

A Study of the Discrepancy Between Federal and State Measurements of On-Highway Motor Fuel Consumption

July 2003

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**A STUDY OF THE DISCREPANCY BETWEEN
FEDERAL AND STATE MEASUREMENTS OF
ON-HIGHWAY MOTOR FUEL CONSUMPTION**

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ABSTRACT

Annual highway fuel taxes are collected by the Treasury Department and placed in the Highway Trust Fund (HTF). There is, however, no direct connection between the taxes collected by the Treasury Department and the gallons of on-highway fuel use, which can lead to a discrepancy between these totals. This study was conducted to determine how much of a discrepancy exists between the total fuel usages estimated based on highway revenue funds as reported by the Treasury Department and the total fuel usages used in the apportionment of the HTF to the States.

The analysis was conducted using data from *Highway Statistics* Tables MF-27 and FE-9 for the years 1991-2001. It was found that the overall discrepancy is relatively small, mostly within 5% difference. The amount of the discrepancy varies from year to year and varies among the three fuel types (gasoline, gasohol, special fuels).

Several potential explanations for these discrepancies were identified, including issues on data, tax measurement, gallon measurement, HTF receipts, and timing. Data anomalies caused by outside forces, such as deferment of tax payments from one fiscal year to the next, can skew fuel tax data. Fuel tax evasion can lead to differences between actual fuel use and fuel taxes collected. Furthermore, differences in data collection and reporting among States can impact fuel use data. Refunds, credits, and transfers from the HTF can impact the total fuel tax receipt data. Timing issues, such as calendar year vs. fiscal year, can also cause some discrepancy between the two data sources.

1. INTRODUCTION

Each year, highway fuel taxes are collected by the Treasury Department and placed in the Highway Trust Fund (HTF). Under provisions set by Congress, these funds are distributed back to the States to support the construction and preservation of the highway system by the U.S. Department of Transportation (DOT), Federal Highway Administration (FHWA). FHWA uses motor fuel usage data, supplied by the States or derived through computer models, to determine the on-highway fuel use, by State. Billions of dollars are apportioned annually using the percentages of on-highway fuel use to derive the revenues attributed to each State. Because the total dollar amount to be distributed is so large, even a small discrepancy can equal hundreds of thousands of dollars.

1.1 BACKGROUND

Federal highway taxes are based on specific tax rates, which differ by type of fuel taxed or by type of user fee. These taxes, which are ultimately paid by final users in specific States, are not paid directly by the final users to the Internal Revenue Service (IRS). Rather, most motor fuel excise taxes are collected by the IRS from large corporations (typically large oil companies or distributors with storage facilities) which have no knowledge of fuel usage within each State. Since State-by-State tax contributions to the Federal HTF cannot be directly measured, other procedures have been developed to attribute on-highway fuel usage, which is then used to apportion Federal funds back to the States.

On an annual basis, States provide consumption and tax data to FHWA on gallons of gasoline, gasohol, on-highway diesel, on-highway liquefied petroleum gas, and other alternative fuels that were consumed in the State. Because State tax data are collected and organized to administer State programs, the fuel usage data sets submitted to FHWA from the States differ, sometimes significantly.

To develop a complete and reasonably consistent data set across all States, FHWA must make adjustments to the State-reported motor fuel data. These adjustments are necessary, for example, to account for public use of gasoline and special fuels (e.g., State laws differ for government use of gasoline and diesel fuel), gasoline losses, fuel types (e.g., gasoline, gasohol at various percentages, special fuels), tax rates (e.g., fully taxed fuels, exempt sales, partially exempt sales, full and partial refunds, and fuels taxed at reduced rates), and off-highway fuel use (e.g., aviation, boating, off-highway recreation). The end result of this process is a set of tables that attribute on-highway motor fuel usage, by fuel type, to States.¹

Gasoline, gasohol, and special fuels (mostly diesel) are consumed in different quantities. Figure 1 shows the relative percentage of use of each type of fuel from calendar years 1991

¹ Oak Ridge National Laboratory, *Attribution and Apportionment of Federal Highway Tax Revenues*, p. v.

through 2001. As seen in Figure 1, the greatest on-highway fuel use is for gasoline, followed by special fuels (most of which is diesel).² Gasohol accounts for a small percentage of the total.

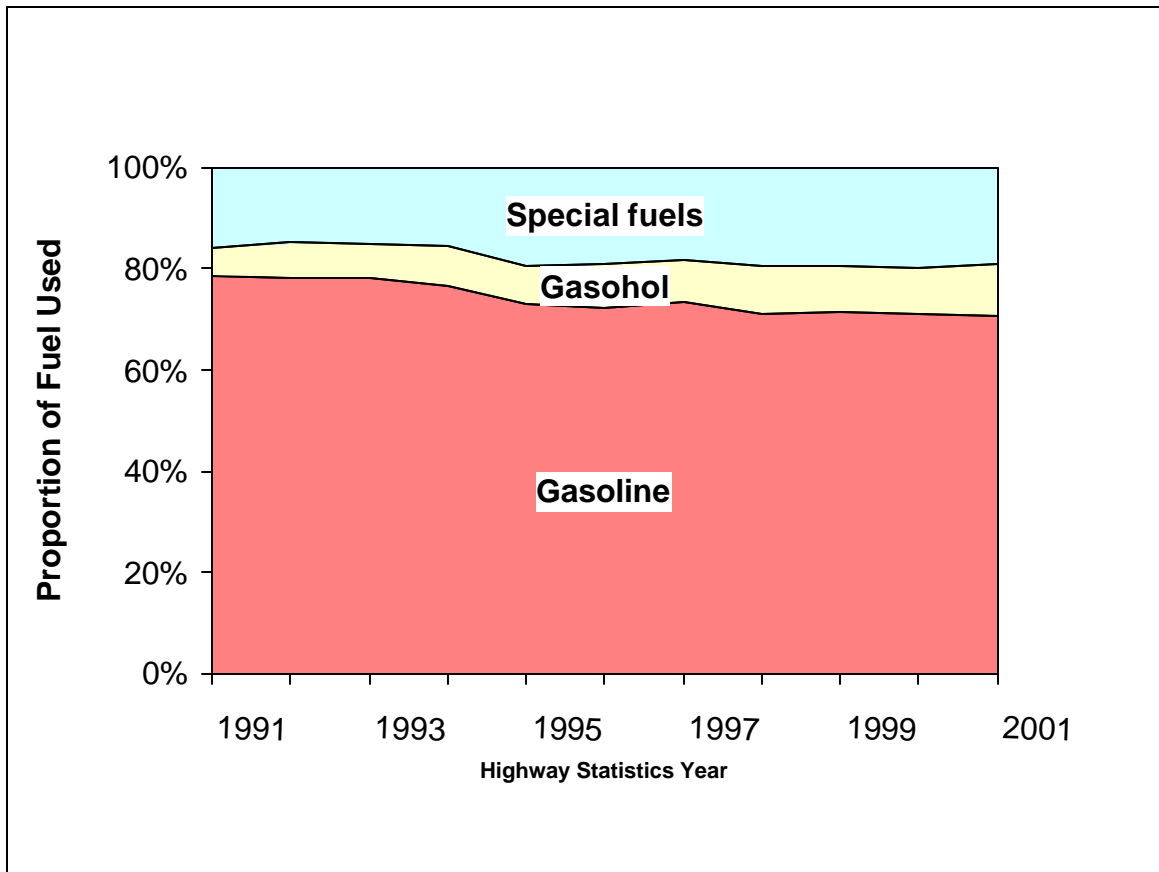


Figure 1. Comparison of total highway fuel usage by fuel type. Source: *Highway Statistics*, Table MF-27, 1991-2001. [See Section 3.1.1 for information on data adjustments for the 1994 data year.]

1.2 PROBLEM DEFINITION

During the Motor Fuel Modeling Workshop held in March 2002, which was sponsored by the FHWA and involved Federal and State personnel, staff from the Office of Highway Policy Information explained the current models used in the FHWA annual attribution process and emphasized the importance of receiving good data from the States. During the course of the workshop, it was pointed out by FHWA that a discrepancy of about 6% between attributed motor fuel usage and motor fuel usage estimated from IRS-reported tax revenues was identified in the 1998 data set. Attendees at the workshop recommended that

² The IRS and FHWA definitions of the term “special fuels” are not identical. Usually, FHWA includes on-highway private/commercial and public use of diesel, kerosene, and alternative fuels within the scope of the term “special fuels.” Throughout this report, the FHWA definition is used. The primary component of “special fuels” is diesel.

this difference be further examined to investigate potential causes for the apparent discrepancy.

1.3 OBJECTIVES

The purposes of this study are (1) to determine how much of a discrepancy exists, over time and by fuel type, between the total fuel usage estimated based on highway revenue funds as reported by the Treasury Department and the total fuel usage used in the apportionment of the HTF to the States, and (2) to identify possible causes of the discrepancy.

2. DATA ANALYSIS

2.1 HIGHWAY STATISTICS TABLES

In its annual *Highway Statistics* series, FHWA publishes tables that show the tax revenues by fuel type (Table FE-9), the gallons of highway use of motor fuel by fuel type (Table MF-27), and the tax rate by fuel type (Table FE-21B). The data comparisons and analyses in this chapter are based on these three tables.

Table FE-9, “Federal Highway Trust Fund Receipts Attributable to Highway Users in Each State,” divides the HTF receipts into two accounts – the Highway Account and the Mass Transit Account. In addition, the Highway Account is subdivided into categories of motor fuel usage and other non-fuel-based taxes (e.g., heavy truck fees). Because the concern that led to this investigation is on motor fuel tax revenues, the non-fuel-based highway taxes are excluded from this study. Note that Table FE-9 is in dollars rather than gallons of fuel and the data are reported on a fiscal year (FY) basis.

Table MF-27, “Highway Use of Motor Fuel,” provides the gallons of gasoline, gasohol, and special fuels used on highway, by State. The primary “special fuel” is diesel, but certain other fuels are also included. Fuel consumption shown in Table MF-27 for a given year is used to calculate State shares of HTF for the subsequent year. Resulting State-level HTF distributions are then presented as Table FE-9 in the *Highway Statistics*. Unlike Table FE-9, data in Table MF-27 are on a calendar year (CY) basis. Although Puerto Rico is included in MF-27, it is not included in Table FE-9. Thus, motor fuel gallons used in Puerto Rico were excluded from this analysis.

