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Financial Evaluation Of Milege Based User Fees For Florida's Transportation Funding

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FINANCIAL EVALUATION OF MILEAGE BASED USER FEES FOR FLORIDA'S TRANSPORTATION FUNDING

by

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A dissertation submitted in partial fulfillment of the requirements
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ABSTRACT

Motor fuel taxes have been collected as a principal source of highway funding for close to a century. They account for approximately two thirds of all the highway user fees and about half of all highway expenditures. Federal fuel taxes have not kept pace with the inflation in general and increasing traffic demand and resulting construction, maintenance and operation costs of the transportation assets in particular.

Lack of political will, combined with rising anti-tax sentiment among the populace, has kept the federal tax level not only well below its initial intents, but also at a unsustainable level in future.

Mileage based user fees are possibly an alternative to the fuel taxes, which have been the main mechanism for funding the transportation system.

Mileage based user fees have been successfully utilized in many parts of the world with glowing results. Germany’s “TollCollect”, a quasi government enterprise has utilized GPS technology in collecting the users’ fee from the truck operators. The system has been a financial engine providing much needed funding for many major transportation projects.

Oregon Department of Transportation, in a federally co-funded pilot project, examined the practicality of the mileage based user fee collection at the fuel pumps. According to the Oregon study, there are not any major technical difficulties in mileage based user fee collection at the pump. Study participants (general motorist) did not express any objection to the mileage based user fee collection.

This dissertation evaluates revenue impacts of several pricing policies including: Current per gallon fuel taxes, conversion to a mileage based user fee, time of day user fee application, area type user fee and congestion priced user fees. State of Florida's years 2015-2035 fuel revenue forecast is used as a case study.

A model is constructed to estimate annual vehicle miles travelled for the analyses period. Fuel efficiencies, current per gallon fuel taxes and their corresponding mileage-based user fee equivalents are the input to a financial model developed for comparisons.

Results demonstrate that decrease in fuel revenues due to vehicles fuel efficiency improvements can be offset by replacing current per gallon fuel taxes with a mileage-based user fee.

Pricing the user fee according to area type, roadway classification, time of day and congestion level can not only generate more revenues but also assist in demand management.

This dissertation and the doctoral degree are dedicated to

Amoo Bahram (my uncle) and his twin brother Baba Bozorg (my father).

May both rest in peace.

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LIST OF ACRONYMS/ABBREVIATIONS

AASHTO	American Association of State Highway Transportation Officials
ACF	Autocorrelation Factor
AIC	Akaike Information Criterion
AR	Autocorrelation Regression
ARIMA	Autoregressive Integrated Moving Average
ASFINAG	National Road Authority Owned by the Federal Republic of Austria
ATMBUF	Area Type Mileage Based User Fee
AVI	Automatic Vehicle Identification
BEBR	Bureau of Economic and Business Research
CBD	Central Business District
CAFE	Corporate Average Fuel Economy
CALTRANS	California Department of Transportation
CPI	Consumer Price Index
CPMBUF	Congestion Pricing Mileage Based User Fees
DMV	Department of Motor Vehicles
DOT	Department of Transportation
DSL	Digital Subscriber Line
DSRC	Dedicated Short Range Communication
EIA	Energy Information Administration
EPA	Environmental Protection Agency
EPCA	Energy Policy and Conservation Act
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FY	Fiscal Year
GIS	Geographical Information Systems
GPS	Global Positioning System
HOT	High Occupancy Toll
HTF	Highway Trust Fund
I-	Interstate
ITS	Intelligent Transportation Systems
LT	Light Truck
MA	Moving Average
MBUF	Mileage Based User Fee
MBUFE	Mileage Based User Fee Equivalence
MPG	Miles Per Gallon
MPO	Metropolitan Planning Organization

NCHRP	National Cooperative Highway Research Program
NEMS	National Energy Modeling System
NHTS	National Household Travel Survey
NHTSA	National Highway Traffic Safety Administration
OBU	On Board Units
OPP	Oregon’s Pilot Project
PACF	Partial Autocorrelation Factors
PDV	Present Day Value
PMT	Person Miles Traveled
PSRC	Puget Sound Regional Council
RUFTF	Road User Fee Task Force
SCETS	State Comprehensive Enhanced Transportation System
SHS	State Highway System
SR	State Road
STARIMA	Space Time Auto Regressive Integrated Moving Averages
TAZ	Traffic Analysis Zone
TDM	Travel Demand Model
TIP	Transportation Improvement Plan
ToDMBUF	Time of Day Mileage Based User Fee
TPG	Tax Per Gallon
TRB	Transportation Research Board
TTI	Texas Transportation Institute
UGB	Urban Growth Boundary
US	United States
USDOL	United States Department of Labor
USDOT	United States Department of Transportation
VAR	Vector Auto Regressive
VAT	Value Added Taxes
VFC	Vehicle Fuel Consumption
VMT	Vehicle Miles Traveled
WSDOT	Washington Department of Transportation

1 INTRODUCTION

1.1 Overview

For nearly a century, motor-vehicle fuel taxes have been the significant portion of the funds utilized in financing construction, maintenance and operation of the US highways.

In the nineteenth century, before the introduction of motorized transportation, most inter-city roads were toll roads. These roads were often developed and operated by private entities under state charters (Poole and Moore, 2010). In the early twentieth century, the utilization of the automobile led to a demand for paved roads. The state of Oregon faced with this public demand, enacted and began collecting a tax on motor fuel to finance construction of paved roads for motorized vehicles in 1919. A decade later, the remaining states and the District of Columbia all passed legislation and began collecting fuel taxes. In 1932, the federal gasoline tax, implemented on a temporary basis initially, was made permanent with the Revenue Act of 1941 (Goodin et al., 2008). Since that time the fuel taxes have accounted for the majority of US transportation funding. These taxes have been intended as means to charge the road users for the cost of the system (Sorensen et al., 2010). The fuel taxes are charged on a cents per gallon basis and need to be regularly increased to offset the effects of inflation.

In 1956, the US Congress established the Highway Trust Fund (HTF) to administer and allocate highway users excise taxes to fund a host of national surface transportation improvement and expansion programs. In 1983, the HTF was divided into two separate but specifically allocated accounts, namely; the highway account and the mass transit account. The highway account, administered by the Federal Highway Administration (FHWA) within the US

Department of Transportation (USDOT), channels the funds to state Department of Transportation (DOT) s for highways and related spending (GAO, 2009).

The balance of the HTF has been gradually declining in recent years to a point that in 2008, it required an eight billion dollar transfer from the general revenue fund to remain solvent (GAO, 2009).

