small fleets or several owner-operators. The result of the assessment is believed to overestimate to a limited extent the number of owner-operators and small-fleets that are registered in California. For this reason, we are rounding the estimates presented by fleet size to account for such uncertainties. Table C- 8 compares California-registered vehicle counts by fleet size.

**Table C- 8. California Registered Heavy Truck Counts by Age and Fleet Size**

<b>California Registered Heavy Truck Counts by Vehicle MY Group and Fleet Size</b>						
<b>Vehicle MY Group</b>	<b>Fleet Size</b>					<b>Grand Total</b>
	<b>1 Truck Fleets</b>	<b>2 Truck Fleets</b>	<b>3 Truck Fleets</b>	<b>&gt;3 Truck Fleets</b>	<b>Unknown Fleet Size</b>	
<b>Less than MY1995</b>	11,000	5,000	3,000	20,000	300	39,300
<b>MY1995 to MY1996</b>	4,000	2,000	1,000	8,000	100	15,100
<b>MY1997 to MY2007</b>	24,000	11,000	7,000	76,000	300	118,300
<b>Over MY2007</b>	6,000	3,000	2,000	41,000	400	52,400
<b>Unknown</b>	100	100	50	300	-	550
<b>Grand Total</b>	45,100	21,100	13,050	145,300	1,100	225,650

The third step in the assessment process for heavy trucks was to cross reference California-registered vehicle by VIN against regulation compliance databases: Truck Regulation Upload and Compliance Reporting System (TRUCRS) and the Drayage Truck Registry. When rounded, there are approximately 225,000 California registered heavy trucks. Over 20 percent of these trucks should be equipped with OEM filters and already comply with PM filter requirements with no further actions needed. Only fleets using the flexibility options need to report to TRUCRS, so this matching process will only provide a subset of the potential PM filters that have already been installed on trucks for regulation compliance. There were over 11,000 in-state and 2,700 IRP matched trucks that reported a retrofit PM filter had already been or soon would be installed.



The Truck and Bus regulation heavy truck requirements can vary based on the total number of trucks in a given fleet (or “fleet size”), the number of heavy trucks within a fleet, the age of vehicles in the fleet, the number of trucks equipped with PM retrofit filters, and the chosen compliance pathway. Registration data sources can be used to provide information on vehicles by fleet, but cannot provide information on chosen compliance pathway or on whether or not a retrofit PM filter has been installed. As a result, staff cross-referenced vehicle registration and regulatory compliance databases to identify trucks reporting to ARB as having installed a retrofit PM filter.

Each individual fleet, identified by common address as discussed above, was then evaluated to determine how many trucks by fleet size might need to take action with Regulation requirements in 2014, 2015, and 2016. Results are shown in Table C- 9 and suggest as many as 30,000 small fleet heavy trucks and 60,000 large fleet trucks may need to take action to comply in 2014. This assessment excludes trucks that had already installed a PM retrofit filter, but did not exclude trucks that claimed a flexibility options in TRUCRS. The next step in the heavy truck analysis was to account for flexibility provisions.

**Table C- 9. Estimated Number of Heavy Trucks That Would Need to Take Steps to Comply in 2014, 2015, and 2016 (without considering regulation flexibility options)**

<i>Fleet Size</i>	<b>Potential Actions Needed for Compliance by Calendar Year</b>					
	<i>2014 Retrofits</i>	<i>2015 Retrofits</i>	<i>2016 Retrofits</i>	<i>2014 Replacements</i>	<i>2015 Replacements</i>	<i>2016 Replacements</i>
1 Truck Fleets	19,000	900	-	-	9,100	3,700
2 Truck Fleets	5,500	200	4,500	2,300	1,200	2,000
3 Truck Fleets	2,500	300	2,400	-	1,400	1,500
>3 Truck Fleets	59,300	4,200	1,800	-	16,800	7,000
<b>Totals</b>	<b>86,300</b>	<b>5,600</b>	<b>8,700</b>	<b>2,300</b>	<b>28,500</b>	<b>14,200</b>

Table C- 10 provides a summary of the number of trucks that have reported into TRUCRS by known compliance status. About 30 percent of the trucks reported into TRUCRS and shown in Table C- 10 are not registered in California. The table suggests there are 6,000 known compliant small fleet heavy trucks with PM filters, and an additional 11,000 small fleet heavy trucks that claimed Good Faith.

**Table C- 10. TRUCRS Reporting Data (Light and Heavy Trucks) by Compliance Status as of January 31, 2014**

<b>Statewide Totals</b>	<b>Small Fleet</b>	<b>Large Fleet</b>	<b>Total</b>
<b>Known Compliant Trucks</b>	<b>24,324</b>	<b>153,648</b>	<b>177,972</b>
- OEM PM Filter	5,631	85,157	90,788
- Retrofit PM filter	1,038	11,309	12,347
- Flexibility options (ag, low-use...)	17,655	57,182	74,837
<b>Good Faith Efforts Total</b>	<b>10,658</b>	<b>9,536</b>	<b>20,194</b>
- Applied for Funding	1,508	200	1,708
- Approved for Loan	1,064	743	1,807
- Denied for Loan	3,424	1,771	5,195
- Ordered PM Filter	3,604	4,591	8,195
- Ordered Truck	1,058	2,231	3,289

Staff evaluated the number of California-registered trucks reporting to TRUCRS against the total number of registered trucks in California. Of the 177,972 known compliant trucks and 20,194 trucks claiming good faith, about 155,000 are heavy trucks registered in California. Comparing this to 225,000 heavy trucks registered in California, this implies about 70% of California-registered heavy trucks are reported into TRUCRS.