Table FE-21B, “Federal Highway-User Fees,” lists the fuel tax rates for gasoline, diesel and kerosene fuel, special fuels (liquefied petroleum gas, liquefied natural gas, and others), neat alcohol (85% alcohol), compressed natural gas, and gasohol at 10%, 7.7%, and 5.7% blends made with ethanol. Tax rate changes are also specified in this table. Table FE-21B also includes the distribution of the taxes; that is, not all of the Federal highway taxes are distributed to the HTF (i.e., the Highway Account or the Mass Transit Account). Portions of the tax revenues are distributed to the Leaking Underground Storage Tank (LUST) trust fund and some to the general fund. For the most recent analysis year (i.e., 2001), these tax rates and fees are shown in Appendix D. The tax distributions were taken into consideration during the data analysis to convert revenues, as specified in Table FE-9, into gallons of fuels. In other words, only the portion of tax designated for the HTF was used in the comparisons.

2.2 DATA CONVERSION

As stated above, the bottom line of Table FE-9 data represents revenues collected from Federal motor fuel excise taxes that went into the HTF. Note that national totals, not individual State fuel usages, from Tables FE-9 and MF-27 are to be evaluated under this comparison study. Because the State-level data shown in Table FE-9 were derived from MF-

27, such a comparison would be meaningless. On the other hand, data presented in the bottom-line of Table FE-9 were obtained from IRS, which is an independent source from the State-reported and FHWA-estimated data in MF-27.

In order to compare the two data sets, which have different units of measure (i.e., dollars versus gallons), a conversion of units is necessary. Using information on tax rates as provided in FE-21B, IRS-reported FE-9 revenue numbers were converted to gallons as described below. The fundamental method for this conversion is as straightforward as “revenue divided by tax rate equals gallons.” The important part is that, as mentioned previously, not all motor fuel excise taxes collected by IRS are distributed into the HTF. Since only HTF revenue is of concern here (i.e., data in FE-9), tax rates used for converting revenue to gallons need to be adjusted by removing those that go into the general fund and LUST. For example, gasoline is currently taxed by IRS at 18.4 cents per gallon. A small part of this tax, 0.1 cent per gallon, is designed for the LUST fund. The HTF is, therefore, collecting 18.3 cents per gallon from gasoline use. Gasoline revenue obtained from Table FE-9, adding both highway and mass transit accounts together, should then be divided by 0.183 to get an estimate for the gallons of gasoline taxed. Mathematically speaking, the conversion formula is as the following:

$$[\text{tax dollars (Table FE-9)}] / [\text{adjusted tax rate (Table FE-21B)}] = \text{fuel use (gallons).}$$

Although special fuel includes diesel and other fuels which have substantially lower tax rates than diesel, the amount of these non-diesel special fuels being used on highway is relatively small. Under this project, all special fuels are treated as diesel and their revenues are converted using diesel tax rates. Consequently, the resulting gallon estimate for special fuels is likely to be slightly understated.

The conversion from gasohol revenue to gasohol gallons is slightly more complicated than those for gasoline and special fuel. Gasohol tax rates differ by percent blend (5.7%, 7.7%, and 10%); however, the revenue from each blend is not provided by FE-9. This makes the task of converting revenue to gallons for gasohol a challenging one. Additional assumptions and analysis to derive total gasohol gallons are required. This analysis is shown in Appendix B.

2.3 COMPARISON BY FUEL TYPE

Ideally, the number of gallons derived from Table FE-9 for each fuel type should be equal to the gallons reported in Table MF-27. Between 1991 and 2001, however, overall discrepancies up to about 6% have been noted. When looking at these discrepancies, one should be careful to note that the total fuel usage for the three fuel types is very different, as shown in Figure 1. The three fuel types thus contribute different proportions to the overall percentage discrepancies.

2.3.1 Gasoline Use

The first fuel type to be examined for differences is gasoline, which represents about 70% to 78% of the total fuel used on-highway. Table 1 shows the data on revenues and on-highway gallons from *Highway Statistics* Tables FE-9 and MF-27, respectively, for gasoline usage in the years 1991-2001. Because FE-9 data are in dollars, the gallons of fuel must be derived by dividing the FE-9 values by the fuel tax rate for each year. Since the tax rate did not always change at the beginning of the fiscal year, the tax rate that was in effect for the majority of the tax year was used in this analysis. The estimated gasoline usages and the percent differences from their corresponding MF-27 values are also included in Table 1.

Table 1. Discrepancies between *Highway Statistics* Tables FE-9 and MF-27 for gasoline usage, 1991-2001

FE-9 ^a (FY)	MF-27 (CY)	MF-27 (in thousand gallons)	FE-9 (in thousand dollars)	Fuel tax rate (cents/gal)	Fuel tax not used for highway fund (included in tax rate)		Estimated fuel use based on FE-9 (in thousand gallons)	Percent difference of FE-9 from MF-27
					LUST trust fund (cents/gal)	Deficit reduction (cents/gal)		
1991	1990	101,981,625	11,022,631	14.1	0.10	2.50	95,848,965	-6.01%
1992	1991	99,286,379	11,217,811	14.1	0.10	2.50	97,546,183	-1.75%
1993	1992	102,145,869	11,922,453	14.1	0.10	2.50	103,673,504	1.50%
1994	1993	103,381,781	11,466,611^b	18.4	0.10	6.80	99,709,661 ^b	-3.55%
1995	1994	104,672,387	12,372,722	18.4	0.10	6.80	107,588,887	2.79%
1996	1995	104,432,608	15,122,095	18.3	0.00	4.30	108,014,964	3.43%
1997	1996	107,767,763	14,903,506	18.3	0.00	4.30	106,453,614	-1.22%
1998	1997	107,261,613	20,848,697	18.4	0.10	0.00	113,927,306	6.21%
1999	1998	110,652,679	20,474,061	18.4	0.10	0.00	111,880,115	1.11%
2000	1999	114,988,789	20,802,491	18.4	0.10	0.00	113,674,814	-1.14%
2001	2000	112,611,645	19,545,036	18.4	0.10	0.00	106,803,475	-5.16%

^a The data year being represented by Table FE-9 is the same as the *Highway Statistics* data year, except FE-9 is for the fiscal year; the data year for MF-27 is the calendar year previous to the *Highway Statistics* data year.

^b In the 1995 *Highway Statistics*, a note on Table FE-9 indicated that data were based on revised numbers as of January 1997. The data for FE-9 for 1994 have been adjusted to accommodate the revised numbers. Additional explanation is provided in Section 3.1.1.

Source: *Highway Statistics*, 1991-2001.

The final column in Table 1 shows the annual discrepancy between Tables FE-9 and MF-27. If the percent difference is negative, then the gallons estimated from tax revenues were less than the gallons of on-highway fuel reported by the States (i.e., data in Table MF-27). If the percent in the final column is positive, then the gallons estimated from tax revenues were greater than the gallons of on-highway fuel reported by the States.

As can be seen in Table 1, the percent differences between the value derived from Table FE-9 and those reported in Table MF-27 for gasoline are relatively small, mostly less than 3.5% (absolute value). Possible explanations for the discrepancies are provided in Section 3.1.

The differences between Tables MF-27 and FE-9 over time, as measured in gallons of gasoline, are shown in Figure 2.

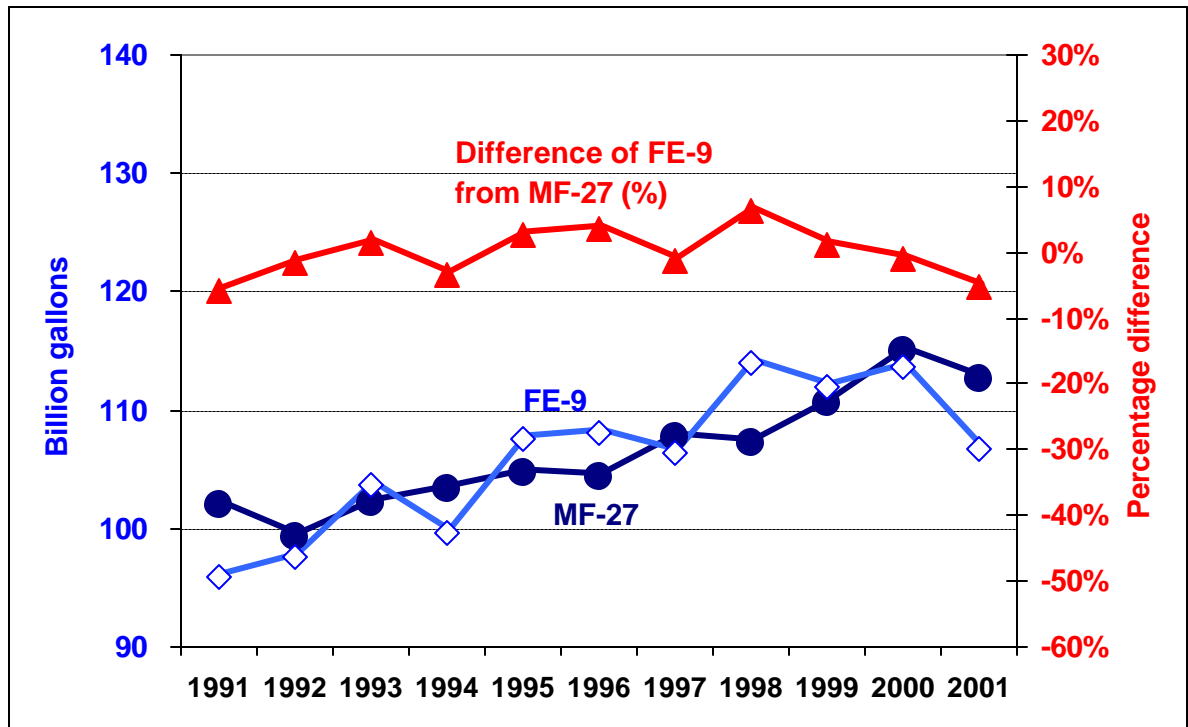


Figure 2. Comparison of MF-27 and FE-9 values for total gallons of gasoline by *Highway Statistics* year. Source: *Highway Statistics*, 1991-2001.

2.3.2 Special Fuels (Diesel) Use

Table 2 shows the data on revenues and on-highway gallons from *Highway Statistics* Tables FE-9 and MF-27, respectively, for special fuels usage in the years 1991-2001. The primary fuel in the category “special fuels” is diesel. As in Table 1, gallons of special fuel can be derived by dividing the FE-9 dollar values by the fuel tax rate in effect for most of the year. Although diesel is the primary component of the special fuels category, certain other fuels are also included (see Section 2.1). These fuels are taxed at different rates, which might impact the gallons of special fuel derived from FE-9. It is not expected that the impact would be significant because diesel is the predominate fuel in the special fuels category. The estimated special fuel usages and the percent differences from their corresponding MF-27 values are also included in Table 2.

Data in Table 2 indicate a larger variation in the discrepancies of special fuel usage estimates over the last decade than those for gasoline. Differences range from over -10% in 1993 to almost +11% in 1995. The estimated special fuel usages for the 3-year period from 1998 to 2000 match almost perfectly. These small differences can easily be attributed to rounding errors from the estimation process.