The cumulative funding gap (the difference of federal investment needed to improve the roadway system and HTF revenues) for 2010 to 2015 and 2010 to2035 are estimated to be $400 Billion and $2.3 Trillion respectively (Atkinson and Schultz, 2009).

The current and continued increase of the HTF disparity is due to four major phenomena:

1. Higher fuel economy standards: vehicles today are much more fuel efficient than in the past. In 1975, as a reaction to the Arabs oil embargo of 1973, the U.S. Congress passed the Energy Policy and Conservation Act (EPCA). The 1975 act also established the Corporate Average Fuel Economy (CAFE) standards. These standards control and mandate the fuel efficiency of automobiles and light trucks sold in the United States. As a result of the CAFE standards, average fleet fuel efficiency of 14.4 miles per gallon in 1980, increased to 20.2 by 2010. The CAFE standards require an increase of the fuel efficiency to 35.5 miles per gallon by 2016 (Portney and Morrison, 2002). Obama’s administration has set a goal of 54.5 miles per gallon by the year 2025 (Reichert, 2011). The 2010 average fuel efficiency standard is currently 27.5 miles per gallon. Due to the direct reverse linear relationship between fuel efficiency and fuel taxes, one can presume a significant reduction in federal fuel tax over the next 15 years due to improved (doubling of the) fuel efficiency standards.

2. Introduction and increased market share of the alternative fuel vehicles: Alternative fuel is generally referred to as fuel sources other than petroleum. The Energy Policy Act (EPAC) of 1992 , defines: Biodiesel, Natural gas, Liquid fuels from natural gas, Propane, Electricity, Hydrogen, Methanol (85% or more), and P-Series fuels as alternative fuels (AFDC, 2011). The alternative fuel vehicles with limited or no gasoline consumption still affect the traffic congestion, roadway safety, and, wear and tear to the transportation infrastructure just like their petroleum burning counterparts. Since 1995 (the first year of complete data availability) to 2008, a recorded 18.3 fold increase in alternative fuel consumption has been reported (AFDC, 2011). With the subsequent passage of the EPAC of 2005, providing tax incentives that promote alternative fuels and advanced vehicles production and use, a bigger share of the U. S. fleet would consume alternative fuels in coming years. The alternative fuel vehicles contribute very little, if any, to the local, state or federal gas tax accounts.
3. Decreased purchasing power of the gas tax: The federal gas tax has been set at 18.4 cents per gallon since 1993. During the last two decades, Consumer Price Index (CPI), inflation, and cost of construction, maintenance and operation of the transportation systems have (on average) more than doubled. Based on inflation, the purchasing power of the federal motor fuel tax has declined to 33% of the value of the 1993 level, and is anticipated to further erode another 20% by 2015 without a tax increase (Reichert, 2011).
4. Aging transportation infrastructure: According to the American Society of Civil Engineers, while bridges are built to last fifty years, average bridge age in the U.S. is forty three years (ASCE, 2009). As of December 2008, 12.1% and 14.8% of bridges nation-

wide were categorized as “structurally deficient” and “functionally obsolete” respectively. According to the Florida Department of Transportation (FDOT, 2006), “a highway bridge is classified as structurally deficient if the deck, superstructure, substructure, or culvert is rated in "poor" condition (0 to 4 on a 10 point scale by the National Bridge Inspection rating scale). A bridge can also be classified as structurally deficient if its load carrying capacity is significantly below current design standards or if a waterway below frequently overtops the bridge during floods. Highway bridges classified as functionally obsolete are not structurally deficient, but their design is outdated. They may have lower load carrying capacity, narrower shoulders or less clearance underneath than bridges built to the current standards”. The American Association of State Highway Transportation Officials (AASHTO) estimated an average annual expenditure of $17 billion in 2006 dollars for the next fifty years to eliminate all existing bridge deficiencies. Poor roadway conditions lead to an increase in crash rates, excessive wear and tear on vehicles and may contribute to the level of congestion. A recent survey reports a decline of roadway condition (“Ride Quality”), with the lowest acceptable ride quality found among urbanized roads at 72.4% (ASCE, 2009). Compounding the problem is the steady increase of traffic demand. From 1980 to 2007, while the auto and truck VMT’s increased nearly 100%, highway lane miles only increased by 3.6%. A study by the National Surface Transportation Policy and Revenue Commission estimated that for a 15 year period, a capital investment range of $130 billion to $240 billion, in 2006 dollars, was needed to maintain key condition and performance measures of our national highway system.

1.2 Motivation

Given the concerns over the future highway funding and issues associated with the current “cents per gallon” fuel tax regime and its unsustainability, a new Mileage Based User Fee (MBUF), based on the Vehicle Miles Traveled (VMT) needs to be explored. Per mile fees are to be paid by all roadway users, regardless of fuel type or fuel efficiency. These per mile user fees can be adjusted in accordance to congestion levels, time of day, vehicle class or weight, type of facility, region (Central Business District, Urban, Transitioning, and Rural) and can be indexed to increase by a prescribed measure such as inflation, CPI, …etc.

The topic of MBUF has been discussed, analyzed and researched by transportation planners, policy makers and academia, extensively. The Transportation Research Board(TRB)/ The National Cooperative Highway Research Program (NCHRP), The Texas Transportation Institute (TTI) and University of Iowa, just to name a few, have established task forces, and working groups dedicated to this topic. Pilot projects in Oregon, Washington and nationally have examined various operations, institutional and implementation challenges associated with this strategy thoroughly. Very limited work on examination of the financial viability for the VMT as a replacement to the existing federal fuel tax have been performed or documented.

The specific emphasis of this dissertation is to examine the financial viability of a MBUF system based on a variety of policy driven objectives and charging scenarios such as: Current federal fuel tax, MBUF, and Variable MBUF’s based on: Facility type, Time of day, Area type and Varying fleet fuel economy standards.

Estimate/forecast of the annual VMT is the most essential parameter that will be utilized when conducting any financial analyses and revenue calculations of an MBUF system. VMT is most commonly forecasted through use of the traditional four step transportation demand forecasting models. A gradual shift in use of regression models based on socioeconomic data has occurred and is gaining popularity in VMT forecasting. Utilization of aggregate uni-variant time series models has been extremely limited for forecasting VMT.

This dissertation is to utilize an aggregate uni-variant time series model to forecast the future VMT based on the established trend and the behavior of available past time series data.

1.3 Objectives

The primary goal of this dissertation is to assess the financial viability of the MBUF as a substitute to the current cents per gallon taxing regime. The State of Florida’s fuel tax is used as the baseline for examining the financial impacts of the various pricing policies and scenarios.