Reporting to TRUCRS is not mandatory, however fleets that choose to take advantage of flexibility provisions in the regulation must also report to TRUCRS. Analysis of trucks reported to TRUCRS suggests about 70% of registered heavy trucks or about 12,000 California-registered heavy trucks in small fleets have claimed flexibility provisions. Because flexibility provisions were not accounted for in Table C- 9, subtracting these 12,000 from 29,300 California-registered heavy trucks in Table C- 9, leaves a maximum of 17,000 possible unreported small fleet heavy trucks that might need to take action in 2014 to comply and have not reported to TRUCRS. Table C- 11 shows the estimated number of California-registered heavy trucks that may need to take action to meet 2014 requirements after accounting for those reported in TRUCRS as complying with the flexibility provisions. Based on this analysis, around 85 percent of California-registered heavy trucks are in compliance with the regulation. Many of these trucks comply through flexibility options and so will gradually need to comply as regulatory compliance dates come due.

**Table C- 11. Estimated Number of California-Registered Heavy Trucks that Need to Take Additional Action to Comply with 2014 Requirements**

	Small Fleet	Large Fleet	Total
<b>Total heavy trucks that need to take action in 2014 based on age in vehicle registration data (Table C-4)</b>	29,300	59,300	88,600
<b>Estimate of California-registered heavy trucks claiming good faith flexibility provisions in TRUCRS*</b>	12,300*	40,000*	52,300
<b>Total that need to take action in 2014 and are not reported in TRUCRS</b>	17,000	19,000	36,000

\* Assumes 70percent of all trucks in TRUCRS and claiming compliance through flexibility provisions are registered in California based on preliminary data evaluation

Note: The estimated compliance rate based on information reported by October 2013 is 85 percent of the 230,000 California registered heavy duty trucks.

Summary

Table C- 12 combines results of the analysis shown in Table C- 11 and Table C- 1. Overall, staff analysis shows that most trucks are currently compliant with 2014 requirements, and that around 70 percent of California-registered heavy trucks are reported into TRUCRS. At the same time fleets will face significant compliance obligations as the regulation continues to be implemented in 2015 and 2016. The proposed regulatory amendments are designed to help ensure emissions reductions are achieved by providing additional pathways to compliance for fleets – especially for small fleets, low mileage fleets, and fleets operating in certain rural areas that may face challenges to comply.

**Table C- 12. Summary of Number of Trucks Estimated to Need to Comply,  
But Have Not Yet Reported to TRUCRS,  
by Calendar Year, Fleet Size, and Weight Class**

Calendar Year	Heavy Trucks			Light Trucks	Total Light and Heavy
	Small Fleet	Large Fleet	Total	All Fleet Sizes	Total
2014	17,000	19,000	36,000		36,000
2015	13,000	21,000	34,000	19,000	53,000
2016	14,000	9,000	23,000	5,000	28,000

Limitations

There are several limitations to this exercise. The latest California vehicle registration data available was provided to ARB in October 2013. Actions taken to comply after this date will not be reflected in the analysis, and the counts will to some degree overestimate the number of trucks that must take action to comply since some will have taken action between October 2013 and today.

DMV extracts are provided to ARB twice per year, in April and October. These biannual DMV data sets require ARB processing to assign necessary field designations (such as vehicle class and registration status categories used by ARB). To expedite updated 2013 truck counts, staff matched VINs on existing ARB processed trucks for detailed data to use for those trucks. The new, unmatched trucks were processed through a VIN decoder to identify the needed detailed information. As not all of the normal processing steps have yet been completed, there may be some minor errors introduced on some individual trucks, however the totals by vehicle class and MY subgroups should be reasonably reliable for the purpose of this status review.

The IRP truck data is an important resource for interstate truck information. However, while conducting this update and analysis, it was discovered that the states of Oregon had ceased participating in this system and so are not included in this analysis. While these data would increase the count of OOS inventory trucks operating in California, the compliance count results would not change since the estimates were based on in-state and CA IRP trucks that provide the majority of heavy duty diesel truck VMT in California.

For both the DMV and IRP truck records, the class of each vehicle was estimated based on data as reported and provided in several weight related fields. The class groups used were “T7” for >33,000 lbs., “T6above26k” for >26,000 and <=33,000lbs., “T6below26k” for >14,000 and <=26,000 lbs., or “Unknown” if it could not be determined. For some individual trucks, there might be erroneous class designations but this analysis reflects the best available data to date.

Analyzing compliance status requires an understanding of the number and age of vehicles by fleet. Because California registration data are not linked to a unique fleet identifier like a Motor Carrier Permit identification number, we grouped California-registered trucks by common address. As discussed above, a unique concatenated long address field was used for DMV truck data to represent a fleet for the purposes of determining fleets sizes to be able to assess compliance status truck counts. Due to permutations in addresses (such as including or excluding a suite or other reference number, different spellings or abbreviations of street names, etc.), it is possible that some small fleet counts are over-estimated for some larger truck fleets if the addresses could not be matched appropriately. The compliance status truck counts represent the best available estimates using the data sources available, however it should be noted that these results provide estimates and not exact numbers. To indicate this level of uncertainty, results provided by fleet size are rounded to an appropriate number of significant digits.

## **Reference**

Lutsey, 2007. Lutsey et al., Assessment of Out-of-State Truck Activity in California, ARB Contract 04-328.