Table 2. Discrepancies between *Highway Statistics* Tables FE-9 and MF-27 for special fuels (diesel) usage, 1991-2001

FE-9 ^a (FY)	MF-27 (CY)	MF-27 (in thousand gallons)	FE-9 (in thousand dollars)	Fuel tax rate (cents/gal)	Fuel tax not used for highway fund (included in tax rate)		Estimated fuel use based on FE-9 (in thousand gallons)	Percent difference from MF-27
					LUST trust fund (cents/gal)	Deficit reduction (cents/gal)		
1991	1990	21,244,926	3,597,947	20.1	0.10	2.5	20,559,697	-3.23%
1992	1991	20,649,770	3,318,609	20.1	0.10	2.5	18,963,480	-8.17%
1993	1992	21,913,950	3,433,839	20.1	0.10	2.5	19,621,937	-10.46%
1994	1993	23,501,015	3,692,294^b	24.4	0.10	6.8	21,098,823 ^b	-10.22%
1995	1994	25,157,457	4,882,324	24.4	0.10	6.8	27,898,994	10.90%
1996	1995	26,308,696	5,480,993	24.3	0.00	4.3	27,404,965	4.17%
1997	1996	27,558,268	5,365,422	24.3	0.00	4.3	26,827,110	-2.65%
1998	1997	29,009,483	7,103,918	24.4	0.10	0	29,234,230	0.77%
1999	1998	30,303,709	7,314,436	24.4	0.10	0	30,100,560	-0.67%
2000	1999	32,141,519	7,877,029	24.4	0.10	0	32,415,757	0.85%
2001	2000	33,493,110	7,445,662	24.4	0.10	0	30,640,584	-8.52%

^a The data year being represented by Table FE-9 is the same as the *Highway Statistics* data year, except FE-9 is for the fiscal year; the data year for MF-27 is the calendar year previous to the *Highway Statistics* data year.

^b In the 1995 *Highway Statistics*, a note on Table FE-9 indicated that data were based on revised numbers as of January 1997. The data for FE-9 for 1994 have been adjusted to accommodate the revised numbers. Additional explanation is provided in Section 3.1.1.

Source: *Highway Statistics*, 1991-2001.

The percent difference between values reported in Table MF-27 and those estimated from Table FE-9 for special fuels in 2001, however, is significantly large. The State-reported total of special fuel use was about 8.5% higher than that derived from the IRS revenue totals. Possible explanations for this and other discrepancies are discussed in Section 3.1. The differences between Tables MF-27 and FE-9 over time, as measured in gallons of special fuels, are shown in Figure 3.

2.3.3 Gasohol Use

The data on revenues and on-highway gallons from *Highway Statistics* Tables FE-9 and MF-27, respectively, for gasohol usage in the years 1991-2001 are presented in Table 3. As in Tables 1 and 2, dividing the revenue values by the primary fuel tax rate for each year results in the gallons of fuel. Because gasohol has been defined as three different blends (i.e., 5.7%, 7.7%, and 10%) since 1993, each with a different tax rate, the conversion process from revenues to gallons is thus not as straightforward as in the cases of gasoline and special fuels. A discussion of this conversion process is included in Appendix B of this report.

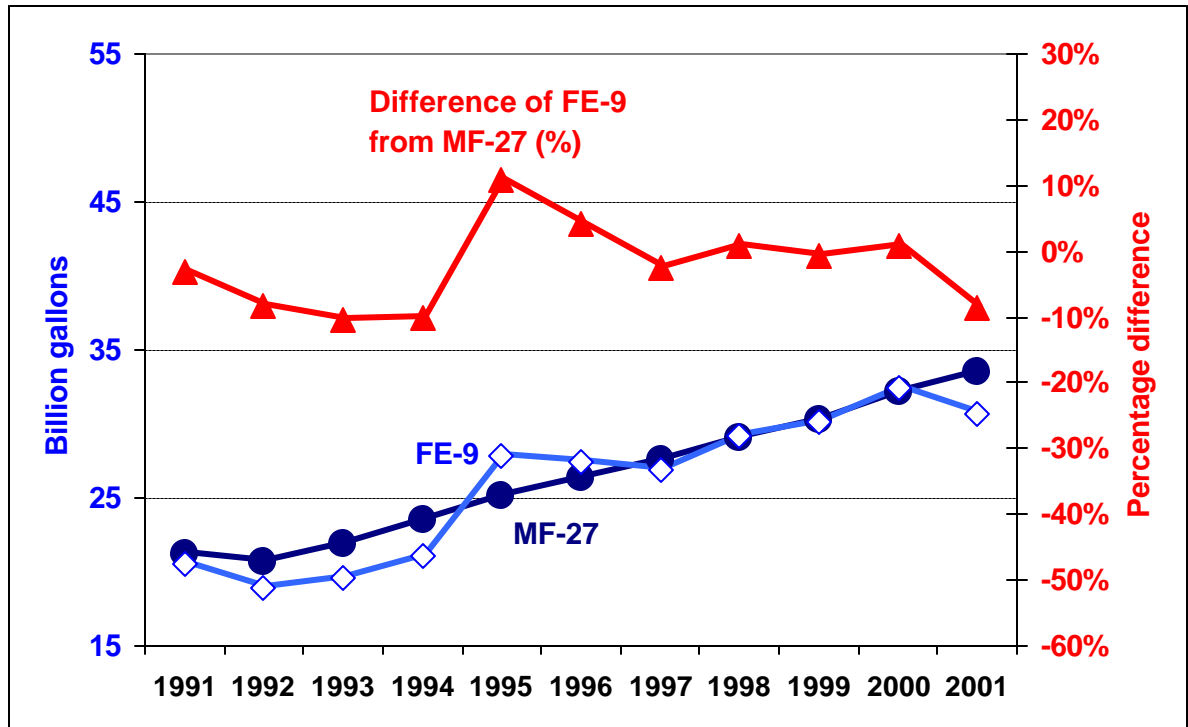


Figure 3. Comparison of MF-27 and FE-9 values for total gallons of special fuels by Highway Statistics year. Source: Highway Statistics, 1991-2001.

As shown in Table 3, the percent differences for gasohol usage vary widely over the past decade. No particular trend or pattern can be identified when examining these discrepancies. Unlike gasoline and diesel fuels where the majority of fuel usage data shown in Table MF-27 was State-reported, a significant portion of gasohol values in Table MF-27 was estimated based on a model developed in 1994. A more in-depth review of the gasohol model is documented in a separate research report.³ It is possible that some of the discrepancies as seen in Table 3 can be attributed to the goodness of fit of the model. Further discussion on this and other possible explanations for the discrepancies are addressed in Section 3.3.2.

³ Oak Ridge National Laboratory, "The Federal Highway Administration Gasohol Consumption Estimation Model," 2003.

Table 3. Discrepancies between *Highway Statistics* Tables FE-9 and MF-27 for gasohol usage, 1991-2001

Year^a	MF-27 (in thousand gallons)	FE-9 (in thousand dollars)	Estimated fuel use based on FE-9 (in thousand gallons)	Percent difference from MF-27
1991	7,539,169	378,174	6,875,891	-8.80%
1992	8,834,483	446,171	8,112,200	-8.18%
1993	8,828,510	548,047	9,234,297	4.60%
1994	10,286,567	850,848	14,246,634	38.50%
1995	11,009,594	679,833	11,076,609	0.61%
1996	13,092,585	896,712	15,319,443	17.01%
1997	12,038,754	862,219	15,382,526	27.78%
1998	14,256,951	1,327,385	13,240,124	-7.13%
1999	14,422,597	1,505,495	15,099,784	4.70%
2000	14,281,065	1,608,814	16,223,276	13.60%
2001	16,449,409	2,037,108	18,746,863	13.97%
^a “Year” is the <i>Highway Statistics</i> year. Source: <i>Highway Statistics</i> , 1991-2001.				

A graphical view of the differences between Tables MF-27 and FE-9 over time, as measured in gallons of gasohol, is shown in Figure 4.

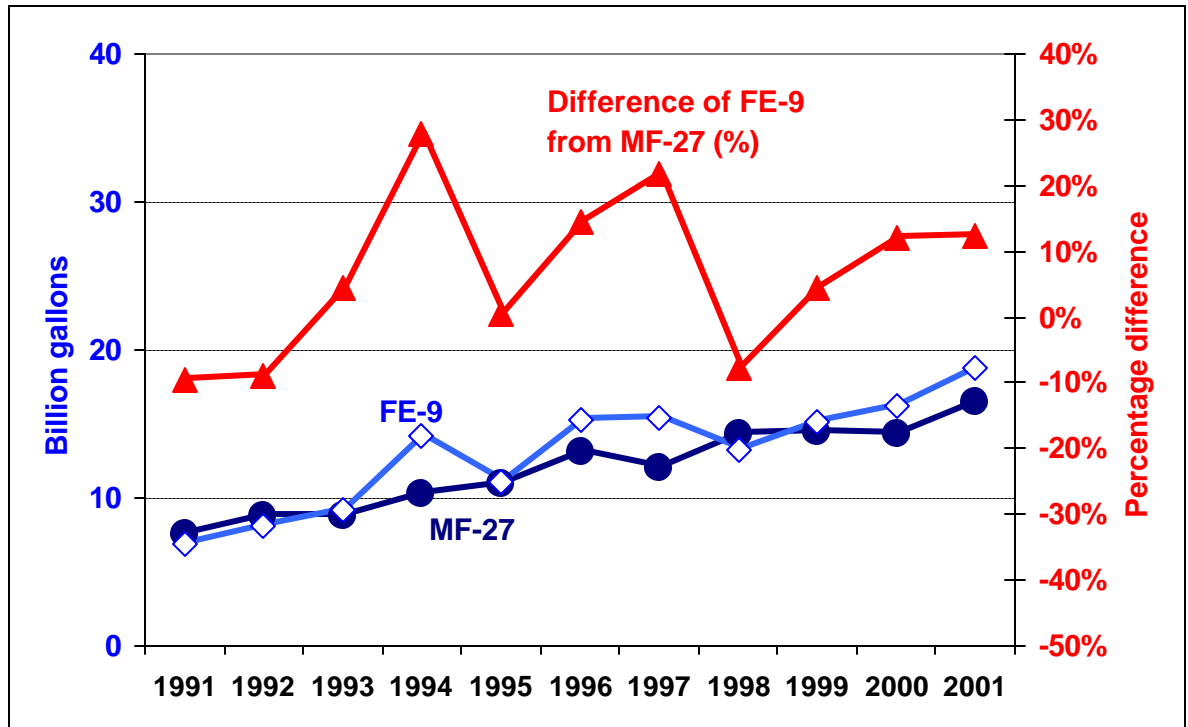


Figure 4. Comparison of MF-27 and FE-9 values for total gallons of gasohol by Highway Statistics year. Source: *Highway Statistics*, 1991-2001.