The dissertation objectives include:

- Perform a literature review to identify various methodologies in forecasting the VMT and also learn about past technical research, pilot projects and actual implementation of mileage based user fee projects
- Document all previous literature on the concept of using MBUF for generating revenue to fund highway systems as stated on the previous page.
- Collect relevant data to build a uni-variant time series model to forecast the future VMT for the study period (2015 to 2035).
- Utilize the VMT forecasts to examine financial viability of mileage based road user fee charging for the State of Florida.

- Build a financial model that can examine revenue impacts of several charging policies and scenarios such as: Existing per gallon fuel taxes (based on existing fleet fuel efficiency and proposed CAFE standards), MBUF, Congestion Pricing, Variable MBUF based on area (Urban vs. Rural) and facility type (freeways vs. others)
- Document the results, including a discussion of the issues, challenges and benefits of implementation

1.4 Organization of the Dissertation

Chapter one (Introduction), presents an overview of the issue or statement of the problem, followed by the motivation for this dissertation. The next section of the introduction chapter presents the objectives of the dissertation followed by this brief elaboration on organization of the dissertation.

Chapter two (Literature Review) documents a summary of the previous work and discusses its relevance to this dissertation.

Chapter three (Methodology) elaborates on the methodology that will be utilized in the data analyses, VMT forecast and financial analyses.

Chapter four (Time Series Analyses and Forecasting) presents the results of data collection, data analyses, Time Series modeling, statistical testing and annual VMT forecasts for the years 2015 through 2035 for the State of Florida.

Chapter five reports on: Assumptions, criteria and financial performance of selected pricing policies.

Chapter six (Conclusion, Summary. and Future Research), provides an evaluation and discussion of the results achieved.

2 LITERATURE REVIEW

2.1 General

This chapter reviews previous studies conducted on the topics of mileage based user fee and/or vehicle miles travelled, since these two terms are often used interchangeably.

The purpose of this literature review is to gain a thorough insight into past research work and projects. It also serves as an assessment of the methodologies utilized in analyses and examination of the VMT modeling and forecasting.

The findings are presented in five sections, namely:

- VMT Calculations and Forecasting,
- US Pilot Projects,
- European Implemented VMT Systems,
- Previous VMT Related Studies,
- Literature Review Summary and Conclusions.

2.2 VMT Calculations and Formatting

VMT refers to total miles traveled by vehicle on a roadway network. It is simply the product of the number of vehicles and length of a roadway section. It can be expressed in terms of roadway function and classification, such as major highways, secondary roads, arterials or collectors. For emission (air quality) analyses, VMT may be expressed in vehicle types with varying fuel efficiencies or weights. For funding allocation purposes, it may be expressed in terms of jurisdictional entities such as the federal, state, county and/or city roads. VMT can also be categorized in a spatial dimension such as rural, urban and Central Business District (CBD).

VMT estimates and forecasts are widely used by environmental and transportation engineers and planners in estimating vehicular emission, energy consumption and pavement performance, assessing traffic impacts and allocating highway funds (Kumapley and Fricker, 1996). Even though there are many approaches in calculating VMT, the forecasting methodology is less varied and can be distinctly categorized into; Utilization of Fuel Consumption Data and Application of the traditional Travel Demand Models (TDM).

2.2.1 Utilization of Fuel Consumption Data:

VMT estimates based on fuel sales have been utilized since 1957. FHWA received VMT estimates based on gallons of fuel sales in the 1970's (Erlbaum, 1989). These estimates were generally based on the cash receipts for retail sales of gasoline and diesel. The fleet fuel efficiency (miles per gallon) and price per gallon were applied to calculate the VMT.

The most recent utilization of the fuel consumption data in forecasting energy related parameters including VMT, primarily at a national level, is the National Energy Modeling System (NEMS). NEMS is used by the Energy Information Administration (EIA) to assess the energy, environmental, economic and security implications of various energy policies and markets (EIA, 2009). The forecasts are typically made for a twenty five year horizon. NEMS consists of four main modules: Macroeconomic activity, petroleum, natural gas and electricity. The transportation demand module, through interaction with the four main modules, forecasts the transportation sector fuel consumption. VMT sub-module resides within the transportation demand module and projects travel demand for automobiles and light trucks. VMT sub-module results are expressed in VMT per capita and, are based on the fuel cost of driving per mile and per capita disposable income. Total VMT is a product of the VMT per capita and number of licensed drivers. A separate freight transport sub-module produces VMT freight estimates by truck size class and technology (EIA, 2010).

Because of NEMS complexity and high cost of proprietary software, it is not used widely outside of the Department of Energy. NEMS, or a portion of it, is installed at various public institutions and laboratories.

NEMS generated forecasts are used by transportation authorities, transportation engineers and planners, economists, academia, and policy makers for various purposes. The California Department of Transportation (CALTRANS) utilizes some of the NEMS output in forecast of VMT, Vehicle Fuel Consumption (VFC), registered vehicles and vehicle fuel economy on a statewide basis.

Similar to the VMT sub-module of the NEMS, a recent report (CALTRANS, 2007) also stated that, the socioeconomic factors that affect VMT include population, per capita personal income, vehicles per person and the cost of fuel per mile of travel. The report predicted that current (2007) automobile VMT of 250 billion miles will increase to approximately 400 billion miles in 2030. A similar growth rate for trucks VMT was anticipated.

In forecasting Oregon state tax revenues, the Cambridge Systematic Team (Cambridge et al., 2000) utilized a fuel consumption based approach. The total VMT was broken into three categories: Light, medium and heavy vehicles. For the first two classes, Cambridge used fuel refund claims records, fuel consumption data, and miles per gallon estimates to calculate VMT.

For the third class of vehicles, VMT was estimated using actual reported mileage from weight-mile records and adjustment factors.

For more than 20 years, Washington Department of Transportation has used the quarterly forecast of the net fuel gallons and multiplied it by a forecast of fleet efficiency, in terms of miles per gallon, to estimate the statewide VMT (WSDOT, 2010).

In September 2009, a technical committee was formed by the WSDOT to review the old VMT forecast and develop a revised statewide VMT forecast. In reviewing the old fuel consumption based model, it was revealed that, for the period 1991 to 1998, the model was accurate (3% error) only 27% of the time, while the majority of the time, it had an error of 6% or more.

Beginning in 2010, WSDOT started utilizing the newly developed model. The new model is a log-log functional form, which includes the log of the following independent variables: Employment, Motor Vehicle Registration, and Gas Prices. The technical committee concluded that there were advantages to project VMT based on the relationship of the historical VMT to the historical data of other economic indicators. The group also discussed exclusion of the gas price as an independent variable due to the difficulties in forecasting fuel prices. Even though when the model was run with and without the gas price variable, it did not result in a significant change in the overall VMT forecasts, the gas price variable was included in the final model.

An Indiana study (Kumapley and Fricker, 1996) examined various methodologies for forecasting VMT. The study revealed the potential errors associated with utilization of the fuel sales in VMT forecasting. The accuracy of retail fuel sales and fleet fuel efficiency data were cited as areas of concern. It was argued that the fleet efficiency varied by location due to the following factors: Fleet mix age, topography and weather, local driving patterns, state of vehicle maintenance, acceleration, evaporation and spillage losses of fuel during sales and while in motion.

2.2.2 Application of the traditional Travel Demand Models (TDM)

The “four step travel demand model/process” , chronologically; Trip generation, trip distribution, modal split and route assignment is the benchmark for travel forecasting in regional transportation planning. Most Metropolitan Planning Organizations (MPOs) have a travel model that is specifically developed for their region. The Traffic Analysis Zones (TAZs), basis for the regional travel model is the segregation the jurisdictional area into smaller area/zones. The roadway network is the transportation facilities connecting these zones (TAZs). The network is constructed with the time and cost of travel for each mode of transportation and connecting zones in pairs. Inputs include socioeconomic parameters such as: employment, population and land use. The future roadway network, socioeconomic forecasts and estimated travel time are also among the input data for a TDM. Trip time data and mathematical models are then applied to forecast the number of trips generated in each zone, the distribution of these trips (origin and destination zones), modal splits, and the links for trips (Horowitz, 2006).

These models are typically used in preparing long-range Transportation Improvement Plan (TIP). Statewide TDMs are developed to forecast all travel in the state. Some statewide models predict travel by people and goods, while most predict vehicular travel by modes (private cars and transit). The statewide models go beyond MPO models by including intercity and regional trips (Liu et al., 2006).

The roadway network coded in the statewide TDM generally includes the higher functional classification roadways. Adjustments to TDM generated VMT to account for the local and residential streets are often required. Additional adjustments to address "donut areas" may be warranted as well (Grant, 2004). He defines the "donut area" as a geographic area that may not be included in a TDM area boundary.

Recent implementations and innovations in statewide TDM were reviewed and documented as part of the National Cooperative Highway Research Program (NCHRP) project 08-36, task 76c.

One of the study's findings was that there were major deficiencies in the data about long-distance passenger travel and rural passenger travel (Horowitz, 2008).

A spreadsheet tool to explore long-range scenario-based estimates of VMT in Florida through year 2050 was developed by Polzin and Chu (2009). The authors acknowledged the availability and richness of the travel behavior data, but expressed uncertainty about human behavior and natural phenomena that may influence the ultimate demand for travel. They argued that factors such as: Economic conditions, energy production, immigration policies, health care condition and longevity, electronic communication, transportation technologies and propulsion technology breakthroughs may influence the ultimate level of travel 30 to 50 years in the future. Given these uncertainties, they utilized a scenario based tool that can examine the sensitivity of the long range forecast based on a varying range of fundamental conditions that influence travel behavior.

Their model can produce both Person Miles Travel (PMT) and VMT regional level estimates for any given year through 2050.

While there are default values for key demographic parameters such as: Population growth, aging of population, population density and change in travel due to: Personal income, vehicle efficiency, fuel cost and travel speed changes (congestion), the analysts may opt to design their own scenario as well.

In an accompanying document, Polzin (2009) provided a step by step tutorial in the spreadsheet use and data entry.

This scenario- based VMT forecasting spreadsheet is a useful tool for conducting alternative analyses for the sake of the comparison. Its output (VMT or PMT) to be used quantitatively as a single source or measure, without a careful and accurate selection of the input values may be problematic. Given this possibility, the model designers have gone through an exhaustive effort to provide reasonable and defendable default options.

2.3 U.S. Pilot Programs

2.3.1 Oregon's Pilot Project (OPP)

Authorized by the Oregon Legislative Assembly on July 2001, a 12- member Road User Fee Task Force (RUFTF) was charged to design a new fee collection option that could replace the gas tax with a stable source of funding, for the long term (Whitty, 2007).

The designed pilot program tested two types of experimental fees: One flat VMT fee equal to the state gas tax and another VMT fee that fluctuated based on the location and time of the travel. The variable VMT rate imposed a higher fee for driving in the Portland metropolitan area during designated times of the day. From the policy point of view, Oregon's variable VMT, is a form of static congestion pricing.

The RUFTF recruited 207 participants through press releases, radio and print advertising and an information website. The pilot program ran for a ten month period.

All the vehicles were equipped with Global Positioning System (GPS) on board units. The on board units were designed to record the drivers' behavior. The volunteers agreed to purchase their gasoline from two pre-designated retail fuel stations at regular intervals. The mileage data was transferred to the system mangers when the gas was purchased at these two fuel stations.

The participants also agreed to participate in three surveys. The surveys were conducted before, midway and after the field operation of the pilot program. The purpose of the surveys was to collect information on household characteristics and travel choices made during the pilot program.

The eastern portion of Portland, where an extensive street network and transit option was available, and the two retail fuel stations were also located, was the home to many of the program participants.

During the first 4.5 month phase of the program, the participants paid the regular state gas tax, with no incentive to travel behavior change. The MBUF for all the participants were being collected to serve as a baseline for future analyses. During the second 5.5 month phase, the participants were broken into three groups with a different tax or user fee. A small group (10 participants) continued to pay regular gas tax. The second group (95 participants) paid the equivalent of the state fuel tax in a fixed MBUF of 1.2 cents per miles driven within Oregon. The third group (102 participants) paid a MBUF of 10 cents per mile for all the driving within the Portland Urban Growth Boundary (UGB) during the week day peak periods. The MBUF rate for off peak period and outside the UGB was set as 0.43 cents per mile. Assignment of the participant to the above captioned group was not random. For example 25% of the participants that regularly traveled inside the UGB were assigned to the second group (flat MBUF) and the remaining 75% were assigned to the third group (variable MBUF).

The program also examined two on board unit technologies for the mileage accuracy reporting.