2.3.4 Total Fuel Usage (All Fuels)

Table 4 shows data on revenues and on-highway gallons from the *Highway Statistics* Tables FE-9 and MF-27, respectively, for the years 1991-2001 for total fuel use. The total fuel usage based on FE-9 revenues is calculated as the sum of those estimates for gasoline, special fuels, and gasohol as presented in Tables 1 through 3. Because gasoline is the dominant motor fuel for on-highway use (see Figure 1), it is no surprise that the discrepancies over the years shown in Table 4 follow closely with those shown in Table 1.

Table 4. Discrepancies between *Highway Statistics* Tables FE-9 and MF-27 for total motor fuel use, 1991-2001

FE-9 ^a (FY)	MF-27 (CY)	State totals from MF-27 (in thousand gallons)	State totals from FE-9 (in thousand dollars)	Estimated fuel use based on FE-9 (in thousand gallons)	Percent difference from MF-27
1991	1990	130,765,720	14,998,752	123,284,553	-5.72%
1992	1991	128,770,632	14,982,591	124,621,863	-3.22%
1993	1992	132,888,329	15,904,339	132,529,739	-0.27%
1994 ^b	1993	137,169,363	16,009,753 ^b	135,055,118	-1.54%
1995	1994	140,839,438	17,934,879	146,564,490	4.06%
1996	1995	143,833,889	21,499,800	150,739,372	4.80%
1997	1996	147,364,785	21,131,147	148,663,250	0.88%
1998	1997	150,528,047	29,280,000	156,401,660	3.90%
1999	1998	155,378,985	29,293,992	157,080,458	1.10%
2000	1999	161,411,373	30,288,334	162,313,847	0.56%
2001	2000	162,554,164	29,027,806	156,190,923	-3.91%

^a The data year being represented by Table FE-9 is the same as the *Highway Statistics* data year, except FE-9 is for the fiscal year; the data year for MF-27 is the calendar year previous to the *Highway Statistics* data year.

^b In the 1995 *Highway Statistics*, a note on Table FE-9 indicated that data were based on revised numbers as of January 1997. The data for FE-9 for 1994 have been adjusted to accommodate the revised numbers. Additional explanation is provided in Section 3.1.1.

Source: *Highway Statistics*, 1991-2001.

For an easy comparison, the percent differences by fuel type are summarized in Table 5.

Table 5. Summary of discrepancies, by year, by fuel type (percent difference)

Year ^a	Gasoline	Special fuels	Gasohol	Overall (total motor fuels)
1991	-6.01%	-3.23%	-8.80%	-5.72%
1992	-1.75%	-8.17%	-8.18%	-3.22%
1993	1.50%	-10.46%	4.60%	-0.27%
1994	-3.55%	-10.22%	38.50%	-1.54%
1995	2.79%	10.90%	0.61%	4.06%
1996	3.43%	4.17%	17.01%	4.80%
1997	-1.22%	-2.65%	27.78%	0.88%
1998	6.21%	0.77%	-7.13%	3.90%
1999	1.11%	-0.67%	4.70%	1.10%
2000	-1.14%	0.85%	13.60%	0.56%
2001	-5.16%	-8.52%	13.97%	-3.91%

^a "Year" is the *Highway Statistics* year.

As shown in Table 5, the greatest overall discrepancy (-5.72%) occurred in 1991. After that point, the overall discrepancies were smaller. As pointed out in previous sections, the measurements of gallons of gasoline were all within about 3.5%, except for 1991, 1994, 1998, and 2001. Special fuels (generally diesel) had a greater variation prior to 1997. For

the years 1997 through 2000, however, the measurements matched fairly closely. In 2001, there was again a large difference. The variations for gasohol were widely distributed, going from more than +38% to almost -9% differences from the amounts in Table MF-27. Although gasohol represents a small percentage (between 6% and 10%) of total fuel use each year, this instability suggests that its gallon usage estimates might have been inaccurately reported (by State) or calculated (by model). Consequently, the overall discrepancy rates are also slightly affected. In general, however, the percent differences overall are quite small. A graphical view of the differences between Tables MF-27 and FE-9 over time, for total fuel use, is shown in Figure 5.

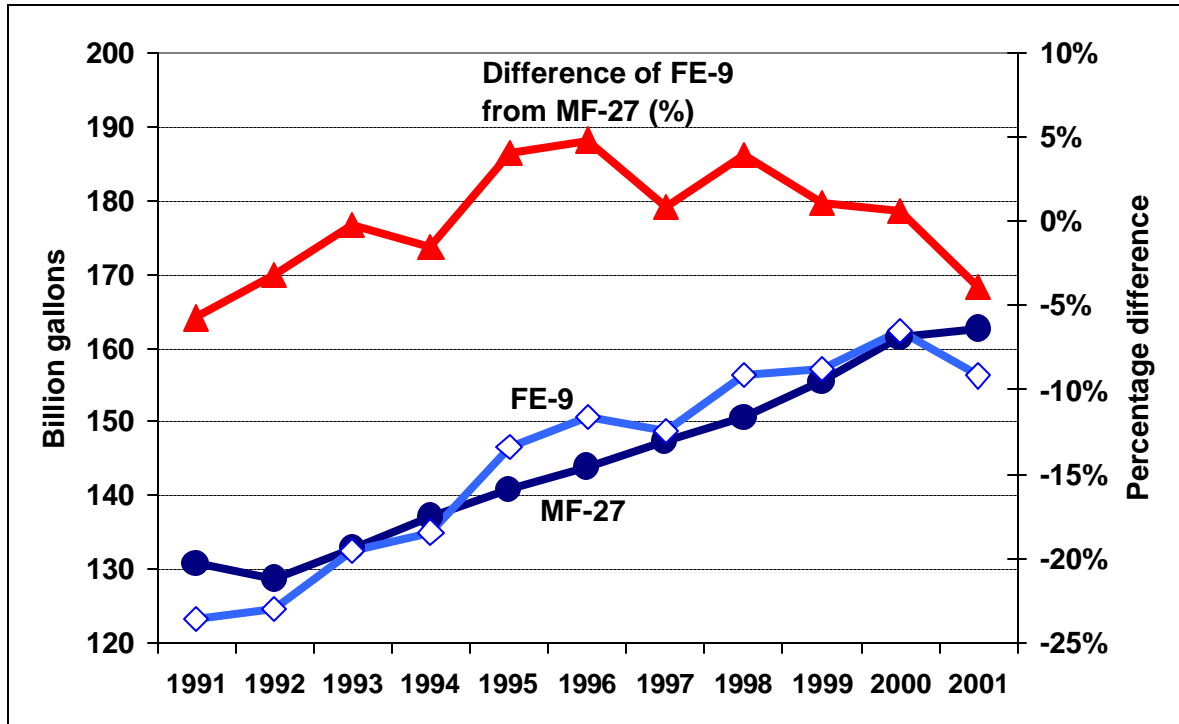


Figure 5. Comparison of MF-27 and FE-9 values for total fuel use by Highway Statistics year. Source: *Highway Statistics*, 1991-2001.

In Table 5, the discrepancy between MF-27 and FE-9 was sometimes positive and sometimes negative. Figures 6 and 7 show a cumulative total, from 1991 to 2001, of the differences for gasoline and diesel fuels, respectively. These charts show that differences tend to even out over time, especially for gasoline.