The on board units tracked and collected the miles driven and the location of the travel. They then transferred this data to the wireless readers at the two retail fuel stations. From there, the existing communication links sent the data to the point of sale system. The central computer linked via a Digital Subscriber Line (DSL), to the point of sale, calculated and returned the appropriate mileage fee for that vehicle. The point of sale then deducted the gas tax from the customer receipt and added the appropriate MBUF. Figure 1-1 depicts the technology configuration and Figure 1-2 displays the customer gas purchase receipts.

Whitty (2007) concluded that the Road User Fee Pilot Program results validated the MBUF concept as a viable alternative to the gas tax; however more development work is needed prior to its large scale application. This pilot program did not have any provisions for the collection of the MBUF's from the alternative fuel vehicles, since those vehicles do not utilize the retail gas stations (point of sale and fee collection for this pilot project).

The project did not provide adequate economical analyses of the long term implementation and its impacts to the future revenue stream.

Since the legislation mandated a revenue neutral system for this pilot project and the establishment of the endowment accounts kept the volunteers from directly seeing the financial effects of their driving behavior, the effectiveness of the cordon/congestion pricing of this project is not readily assessable.

Since the conclusion of the pilot project, researchers have studied and assessed many facets of the project including the driver traveling behavior changes, performance of the technology and the institutional issues (fairness, privacy and acceptability). A discussion of these studies and their finding is presented in a subsequent section “Previous MBUF Studies”.

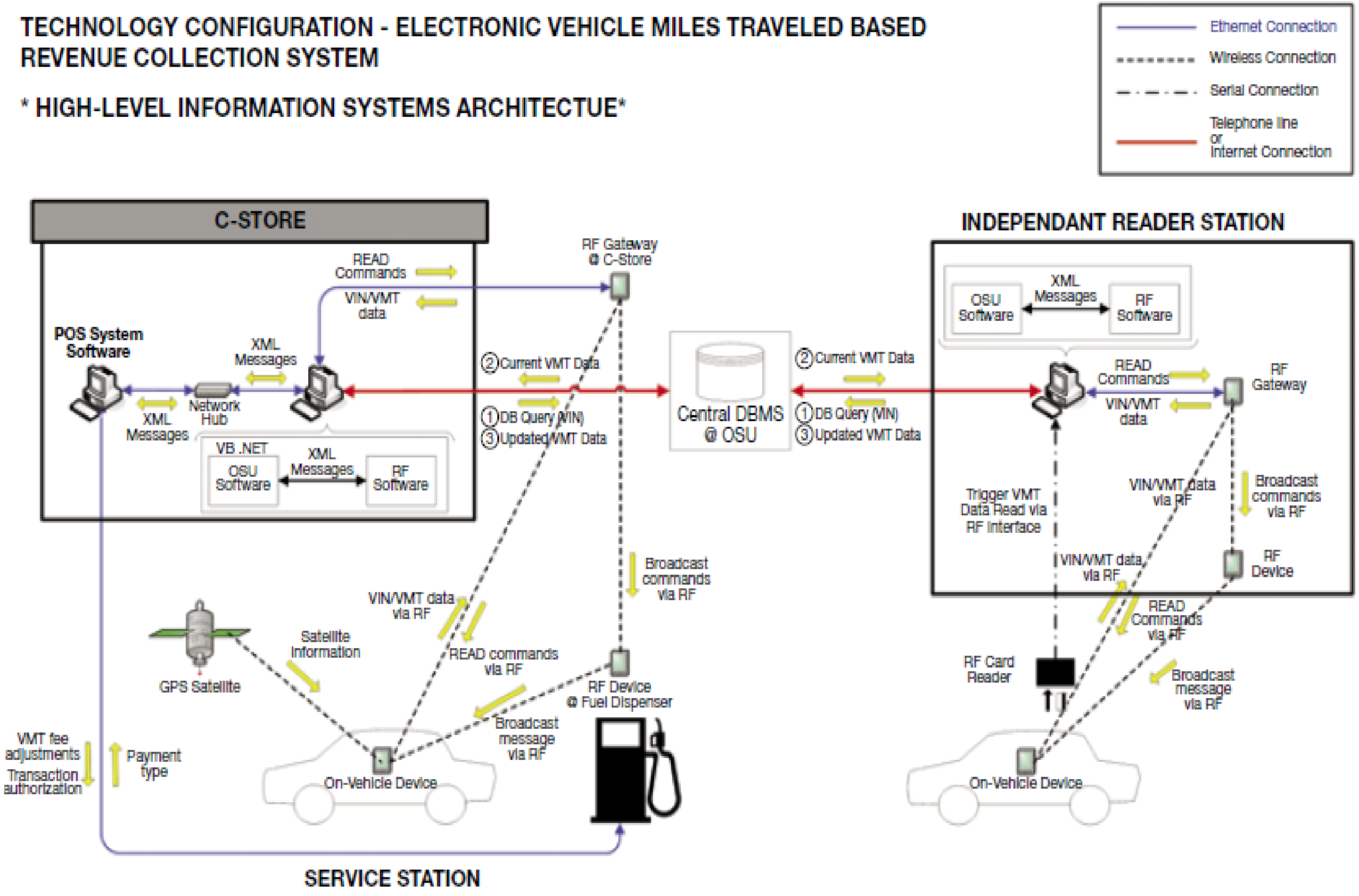
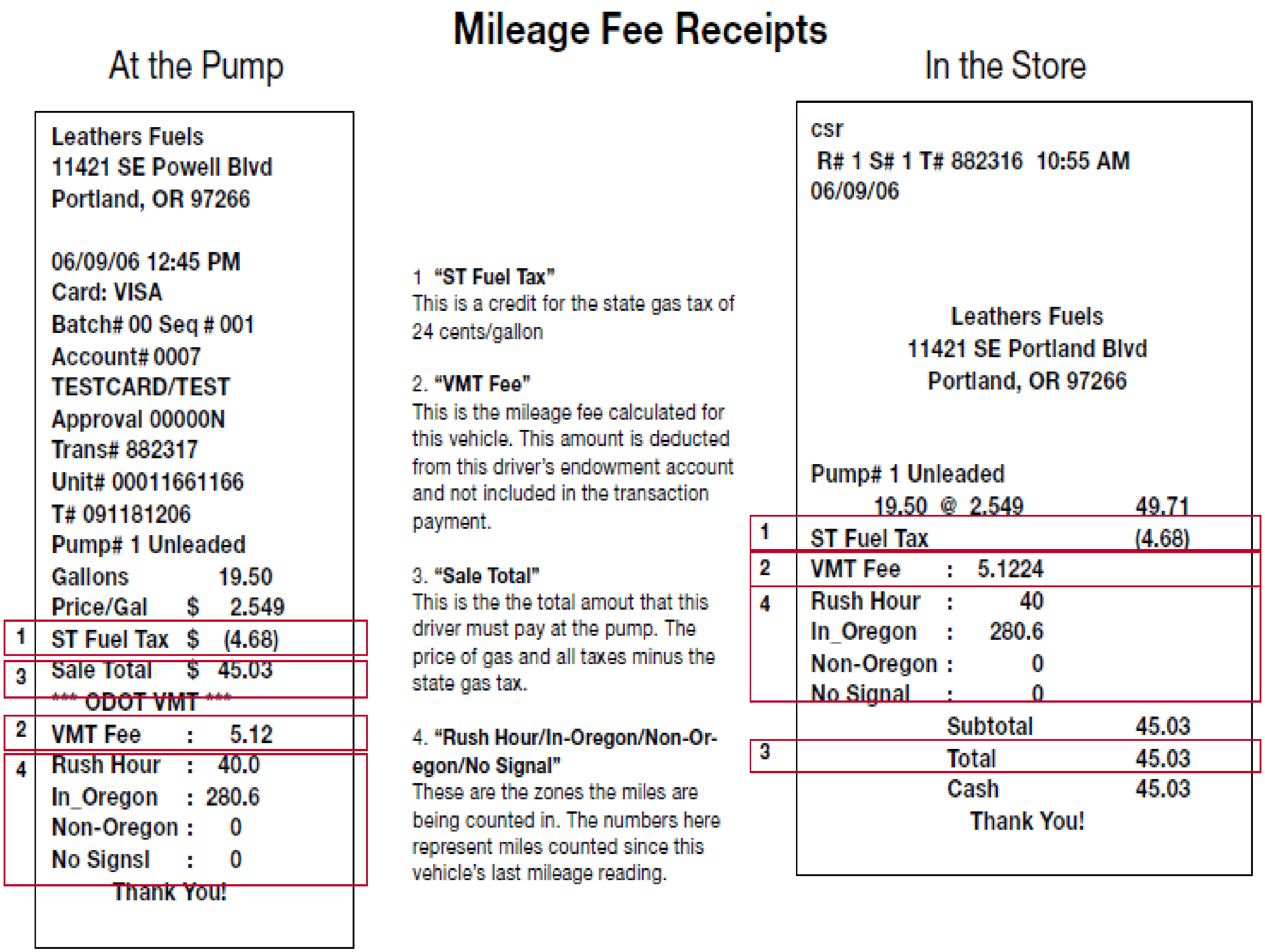


Figure 2-1: Oregon’s Pilot Project Technology Configuration

(Whitty, 2007)



Mileage Fee Receipts

At the Pump

Leathers Fuels
11421 SE Powell Blvd
Portland, OR 97266

06/09/06 12:45 PM
Card: VISA
Batch# 00 Seq # 001
Account# 0007
TESTCARD/TEST
Approval 00000N
Trans# 882317
Unit# 00011661166
T# 091181206
Pump# 1 Unleaded
Gallons 19.50
Price/Gal $ 2.549
1 ST Fuel Tax $ (4.68)
3 Sale Total $ 45.03
*** ODOT VMT ***
2 VMT Fee : 5.12
4 Rush Hour : 40.0
In_Oregon : 280.6
Non-Oregon : 0
No Signsl : 0
Thank You!

1 **"ST Fuel Tax"**
This is a credit for the state gas tax of 24 cents/gallon

2. **"VMT Fee"**
This is the mileage fee calculated for this vehicle. This amount is deducted from this driver's endowment account and not included in the transaction payment.

3. **"Sale Total"**
This is the the total amout that this driver must pay at the pump. The price of gas and all taxes minus the state gas tax.

4. **"Rush Hour/In-Oregon/Non-Oregon/No Signal"**
These are the zones the miles are being counted in. The numbers here represent miles counted since this vehicle's last mileage reading.

In the Store

csr
R# 1 S# 1 T# 882316 10:55 AM
06/09/06

Leathers Fuels
11421 SE Portland Blvd
Portland, OR 97266

Pump# 1 Unleaded
19.50 @ 2.549 49.71
1 ST Fuel Tax (4.68)
2 VMT Fee : 5.1224
4 Rush Hour : 40
In_Oregon : 280.6
Non-Oregon : 0
No Signal : 0
Subtotal 45.03
3 Total 45.03
Cash 45.03
Thank You!

(Whitty, 2007)

Figure 2-2: Oregon's Pilot Project Mileage Free Receipts

2.3.2 Puget Sound Regional Council (PSRC) Traffic Choice Study

In 2002, the PSRC (MPO for the greater Seattle area), conducted a pilot project, funded by an FHWA grant to access the drivers behavior in response to variable charges for road use. The project placed GPS tolling meters in 275 volunteers' vehicles. Each on board unit was loaded with adequate pre determined balance (road user credit) based on their previous driving behavior. AM peak period MBUF rates of \$0.30 and \$0.14 for freeway and arterials respectively and PM peak period MBUF rates of \$0.44 and \$0.23 for freeway and arterial respectively, were assessed. The off peak period MBUF rates of \$0.07 and \$0.03 for freeway and arterial respectively were set. The participants were advised that at the end of the trial period the balance left on their on board unit will be refunded to them. This served as a realistic incentive to minimize the actual toll bill.

In April 2008, PSRC published their final report (Kitchen, 2008). In his report, Kitchen's primary conclusions were: There is a dramatic opportunity to significantly reduce traffic congestion while generating revenues. The core technology for the satellite based (GPS) MBUF is mature and reliable. A large – scale implementation of a GPS –based MBUF system depends on a proven system, a viable business model and public acceptance.

2.3.3 University of Iowa: National Evaluation of a Mileage-Based Road User Charge Study

This four year study assessed and explored a new approach to administer and collect road user fees. The study‘s two years of field operations, which ended in July, 2010, equipped approximately 2552 volunteers (chosen from a pool of 78000 candidates) vehicles with On

Board Units (OBU). The participants were chosen from twelve regions and various demographic characteristics to reflect the U.S. population as a whole. The participants were selected from: Baltimore, MD; Eastern Iowa; Austin, TX; Boise, ID; the Research Triangle of North Carolina; San Diego, CA; Portland, OR; Albuquerque, NM; Billings, MT; Wichita, KS; Chicago, IL; and Miami, FL.

The participants drove nearly 25 million miles in all 48 contiguous states during the operational phases of the field operation study.