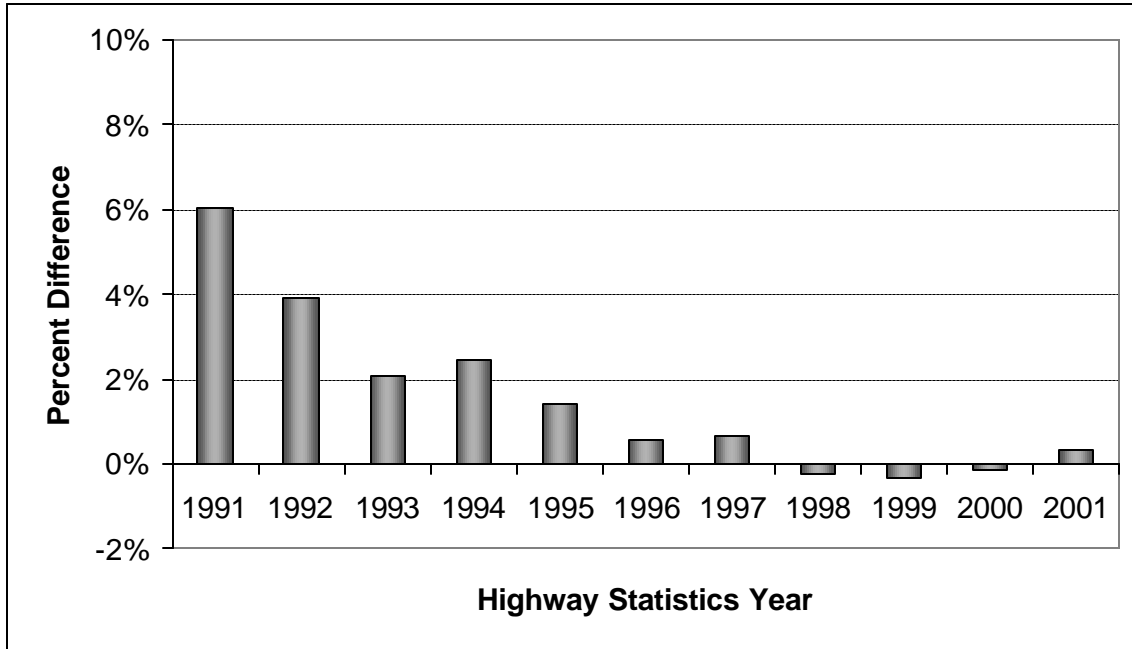


Figure 6. Cumulative differences over time (1991-2001) for gasoline

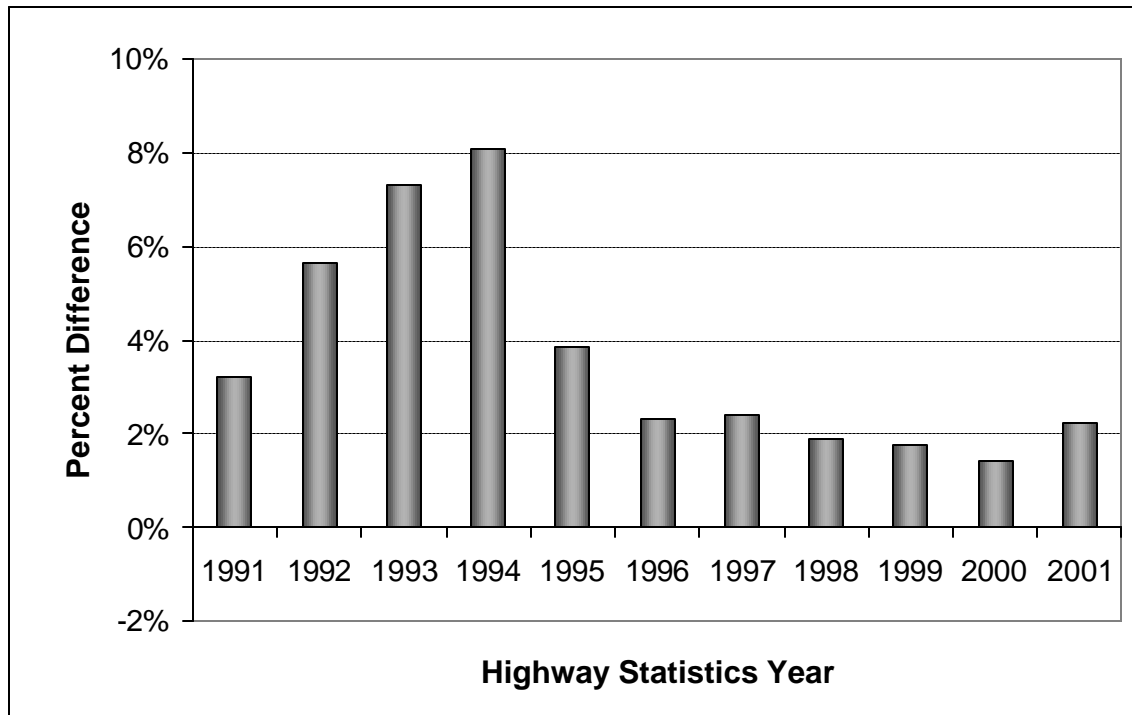


Figure 7. Cumulative differences over time (1991-2001) for special fuels

In the following sections, several issues that might have contributed to the discrepancies are examined. Potential explanations for the reasons of these discrepancies are then provided.

3. ISSUES AND POTENTIAL EXPLANATIONS

This section addresses various issues and potential explanations for the discrepancies noted in Section 2. Although issues are discussed individually, this separation of the issues does not suggest that there are independent or mutually exclusive reasons for any of the discrepancies identified. In fact, it is more likely that many of these discrepancies are caused by a combination of several issues. The issues are discussed in the following categories:

- Data issues,
- Tax measurement issues,
- Gallon measurement issues,
- Highway trust fund receipts and transfers,
- Timing issues.

Note that the sequencing of this list does not imply any particular order of importance for these issues.

3.1 DATA ISSUES

As noted in Section 1.1, the processes for remitting taxes and reporting fuel usage are complex. Even with continued efforts to improve the processes, errors sometimes occur and adjustments are then necessary.

3.1.1 Data Issues In 1994

The revenue data published in the 1994 *Highway Statistics* Table FE-9 were in fact different from those presented in Tables 1-4 of this report. For this comparison study, an adjustment on gasoline and special fuel revenues was made by Oak Ridge National Laboratory (ORNL) to correct an error in IRS-reported data. Prior to this adjustment, the percent difference between the estimated gallons derived from Table FE-9 and the reported gallons from Table MF-27 for gasoline was -17.52% and for special fuel was -22.8% in 1994. These large discrepancies were due to a \$1.59 billion error by IRS in the 1994 data. This error was found after the close of FY 1994 and was identified in a footnote on the 1994 *Highway Statistics* Tables FE-9 (revised July 1995) and FE-10. This footnote did not specify breakdowns of this \$1.59 billion by fuel type, however. ORNL contacted FHWA and was able to obtain information to adjust the 1994 revenue data. With this adjustment, the gasoline discrepancy went from -17.52% to -4.64% and special fuels went from -22.8% to 11.39%. Although the overall discrepancy for 1994 is small, the differences for gasoline and special fuels remain among the larger discrepancies even with the adjustments. One likely explanation for this larger discrepancy might have been a result of tax evasion problems. The tax evasion issue is addressed later in Section 3.2. The large discrepancy for gasohol (Table 3) is further discussed in Section 3.3.2.

3.1.2 Data Issues In 1998-1999

Table FE-9 is based on a fiscal year time period – i.e., October 1 through September 30 of the next year. At the end of FY 1998, as a result of Section 901(e) of the Taxpayer Relief Act of 1997, the oil companies were allowed to delay payment of taxes that were due in August and September until October 5, 1998.⁴ This delay caused a \$6 billion shift in revenue receipts during this time period. Revenue amounts published in Table FE-9 of 1998 and 1999 *Highway Statistics* have been adjusted by FHWA to reflect this shift. The discrepancy in gasoline usage estimated from FE-9 versus the total from MF-27 for 1998, however, is still about 6%. Additional explanations for this discrepancy are provided below.

3.1.3 Data Issues In 2001

In 1999 and 2000, the discrepancies between estimated gasoline and special fuels usages from FE-9 and MF-27 were quite negligible. In the most recent issue of *Highway Statistics*, however, the percent differences were again elevated. While the discrepancy in the gasohol measure is not surprising because the gasohol discrepancies have been fairly large for most years, the differences for gasoline (-5.16%) and special fuels (-8.52%) are unusual.

One possible explanation for the difference involves the events of September 11, 2001. After the collapse of the World Trade Center towers, travel decreased dramatically. The data collected for Table FE-9 covers the time period October 2000 through September 2001; the data for Table MF-27 covers the time period January 2000-December 2000. Although there is only a two-week time period following September 11 before the end of the final quarter of FY 2001, this short time period might have possibly caused a sharp decrease in tax revenue collections by the IRS. The State-reported motor fuel usage data, of course, covered the calendar year prior to the event.

3.1.4 Other Data Issues

During the data years covered in Tables 1-5, State-reported data were submitted in several formats – mailed in paper reports, facsimile paper reports, e-mailed reports, or computer disk reports in spreadsheet format. Although no evidence of data input errors has been identified, the chance of error is great when data must be re-typed. In addition, the models used by FHWA were not always integrated. Columns from one spreadsheet, for example, would need to be copied to a different spreadsheet. This type of manual data transfer could lead to error. In December 2001, States began using the web-based data entry tool. The new system should prevent data errors caused by re-keying data and should be a vast improvement for future State-submitted data.

In 1999, FHWA conducted a survey concerning State gasohol data. According to the survey, only about 23 States have reported reasonably good gasohol data, another 10 States do not use gasohol, and the remaining 18 States have unreliable data – they either did not report

⁴ *Highway Statistics 1998*, Table FE-10A, footnote 1.

gasohol use when it is known to exist or they reported an estimated number with a questionable accuracy.⁵

3.2 TAX MEASUREMENT ISSUES

To address the ongoing problem of fuel tax evasion, Congress first approved funding for the Joint Federal/State Motor Fuel Tax Compliance Project in FY 1990. The funding provided in the following FY by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) allowed nationwide expansion of the fuel tax evasion program.⁶ Prior to the ISTEA, evasion of the Federal tax was estimated to be between 3% and 7% of the gasoline gallons consumed and between 15% and 25% of diesel gallons. Changes to the Internal Revenue Code enacted as a result of provisions from the Omnibus Budget Reconciliation Act of 1993 that changed the point of taxation for diesel fuel to the terminal rack and required dyeing of diesel fuel if sold untaxed, made evasion of the Federal diesel fuel tax more difficult. The Taxpayer Relief Act of 1997 expanded the definition of taxable fuel to include kerosene and, as of July 1998, kerosene was to be treated the same as diesel fuel with regard to the point of taxation and dye requirements. This change closed another evasion loophole.

The Transportation Equity Act for the 21st Century (TEA-21) was enacted June 9, 1998, and amended on July 22, 1998. TEA-21 authorized \$35 million over the life of the legislation (six years) for the Highway Use Tax Evasion program. The main priority of the tax compliance program in TEA-21 was the development, operation, and maintenance of an automated fuel tracking system as an enforcement tool to be used by the IRS and States. The Excise Files Information Retrieval System (ExFIRS), under development by the IRS, was allotted priority funding with any remaining funds to be allotted to the States for fuel tax compliance programs. State tax compliance fund levels were significantly reduced and, as a result, many States' programs were reduced. Although changes under TEA-21 were significant to the State programs, particularly in the area of funding, the residual affects of the strong State and Federal programs under ISTEA that focused on examinations, audits, and investigative enforcement efforts likely explain a part of the smaller discrepancies for special fuels between 1998 and 2000.

3.2.1 Federal/State Tax Evasion

As explained in Section 1.1, Federal motor fuel excise tax liability occurs when the fuel moves out of the bulk transportation/storage network at the terminal rack. The owner of the fuel at this point is liable for the tax payment. Using taxpayer forms and revenue collections data, the IRS calculates Highway Trust Fund Certification of taxes. During the past 10 years, three major process improvements have brought about better compliance success. These

⁵ Federal Highway Administration, "The Buck Starts Here, Motor Fuel Attribution: FHWA Estimation of Highway Trust Fund Tax Receipts from Each State," presentation for Gasohol Workshop, February 2003.

⁶ Peters, Mary, "Statement of Mary E. Peters, Administrator, Federal Highway Administration, United States Department of Transportation, before the Committee on Finance, United States Senate Hearing on Schemes, Scams, and Cons: Fuel Tax Fraud," <http://finance.senate.gov/sitepages/2002HearingF.htm/hearing071702.htm>, July 11, 2003.

include (1) moving the point of taxation to the terminal rack, which eliminated significant tax evasion, (2) requiring tax-free diesel to be dyed red, and (3) taxing undyed kerosene on the same basis as regular diesel fuel with which it is mixed.⁷

Although these measures reduced tax evasion on the large scale (e.g., tax evasion on the multi-million dollar scale by criminal elements), tax evasion on a smaller scale has also been identified. It is legal, for example, for farmers to claim credits for excise taxes they paid on gasoline used on a farm for farming purposes; however, it is illegal for them to claim credits for undyed diesel fuel used in farming (i.e., individual tax payers cannot claim credits for undyed diesel fuel; only the “registered ultimate vendor” may claim credits/refunds for undyed diesel fuel used on a farm).⁸ If credits are claimed illegally, then FE-9 will not be accurate. Thus, the gallons from MF-27 and the gallons derived from FE-9 values will not match.