The data was collected from both the technology and the participants. The GPS located in the OBU's of the participants' vehicles kept track of the mileage and the location of travel. This data was transmitted via a wireless data network to the Billing Center at the University of Iowa, for processing, invoicing and evaluation. During the field operation study period, the participants continued paying normal gas taxes, but were also provided a monthly invoice to demonstrate how much they would have paid if the MBUF charging system was actually implemented.

Participants were routinely given a series of questionnaires to assess their attitudes and perceptions regarding the system and the concept of mileage-based charging.

The two major focus of the study were to: Test the appropriateness of technology, and assess the user accessibility and acceptability (University of Iowa, 2009).

Since the field operation study was concluded a short time ago, no extensive analyses or reports are available yet. However, in the subsequent section of this chapter a discussion of Hanley and Kuhl (2011), who presented an initial result report to the TRB 2011 Annual Meeting, is provided.

2.4 Implemented MBUF Projects

During the past two decades several European countries and New Zealand have successfully implemented MBUF's for trucks through use of GPS and electronic toll collection technologies. These systems are operational in: Germany, Austria, Czech Republic, Slovakia, Switzerland and New Zealand (Sorenson, et al. 2010).

These European countries, at the crossroads of Europe, with a significant east-west and north-south motorway system, did not have adequate motor fuel taxes to pay for highway maintenance resulting from the freight movements via trucks. In case of some of the smaller European countries, a foreign truck could travel, border to border without purchasing any fuel and paying any fuel taxes to the host country. This anomaly served as the prime motivation for a distance based charging system in many European countries.

This section of the proposal provides a brief summary for several of these implementations.

2.4.1 The German Truck MBUF System

In operation since January 2005, it utilizes the GPS technology to track vehicles over 12 tons, which are equipped with an OBU. The fees are based on miles travelled on German motorways and are set based on number of axles and classification of the trucks' emission data. The least air polluting trucks pay the lowest rates with gradual per kilometer fee increases for more air polluting truck categories. Per kilometer rates are currently set at 0.141 to 0.288 Euros (0.36 to 0.72 dollars) per mile. Cellular communication is utilized to transfer the location of entry, exit and distance travelled on the German motorway systems to the TollCollect processing office.

TollCollect is administered by a private consortium that collects tolls in behalf of the German government. The tolling covers more than 15,000 kilometer of German motorways and has generated more than 24 billion Euros since its implementation (TollCollect, 2011) for the German Federal Budget.

2.4.2 The Czech Republic Truck Toll

In operation since January 2007, initially a Dedicated Short-Range Communication (DSRC), with GPS communication added in January 2010, is a weight-distance truck toll for major motorways (approximately 1,400 Kilometers) in the Czech Republic. Its managing authority is the Czech Ministry of Transport, but is contracted to the Kapsch Group for toll collection and operation. Kapsch Group is an Austrian based private toll collection and system provider. All trucks travelling on the Czech's motorway system are required by the Czech laws to have the OBU installed in their vehicles. More than 300 overhead gantries serve as reinforcement zones and are equipped with classification equipments and cameras. It is interesting to note that more than half of the trucks using the Czech highways are foreign based. Per kilometer rates are 2.2 times lower for the arterials than freeways (Kapsch, 2011).

2.4.3 The Austrian GO Program:

In operation since January, 2004, it is a weight-distance based charging system for vehicles whose weight exceeds 3.5 tons travelling Austria's motorway. Each truck is equipped with an OBU featuring DSRC. These units communicate with 420 overhead gantries located throughout the 2000 kilometer motorway systems. The data from communication between OBU and system gantries serves as an input to the distance based fee charging process. The MBUF collection system is administered by the ASFINAG, the national road authority wholly owned by the Federal Republic of Austria. The system is operated by the private toll collection and system provider Kapsch Group. The system is interoperable with adjoining countries truck MBUF systems. Interoperability is simply a business, technology and communication arrangement/protocol between two or more charging entities to allow for a single OBU and single invoice for their users (Arnold, et al. 2010).

2.4.4 The Swiss Heavy Goods Vehicle Fee MBUF System

In operation since January, 2001, it applies to all vehicles whose weight exceeds 3.5 tons. The fee is based on the distance travelled on any Swiss roads (not only the motorways) and the emission class. The supporting technology includes an OBU featuring GPS and DSRC, as well as a connection to the vehicle’s tachometer (including odometer information). DSRC is primarily used for the gantries located at the border crossing points and major arterials, while GPS is used for all other roads. Similar to the Czech system, gantries also serve as a verification/enforcement tool, to prevent fee evasions (Sorensen, et al. 2010).

2.4.5 The Slovakia Truck MBUF System

In operation since January, 2010, uses OBU combining the GPS and cellular communication to collect fees on 1,500 miles of roads, based on distance, number of axles and emission class. All trucks whose weight exceeds 3.5 tons are required to be equipped with an OBU and to pay. The system administrator is the National Highway Company. System fee collections and operations are privatized (Sorensen, et al. 2010).

2.5 Previous MBUF Studies

Previously discussed US VMT pilot projects, successful Europeans' MBUF implementation projects and an increased awareness of the current transportation funding problems have generated a growing interest in the VMT topic by transportation planners, policy makers and researchers. The collected data from these pilot and implemented projects serves as a rich resource for the researchers. This section of the proposal presents a summary of the past studies dealing with various aspects of the VMT topic. Past studies generally addressed four distinct MBUF subject matters: Technological, Institutional, Implementation, and Financial.

2.5.1 Technology Related Studies:

Bertini et al. (2002) analyzed the data transmission options for the Oregon's Pilot Project. The three options considered were: Wide Area Location Data (either raw location data or calculated VMT is transmitted via cellular communication from the vehicle to collection centers at frequent intervals), and Data Hub Location (raw location data or calculated) VMT is transmitted from the vehicle to an intermediary reader located at a fuel station or the Department of Motor Vehicles (DMV)).

They concluded that the Wide Area Location Data was the most expensive option, while the service station or DMV Hub was the least expensive.

Kim et al. (2002) were set out to collect information on various technologies including but not limited to: Radio-Frequency Automatic Vehicle Identification (AVI) devices, GPS-based devices and various electronic data transfer devices. They concluded that, at that time (2002), most AVI devices were not appropriate for the Oregon Pilot Project. They also acknowledged the high cost of the GPS-based systems. Kim et al. (2002) identified three companies that had devices with the required functionality for the Pilot Project.