Two areas of possible fuel tax evasion at the current time involve imports of foreign finished petroleum products and jet fuel fraud. Tax avoidance on imported fuels results from a lack of coordination among multiple agencies responsible for tracking both exported and imported motor fuel. Jet fuel fraud results from the use of jet fuel, which is an undyed, high-grade kerosene that can be used in diesel engines, at a low-tax or tax-free price and then using it in diesel engines for on-highway transport. One study estimated potential revenue losses resulting from jet fuel diversion at over \$9 billion dollars for the period FY 2002 through FY 2011.⁹

While the purpose of the current study is to examine the discrepancy between Federal fuel taxes and State measurements of on-highway fuel usage, it is of some value to also look at State tax evasion behaviors. Some prominent means of evasion of State taxes include the following:

- Bootlegging across State lines. Purchasing fuel where tax rates are low and selling it where tax rates are higher and pocketing the “profit” occurs most often along the borders of States with high tax differentials. This practice is more successful in evading State than Federal taxes because the Federal excise tax is collected when the fuel is removed from licensed taxpayers (large wholesalers or the refinery). (Bootlegging can occur on the Federal level when barges tie up where fuel can be pumped directly into trucks, thereby bypassing the terminal rack.¹⁰)

⁷ Office of Public Affairs, “Statement of Andrew Lyon, Deputy Assistant Secretary for Tax Analysis United States Department of the Treasury Before the Committee on Finance United States Senate,” <http://www.treas.gov/press/releases/po3085.htm>, May 9, 2002.

⁸ “Opportunities Exist for Further Reducing Erroneous Fuel Tax Credits,” Final Audit Report from the Deputy Inspector General for Audit, Reference Number 2000-30-057, <http://www.treas.gov/tigta/reports/200030057fr.html>, March 2000.

⁹ Peters, Mary, “Statement of Mary E. Peters, Administrator, Federal Highway Administration, United States Department of Transportation, before the Committee on Finance, United States Senate Hearing on Schemes, Scams, and Cons: Fuel Tax Fraud,” <http://finance.senate.gov/sitepages/2002HearingF.htm/hearing071702.htm>, July 11, 2003.

¹⁰ Peters, Mary, July 11, 2003.

- “Watering down” alcohol blends. When tax exemptions are granted to special blends of fuel but the additive is expensive, the blender might tend to use less of the additive. For example, a blender might sell a fuel as gasohol claiming that it contains 10% alcohol and apply for the associated tax credit when the fuel actually contains less than 10%.
- “Daisy chain” documentation. A lengthy, confusing, and complex paper trail of tax documents makes it difficult for auditors to discover the evasion. This practice can actually evade both Federal and State fuel taxes, if successful. Changing the point of taxation to the terminal rack for the most part addressed this issue for diesel fuel. However, the same opportunity for evasion of taxes can still occur with jet fuel sales. Jet fuel can be purchased tax-free at the terminal rack by an “H” registrant and can be sold tax-free to other “H” registrants allowing the same scenario to develop as in the past with diesel fuel. (An “H” registrant is an importer or producer, including wholesale distributor, of aviation fuel. A person must register with the IRS as an “H” registrant.)
- Abuse of diesel tax laws. This practice involves abuse of the tax exempt usage laws.¹¹

These behaviors could result in reporting errors by States, in either measurement of tax revenues (Form 556) or motor fuel usage (Form 551M). If reporting errors occurred, then reconciliation of the two forms would be more difficult.

3.2.2 Differences In Federal/State Tax Logic

The following paragraphs provide possible areas in which tax law differences among the States might contribute to the discrepancy problem. Generally, although not always, State motor-fuel taxes are levied on all consumers, and refunds are given for exempted use. Problems arise because States differ in the exemptions and not all refunds are claimed. Therefore, the net volume of fuel taxed is not the same as the volume used on highways.

Specifically, gasoline and gasohol gallons used on-highway by public sectors [including State-County-Municipal (SCM) and Indian tribal government users] are eligible for a refund of the Federal tax. In 2001, this usage totaled over 2 billion gallons, most of which was for SCM consumption.¹² A potential for discrepancies exists in this area because some States are unable to report on gallons of fully refunded Federal tax for on-highway fuel usage. In addition, some States are unable to separate on-highway and off-highway public fuel usage. For example, most States exempt or refund taxes for all fuel used by the Federal agencies while some States tax Federal highway use of motor fuel. Also, most States exempt or refund SCM government non-highway uses of motor fuel while others provide exemptions or refunds for SCM government uses of motor fuel on highway.

In CY 2002, a change was implemented in the reporting of public use of diesel fuel. Prior to this time, Federal tax laws included private and commercial uses of on-highway diesel fuels

¹¹ Denison, Dwight V., Robert J. Eger III, and Merl M. Hackbart, “Cheating Our State Highways: Methods, Estimates and Policy Implications of Fuel Tax Evasion,” *Transportation Quarterly*, Vol. 54, No. 2, pp. 47-58, Spring 2000.

¹² *Highway Statistics 2001*, Table MF-21.

but excluded public usage; however, only about seven States could actually separate public use of diesel and report the usage correctly. The revised logic instructed States to include on-highway public use of diesel fuel in their reporting process. Currently, five States, which do not tax publicly used diesel motor fuel, do not have mechanisms for reporting on the public use of diesel.

Furthermore, some States contain Native American tribal lands. Federal tax on motor fuel purchased for tribal government uses is fully refunded. However, tribal members are not exempt from Federal motor fuel excise tax. Occasionally, motor fuel purchased for tribal government use is resold and, therefore, should be reported as taxable fuel used on-highway. Not all States and Native American representatives cooperate to document this usage; therefore, the total fuel usage may be incorrectly reported to FHWA. In addition, States are precluded from taxing Native American tribal members and enterprises on reservations except as specifically authorized by Federal law. Numerous cases have been taken to court only to have the decisions narrowly address the specific issue related to each case; therefore, there is no ruling applicable to all State motor fuel tax situations. It should be noted that petroleum usage and reporting on Native American lands is a complex issue involving differences in Federal laws, State laws, and enforcement processes.

In addition, a few State reports of motor fuel tax receipts need additional calculations to make them consistent with Federal needs. For example, a State might report gross tax receipts for a combination of fuels. Other special tax logic situations need to be considered for individual States. For example, a State might assess an environmental fee in its State tax rate but not report revenue from the fee in its annual submission of Form 556. If adjustments are not made to account for this fee, then the State-reported gallons from Form 556 will not match the sum of the gallons from the State's monthly submissions of Form 551M.

Finally, Form 556 is submitted annually based on the individual State's fiscal year, which may differ from the Federal fiscal year. FHWA reconciles the monthly usage report with the annual revenue report. FHWA must match the gallons reported monthly on Form 551 with the appropriate time period from Form 556. Although this seems to be a trivial issue, it is important because a State's tax rates could change during a year, which would impact the calculation of gallons used by that State.

If the only tax logic issue was that "Federal and State tax practices are not equal," then the difference could be accommodated fairly easily. The truth is, however, that there are as many tax codes as there are States. Thus, FHWA personnel must make adjustments for individual States; even with careful attention, these adjustments could be a cause of some discrepancy.

3.3 GALLON MEASUREMENT ISSUES

3.3.1 State Reporting Issues

Several possible areas of concern exist when attempting to ensure that the number of gallons of on-highway fuel used in each State is measured with the same standard for all States.

States report gallons to FHWA on Form 551M (a monthly report). Unfortunately, a State may fail to report some on-highway gallons (e.g., transit use), fail to adjust for non-highway use, incorrectly report motor-fuel losses, and be unable to separate gasohol by blend ratio. Different States experience different problems in reporting fuel use gallons.

FHWA directs States to report gallons of fuel used on highway. Because of the different methodologies used by States to collect data, States may or may not report fuel use the same way. Accurate measurement of motor fuel use, however, is very important because it is the basis for the FHWA attribution process. Although FHWA uses models to estimate missing data or revise erroneous data and applies professional judgment in interpreting State data, accuracy of the State-reported fuel use is critical.

If the State-reported fuel-use data is erroneous, for whatever reason, then there will be a discrepancy between the total gallons of *Highway Statistics* Table MF-27 and the derived gallons from Table FE-9. For example, IRS tax receipts are very responsive to economic conditions. If travel decreases, tax receipts decrease and Table FE-9 will reflect this situation. On the other hand, it is possible that a State's measure of the gallons of fuel used will not reveal this downward trend, at least not as quickly as happens with the IRS reporting mechanism.

3.3.2 Gasohol Issues

Estimation of gasohol consumption has several problems. Prior to 1993, gasohol was not defined as three blends, so only one tax rate was applied to gasohol use. When the Federal law was enacted to define three blends, it also defined a different tax rate for each blend. The tax logic of few States, however, can distinguish among the different blends. Most States consider only the 10% blend as gasohol. Thus, the gasohol usage reported by States must be adjusted by FHWA to account for each blend. The gasohol attribution process is as follows: States providing reasonably good gasohol data are allocated their share; States known to have no gasohol consumption are allocated zero gallons; gasohol consumption in all other States is estimated using a regression model. It is possible that the regression model used for the current gasohol consumption estimation is inadequate.

The current FHWA gasohol model was originally developed and used for the first time in the 1994 edition of *Highway Statistics*. Before that, only State-reported gasohol gallons were used, and no estimation was made by FHWA for non-reporting States. Thus, some States may have had zero usage recorded in prior editions of *Highway Statistics* Table MF-27 even when gasohol was used in the State.

The current model uses IRS tax revenue collected from gasohol to generate a control total for the total consumption. Prior to estimating the unreported State gasohol data, the gasohol model, however, does not subtract the non-HTF tax percentages (e.g., the LUST tax) from the tax rate before dividing the tax rate into the HTF tax revenue. (This process is explained in Section 2.2.) Therefore, the amount of gallons estimated by the model is expected to be underestimated.

Because of the vast percent discrepancies for gasohol (Table 3), the gasohol model is currently under review. The results of this gasohol analysis will be reported in a separate document.¹³

3.4 HIGHWAY TRUST FUND NON-TAX RECEIPTS

In addition to receipts of, and refunds and credits deducted from, motor fuel excise taxes and highway user fees, the annual HTF total also includes certain non-tax receipts. In FY 2001, approximately \$16 million was added to the HTF from fines and penalties paid by truck companies. Furthermore, about \$1 million was generated from interest under the Cash Management Improvement Act.¹⁴ These amounts, which totaled about \$17 million in FY 2001, were included in FE-9 and were treated as fuel tax during the revenue-to-gallon conversion process.

On the other hand, a small portion of the total HTF is transferred annually into other trust funds. In FY 2001, this included over \$244 million to the Aquatic Resources Trust Fund and almost \$1 million to the Land and Water Conservation Fund.¹⁵ These amounts, totaling about \$245 million in FY 2001, were removed from FE-9 and were not considered during the revenue-to-gallon conversions. Most of this transfer was generally made from funds generated by gasoline receipts because of its large share in the total HTF.

Combining the impacts from non-tax receipts and the transfers, the FE-9-based gallon estimates for gasoline could be slightly understated. For FY 2001, these non-fuel tax receipts accounted for approximately 1.2% of the total gasoline tax receipts.

3.5 TIMING ISSUES

As stated previously, in the calculation of the percent differences in this report, ORNL used the Federal tax rate that was in effect during the majority of the tax year. Because the tax rates may change at different times during the year, it is possible that this could have some impact on the analysis. Several other timing issues are briefly discussed below.

3.5.1 Delays In International Fuel Tax Agreement Data Reporting

The International Fuel Tax Agreement (IFTA) process is a fuel tax collection agreement among the 48 contiguous States and ten Canadian Provinces. IFTA provides a consistent reporting mechanism for interstate commercial motor carriers. Under IFTA, a motor carrier pays fuel taxes for all jurisdictions in which it operates to its base jurisdiction. Then the base jurisdictions settle among themselves the taxes owed to each, ensuring that taxes are paid to the jurisdiction in which the fuel was actually used. The IFTA process is based on a quarterly

¹³ Oak Ridge National Laboratory, "A Detailed Review of the Current Gasohol Consumption Estimation Model," DRAFT, March 2003.

¹⁴ *Highway Statistics 2001*, Table FE-10.

¹⁵ *Highway Statistics 2001*, Table FE-10.

reporting and collection schedule; this implies a delay in monthly reporting to FHWA. Nonetheless, in a survey of States concerning this delay, timeliness was not reported as a serious difficulty. Although delays in the IFTA process are not viewed as a problem by the States, these data delays are a reality because most States use the IFTA data to complete FHWA Form 551M.

3.5.2 Calendar Year Vs. Fiscal Year In Attribution Process

As mentioned earlier, there is a difference in timing for the data of the two tables being compared in this report. That is, MF-27 reports motor fuel usage for a calendar year, and FE-9 reports tax revenue for a fiscal year. The concern is that this timing difference may be a cause of some of the discrepancy.

An analysis was conducted using six years worth of monthly revenue data provided by FHWA, to investigate whether fiscal year tax dollars differed substantially from calendar year tax dollars. It was discovered that differences between calendar year and fiscal year data were not significant in most years. There were some cases, however, in which the differences were over 5%. This happened whenever the last quarter of a calendar year (October-December) contained unusually low or unusually high motor fuel tax receipts as compared to the previous year. The effect from the data anomaly would show in the *current* calendar year total, but in the *next* fiscal year total. This is expected to be a problem when comparing FY 2001 data and CY 2001 data, because the September 11, 2001, event resulted in significant travel reductions in the last calendar quarter of 2001.

3.5.3 Lag Times Between Federal Taxation And State Apportionments

Using FHWA Form 551M, States report monthly motor fuel consumption. The report is due no later than 90 days after the close of the month being reported. It takes over two years to obtain and analyze the States' data, run computer models to estimate incorrect or missing data, and allow the States time to review a draft summary report. For example, fuel usage for a State for CY 1997 was combined with Treasury information for fiscal year 1998 to provide apportionments to the State for FY 2000.

Thus, MF-27 data represents fuel usage of the year prior to the revenue data reported in FE-9. ORNL performed a comparison using data sets from the same year (see Appendix C). There was no clear indication that the results were better or worse than the current process.

3.5.4 Calculations Of Taxes When State Fuel Tax Rates Change

In addition to reporting monthly fuel consumption, States also submit an annual report to FHWA (Form 556), which records total highway tax receipts collected by the State. This form is based on each State's fiscal year, which varies State by State. For example, one State's fiscal year may be June-May, while another may be October-September, and another may be a different timeframe.

When FHWA compares the State data on monthly Forms 551 of fuel usage with the annual revenue reports from Form 556, they match the reports according to the months being reported. This process ensures that the correct number of gallons is computed based on the correct tax rate for each State. This is a manual process and has the potential for introducing error in the State's reported fuel usage. If errors occur, the discrepancies could be introduced in the calculation of MF-27 totals.

4. SUMMARY AND RECOMMENDATIONS

This study examined the differences in the total gallons represented by Tables MF-27 and FE-9 in the yearly series of *Highway Statistics*. Table MF-27, which represents the total U.S. motor fuel usage by fuel type, is based primarily on reports from individual States and values estimated by FHWA. Table FE-9, which is given in total dollars, is based on reports of tax revenues collected by IRS. The values from FE-9 were divided by the corresponding tax rate in order to convert to gallons; these values were then used in the comparison tables and figures of this report.

4.1 SUMMARY

This report documents the findings from an analysis of the discrepancy by fuel type between *Highway Statistics* Tables MF-27 and FE-9 for the years 1991-2001. Results presented in Tables 1-5 and Figures 2-5 indicate that the overall discrepancy is relatively small (within 5% difference since 1992). The amount of the discrepancy (as measured in percent), however, is not consistent from year to year. The study identified some potential explanations for the discrepancies. These include issues on data, tax measurement, gallon measurement, HTF non-tax receipts, and timing.

Several potential explanations for these discrepancies were identified, including issues on data, tax measurement, gallon measurement, HTF receipts, and timing. Data anomalies caused by outside forces, such as deferment of tax payments from one fiscal year to the next, can skew fuel tax data. Fuel tax evasion can lead to differences between actual fuel use and fuel taxes collected. Furthermore, differences in data collection and reporting among States can impact fuel use data. Refunds, credits, and transfers from the HTF can impact the total fuel tax receipt data. Timing issues, such as calendar year vs. fiscal year, can also cause some discrepancy between the two data sources.

The study found that several important events have improved the fuel reporting process. For example, after IFTA was implemented, the discrepancies in reporting of special fuels usage were smaller. Furthermore, it has long been recognized by FHWA that the quality of the State-reported data is critical to ensure that the attribution process is fair and equitable. Recently, FHWA has conducted several workshops and training sessions to encourage States to report more accurate data. In addition, FHWA is developing “smart” tools to assist the States to input their highway use data in an easier and more consistent way.

It should be noted that the special fuels category is primarily diesel fuel. Because other fuels are also included in this category and these fuels are taxed at different rates, the gallon estimate for special fuels is likely to be slightly understated.

In recent years, the consumption of gasohol has increased rapidly. Although gasohol remains a small percentage of the total fuel used in the United States (Figure 1), it nevertheless has

increased from 5.8% in 1991 to 10.3% in 2001. Therefore, accurate measurement of gasohol gallons is becoming more of an issue. The FHWA gasohol model was recently revised to better account for gasohol usage on Table MF-27.

4.2 RECOMMENDATIONS

As found from this study, gasohol has the widest range of differences. It is believed that the current gasohol model needs to be revised to better account for gasohol usage. It is also recommended that States attempt to revise their tax laws to follow the Federal guidelines for gasohol blends.

Throughout the attribution process, the States have several opportunities to review and correct their reported data. For example, when *Highway Statistics* is published each year, Tables MF-21, MF-33GA, and MF-33E provide information on motor fuel use for the reporting year. The States then have a final opportunity to review these gallons and submit changes, if needed, to FHWA. The revised gallons by fuel type are then published in Table MF-27 and used in the development of attributions as reported in Table FE-9 for the subsequent year. For gasoline and special fuels, the process is fairly straightforward. For gasohol, changes can be quite significant, and it is recommended that FHWA re-run the gasohol model with the revised data.

Another recommendation is for FHWA to include a streamlined integrated data processing system to help maintain data integrity and consistency. With this system, the data input from each State, via the new automated system (i.e., Smart Tool), would progress through quality checks as appropriate.

It is recommended that a survey be conducted to ascertain the procedures used by the States to determine their fuel usage. That is, it is possible that State methodologies for obtaining fuel use data are so diverse that the fuel totals among the States are not as comparable as desired.

Although IFTA has improved the reporting of the use of diesel fuel in the jurisdiction in which the fuel is actually used, the category of “special fuels” is problematic, however. It is recommended that diesel be reported separately from the other special fuels.

It is also recommended that FHWA include one additional step within the annual attribution process. This final check would be a data analysis similar to that described in this report to compare Tables MF-27 and FE-9. This data analysis process would be another tool to ensure best practices for the allocation of the HTF to the States.

The work of the Joint Federal/State Motor Fuel Tax Compliance Project to address the ongoing problem of motor fuel tax evasion will also help to ensure that the gallons used are recorded accurately, increasing the accuracy of Table FE-9. When the ExFIRS fuel tracking system becomes mature, it should be investigated as a source of data by fuel type and State.

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APPENDIX A
ACRONYMS AND ABBREVIATIONS

CY	Calendar Year
DOT	Department of Transportation
ExFIRS	Excise Files Information Retrieval System
FHWA	Federal Highway Administration
FY	Fiscal Year
GAO	General Accounting Office
HTF	Highway Trust Fund
IFTA	International Fuel Tax Agreement
IRS	Internal Revenue Service
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
LUST	Leaking Underground Storage Tank
ORNL	Oak Ridge National Laboratory
SCM	State-County-Municipal
TEA-21	Transportation Equity Act for the 21 st Century
U.S.	United States

**APPENDIX B
GASOHOL CALCULATIONS
BY PERCENT BLENDS**

The following tables explain the process for calculating gasohol fuel use. First, revenue data from Table FE-9 was divided into the three blends by using information obtained from IRS tax data. The percent share for each gasohol blend was calculated by dividing its tax liability by the total of all three blends (Table B.4).

It should be noted that the refunds and credits were removed before the calculations. Similar to gasoline and special fuels, tax rates for each gasohol blend were adjusted by removing the portion that went into non-HTF accounts. The gallons of each gasohol blend were then estimated by dividing the revenue share for that blend from FE-9 by the adjusted tax rate (Tables B.1-B.3).

Table B.1. Converting FE-9 revenue data to gallons for gasohol at 10% blend

Fiscal year	FE-9 total (in thousand dollars)	Percent share of total revenue	Fuel tax rate (cents/gal)	Fuel tax not used for highway fund (included in tax rate)		Estimated fuel use at 10% (in thousand gallons)
				LUST trust fund (cents/gal)	Deficit reduction (cents/gal)	
1991	\$378,174	100.00%	8.7	0.10	3.1	6,875,891
1992	\$446,171	100.00%	8.7	0.10	3.1	8,112,200
1993	\$548,047	74.59%	8.7	0.10	3.1	7,432,962
1994	\$850,848	72.82%	13.0	0.10	7.4	11,264,557
1995	\$679,833	64.30%	13.0	0.10	7.4	7,947,701
1996	\$896,712	73.38%	12.9	0.00	7.5	12,185,569
1997	\$862,219	87.54%	12.9	0.00	7.5	13,977,549
1998	\$1,327,385	87.57%	13.0	0.10	3.1	11,860,473
1999	\$1,505,495	90.59%	13.0	0.10	3.1	13,915,958
2000	\$1,608,814	93.51%	13.0	0.10	3.1	15,351,011
2001	\$2,037,108	78.12%	13.1	0.10	2.5	15,156,488

Table B.2. Converting FE-9 revenue data to gallons for gasohol at 7.7% blend

Fiscal year	FE-9 total (in thousand dollars)	Percent share of total revenue	Fuel tax rate (cents/gal)	Fuel tax not used for highway fund (included in tax rate)		Estimated fuel use at 7.7% (in thousand gallons)
				LUST trust fund (cents/gal)	Deficit reduction (cents/gal)	
1991	\$378,174	0.00%	8.7	0.1	3.1	0
1992	\$446,171	0.00%	8.7	0.1	3.1	0
1993	\$548,047	15.47%	9.942	0.1	2.5	1,155,033
1994	\$850,848	15.86%	14.242	0.1	6.8	1,838,259
1995	\$679,833	20.81%	14.242	0.1	6.8	1,926,590
1996	\$896,712	16.53%	14.142	0	6.9	2,047,194
1997	\$862,219	7.38%	14.142	0	6.9	878,778
1998	\$1,327,385	8.49%	14.242	0.1	2.5	968,570
1999	\$1,505,495	6.35%	14.242	0.1	2.5	821,779
2000	\$1,608,814	4.39%	14.242	0.1	2.5	606,905
2001	\$2,037,108	7.13%	14.319	0.1	2.5	1,239,365

Table B.3. Converting FE-9 revenue data to gallons for gasohol at 5.7% blend

Fiscal year	FE-9 total (in thousand dollars)	Percent share of total revenue	Fuel tax rate (cents/gal)	Fuel tax not used for highway fund (included in tax rate)		Estimated fuel use at 5.7% (in thousand gallons)
				LUST trust fund (cents/gal)	Deficit reduction (cents/gal)	
1991	\$378,174	0.00%	8.7	0.1	3.1	0
1992	\$446,171	0.00%	8.7	0.1	3.1	0
1993	\$548,047	9.93%	11.022	0.1	2.5	646,302
1994	\$850,848	11.32%	15.322	0.1	6.8	1,143,819
1995	\$679,833	14.89%	15.322	0.1	6.8	1,202,318
1996	\$896,712	10.09%	15.222	0	6.9	1,086,680
1997	\$862,219	5.08%	15.222	0	6.9	526,199
1998	\$1,327,385	3.94%	15.322	0.1	2.5	411,081
1999	\$1,505,495	3.06%	15.322	0.1	2.5	362,046
2000	\$1,608,814	2.10%	15.322	0.1	2.5	265,359
2001	\$2,037,108	14.75%	15.379	0.1	2.5	2,351,011

Table B.4. IRS tax liabilities data from FHWA

Fiscal year	10%		7.70%		5.70%		Total all blends excluding refunds & credits
	Tax liability based on IRS	Total refunds & credits	Tax liability based on IRS	Total refunds & credits	Tax liability based on IRS	Total refunds & credits	
1991	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1992	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1993	768,026	71,150	150,818	6,261	96,457	3,671	934,219
1994	904,420	72,758	187,932	6,760	131,747	2,434	1,142,147
1995	1,177,950	47,002	370,745	4,778	265,992	4,009	1,758,898
1996	1,117,610	18,469	250,175	2,529	152,648	1,590	1,497,845
1997	1,497,534	29,895	125,482	1,736	86,317	1,169	1,676,533
1998	1,486,480	44,721	143,097	3,227	65,417	546	1,646,500
1999	1,497,510	30,183	105,021	2,084	50,312	755	1,619,821
2000	1,743,698	39,092	81,072	1,013	38,601	349	1,822,916
2001	1,676,875	33,486	151,732	1,749	313,042	2,798	2,103,616

APPENDIX C
A COMPARISON OF PERCENT DIFFERENCES
BETWEEN MF-27 AND FE-9:
USING STATISTICS FROM THE SAME *HIGHWAY STATISTICS* VOLUME
VERSUS USING STATISTICS FROM THE SAME DATA YEAR

In Tables 1-5 of this report, all comparisons of MF-27 and FE-9 were made using the data obtained from the same *Highway Statistics* edition. The data in FE-9 is based on a fiscal year and the data in MF-27 is based on the previous calendar year. Thus, there is only one quarter of overlapping data. Therefore, it might be expected that if the same data year were used, the comparison results might be closer. Table C.1 provides results from this comparison. Note that data are not yet available for MF-27 for 2001 (to be published in 2002 *Highway Statistics*).

Table C.1. Comparing percent differences using different time frames for comparison

Highway Statistics year	Gasoline comparison, percent differences		Special fuels comparison, percent differences		Gasohol comparison, percent differences	
	Using same Highway Statistics year	Using same data year	Using same Highway Statistics year	Using same data year	Using same Highway Statistics year	Using same data year
1991	-6.01%	-3.46%	-3.23%	-0.44%	-8.80%	-22.17%
1992	-1.75%	-4.50%	-8.17%	-13.46%	-8.18%	-8.11%
1993	1.50%	0.28%	-10.46%	-16.51%	4.60%	-10.23%
1994	-3.55%	-4.74%	-10.22%	-16.13%	38.50%	29.40%
1995	2.79%	3.02%	10.90%	6.04%	0.61%	-15.40%
1996	3.43%	0.23%	4.17%	-0.56%	17.01%	27.25%
1997	-1.22%	-0.75%	-2.65%	-7.52%	27.78%	7.89%
1998	6.21%	2.96%	0.77%	-3.53%	-7.13%	-8.20%
1999	1.11%	-2.70%	-0.67%	-6.35%	4.70%	5.73%
2000	-1.14%	0.94%	0.85%	-3.22%	13.60%	-1.37%
2001	-5.16%	N/A	-8.52%	N/A	13.97%	N/A

As can be seen in Table C.1, results from the use of same data year in comparisons went both ways; sometimes the discrepancy is less and sometimes it is greater. Overall, there does not appear to be an advantage to using the same data year.

APPENDIX D: FEDERAL HIGHWAY-USER FEES 1/

OCTOBER 2002

TABLE FE-21B

USER FEE	TAX RATE	DISTRIBUTION OF TAX				
		EFFECTIVE DATE	HIGHWAY TRUST FUND		LUST TRUST FUND	GENERAL FUND
			HIGHWAY ACCOUNT	MASS TRANSIT ACCOUNT		
Fuel Taxes (Cents per Gallon)						
Gasoline	18.3	01/01/96	12	2	-	4.3
	18.4	10/01/97	15.44	2.86	0.1	-
Diesel and Kerosene fuel	24.3	01/01/96	18	2	-	4.3
	24.4	10/01/97	21.44	2.86	0.1	-
Special fuels 2/ 3/	18.3	01/01/96	12	2	-	4.3
Liquefied Petroleum Gas	13.6	10/01/97	11.47	2.13	-	-
Liquefied Natural Gas	11.9	10/01/97	10.04	1.86	-	-
Other Special Fuels	18.4	10/01/97	15.44	2.86	0.1	-
Neat alcohol (85% alcohol) 3/ 4/	9.25	10/01/97	7.72	1.43	0.1	-
Compressed natural gas 5/	4.3	10/01/93	-	-	-	4.3
	4.3	10/01/97	3.44	0.86	-	-
Gasohol 6/						
10 percent gasohol made with Ethanol	12.9	01/01/96	3.4	2	-	7.5
	13	10/01/97	6.94	2.86	0.1	3.1
	13.1	01/01/01	7.64	2.86	0.1	2.5
7.7 percent gasohol made with Ethanol	14.142	01/01/96	5.242	2	-	6.9
	14.242	10/01/97	8.782	2.86	0.1	2.5
	14.319	01/01/01	8.859	2.86	0.1	2.5
5.7 percent gasohol made with Ethanol	15.222	01/01/96	6.322	2	-	6.9
	15.322	10/01/97	9.862	2.86	0.1	2.5
	15.379	01/01/01	9.919	2.86	0.1	2.5
Other Taxes - All Proceeds to Highway Account						
Tires			0-40 pounds, no tax Over 40-70 pounds, 15 cents per pound in excess of 40 Over 70-90 pounds, \$4.50 plus 30 cents per pound in excess of 70			
Truck and trailer sales 7/			12 percent of retailer's sales price for tractors and trucks over 33,000 pounds gross vehicle weight (GVW) and trailers over 26,000 pounds GVW			
Heavy vehicle use			Annual tax: Trucks 55,000-75,000 pounds GVW, \$100 plus \$22 for each 1,000 pounds (or fraction thereof) in excess of 55,000 pounds; trucks over 75,000 pounds GVW, \$550			
<p>1/ Source: Office of Highway Policy Information, Federal Highway Administration.</p> <p>2/ Special fuels include benzol, benzene, naphtha, liquefied petroleum gas, casing head and natural gasoline, or other liquid used fuel in a motor vehicle except diesel, kerosene, gas oil, fuel oil, or a product taxable under the gasoline tax provisions. Prior to October 1, 1997, most special fuels were taxed at a single rate. Exceptions were LPG, which was not subject to the LUST tax, and neat alcohols, which are taxed at various rates depending on type and source of alcohol. Beginning October 1, 1997, LPG and LNG are taxed based on their energy content relative to gasoline. Other special fuels, with the exception of neat alcohols, are taxed at the basic special fuels rate.</p> <p>3/ Neat alcohol made with alcohol derived from petroleum products (M85) is taxed as a special fuel.</p> <p>4/ In 1996, only \$166,000 was collected by Internal Revenue Service for taxes on neat alcohol and some other miscellaneous sources. There is no accurate way to distribute miscellaneous taxes to specific funds or accounts.</p> <p>5/ Compressed natural gas is taxed 48.54 cents per thousand cubic feet (MCF), with the Mass Transit Account receiving 9.7 cents per MCF and the Highway Account receiving 38.83 cents per MCF. Roughly converting these amounts to cents per gallon results in the entries in the table above.</p> <p>6/ Section 1920 of the Energy Policy Act of 1992 expanded the definition of gasohol effective January 1, 1993. Prior to the Act, gasohol was defined as a blend of gasoline and at least 10 percent fuel alcohol (by volume), and blends containing less than 10 percent alcohol were taxed as gasoline. Under the Act, the product now called 10 percent gasohol corresponds to the old definition. Two additional types of gasohol are also defined. The term 7.7 percent gasohol includes gasoline-alcohol blends where the alcohol content is at least 7.7 percent but less than 10 percent. The term 5.7 percent gasohol includes gasoline-alcohol blends where the alcohol content is at least 5.7 percent but less than 7.7 percent.</p> <p>7/ Section 1401 of the Taxpayer Relief Act of 1997 replaced a mechanism by which the fair market value of tires exceeding 40 pounds was deducted from the fair market value of a truck and replaced it with a credit for the excise tax paid. This provision was effective January 1, 1998.</p>						

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