Donath et al. (2009) explored availability for off- the-shelf technologies dealing with detection (time and space), communication and data storage required to implement a VMT system at a large scale (nationally). The unique features of the system are: VMT is calculated by an on board unit that is connected to the vehicle data bus and powered via a single strand connector (available on all 1996 or newer cars). The wireless data transmission is via text messaging at any time interval. And VMT can be pooled by zones. They claimed that all the necessary components of the described system are readily available. They also stated that, even though, GPS receivers or longitude/latitude position data is not necessary, but higher resolution position sensors may be added to the core platform as needed based on policy objectives. The accuracy of the location data, based on a cell phone or a texting devise seems a bit problematic.

Hanley and Kuhl (2011), based on their study of the University of Iowa’s National MBUF pilot project, concluded that the field operation tests demonstrated that robust and reliable hardware and communication infrastructure for collection and reporting of data already existed.

2.5.2 Institutional Issues Related Studies

Guo et al. (2011) utilized the data from the OPP's two MBUF groups (flat and variable rates) to test four hypotheses and concluded the following:

1. The variable rate participants, as expected, decreased their peak period travel and through the UGB areas.
2. There was no detected spillover effect to the areas outside the UGB or during the off peak pricing periods.
3. For the variable MBUF participants, density and mix land uses were statistically significantly correlated with the reduced VMT.
4. The MBUF, as a substitute for the gas tax, reinforced the influence of the urban form on travel behavior.

Their findings confirm the effectiveness of the cordon and congestion pricing policies.

McMullen et al. (2008) utilized various statistical tools/analyses to assess the distributional effects of various user fees in Oregon. The issues of concern for the Oregon policy makers were:

1. The shift to a MBUF would be regressive (more economical hardship for the poor),
2. Rural area motorists/residents would be adversely impacted, and
3. A change to MBUF would discourage people from buying more fuel efficient vehicles.

They concluded that the gasoline tax was not regressive and a change to a revenue neutral MBUF rate of 1.2 cents per mile would not result in much hardship to the poor. They also found that a rural resident actually would pay less under a MBUF regime than a regular gas tax. And lastly they determined that a shift to a MBUF would not create enough disincentives to encourage purchase of a more fuel economy or a hybrid vehicle.

Goodin et al. (2008) explored the application of the MBUF as an alternative to the fuel tax in rural and small urban areas of the Texas. They conducted interviews with the stakeholders, focus groups and a community advisory committee to identify the implementation issues. Some of the observations documented include: 1) MBUF's were generally viewed as fair, 2) The public wants to know the value in any new system, and 3) Privacy concerns are likely to be widespread.

Goodin et al. (2009) examined the institutional issues associated with the MBUF implementation.

The important pressing issues identified included: Public acceptance, legislation, administration issues, equity consideration, program structure and potential implementation strategies.

Baker et al. (2011) evaluated MBUF as a possibility for meeting the state of Texas' long-term transportation needs. They conducted interviews with the general public and stakeholders to receive feedback on the concept. They concluded that, most study participants identified the privacy, cost of administration and enforcement as barriers to a workable system. It was also noted that a field demonstration which illustrates the full aspects of the large implementation, including payment, administration and enforcement can show how the concept may work for the Texans. They suggested that an effective policy/design can alleviate the public concerns.

Agrawal and Nixon (2011) summarized the results of a national random-digital public opinion poll in regard to various taxing options to increase federal transportation revenues. There were 1,545 respondents. There were eight tax options including: Variations on increasing the federal fuel taxes, introduction of new mileage tax, and creating a new national sales tax. They discovered none of the taxing options achieved a majority support.

In the current anti-tax public sentiment environment, their results should not be surprising. Presenting the MBUF as a direct user fee instead of "introduction of new mileage tax" might have garnered more support.

Weatherford (2011) used the data from the 2001 National Household Travel Survey (NHTS) to evaluate the distributional implications of the replacement of the current per gallon fuel taxes with MBUF. His analyses indicated that MBUF's will be less regressive than the fuel taxes by shifting of the taxation burden from the poorer to the richer households. Similar shifting of taxation burden from the older to the younger households and from rural households to urban households was also discovered during his analyses.

Robitaille et al. (2011) also examined the equity of the MBUF's utilizing the 2001 NTHS. They evaluate the equity of various taxing and user fees strategies. Their findings as relate to the MBUF revealed that, imposing a flat rate would have a minimal impact on each household as percentages of their total income. Their analyses showed a decrease of 0.4% in miles driven once the MBUF's were introduced. They also conclude that a variable MBUF is more effective in achieving equity and needs to be further explored.

2.5.3 Implementation Related Studies

Rufolo et al. (2002) compared public vs. private administration of the VMT data and fee collection centers for the Oregon's MBUF system. Their analyses included identification and assessments of the issues of the in-house vs. privatization forms of operations. They concluded that with the state oversight and audit, private providers licensed by the state, can provide the highest level of service at a lower cost. But they recommended a provision of rigid contract terms and clear definition of the responsibilities.

Sorensen et al. (2010) concluded that a MBUF system could be implemented within approximately five years. They stated that a MBUF system can be either substitute or complement the existing fuel tax regime. They also presented a strong case that the currently available technology and administration structures might be used to implement this system. They predicted that, once initiated, the full transition to MBUF may occur much faster than anticipated.

Forkenbrock and Hanely (2006) studied the benefits, issues and challenges of the MBUF system. They argued that the advances in the GPS and GIS technologies are making the transition to a MBUF system more feasible. They suggested that a MBUF regime may also allow for pursuing a variety of public policy objectives such as congestion pricing, privately operated toll ways, High Occupancy Toll(HOT) Lanes, improved travel demand management and finally shifting the financial burden of the roads to the users.

Guderson (2003) recommended the following steps for an implementation plan of the MBUF system: Implement small scale pilot tests, propose legislation, implement the MBUF as a compliment to the existing tax initially, and then, transitioning it into a replacement for the fuel tax regime.

Delcan Corporation (2011) examined the feasibility of using existing GPS-based technology to implement a truck MBUF that could replace all the truck taxes and fees in the

State of New York. They examined several MBUF rates including a flat rate, variable rates based on the roadway classification, and variable peak period pricing.

Delcan Corporation (2011) concluded that any truck MBUF system should focus on: Simplicity, Cost control and an emphasis on the economic importance of an efficient trucking industry. Their analyses revealed that a truck-based MBUF system offers the potential to generate additional revenues. They also examined the viability of using the existing GPS-based technology for collection of trucks fees and taxes in the state of New York. They concluded that the technologies already installed in the trucks, were sufficient to determine routes with enough accuracy to assess fees.

Hanley and Kuhl (2011), based on their analyses of the University of Iowa's National Pilot Project data stated that, over 60% of the participants expressed neutral or negative view of the MBUF pricing before the study, however after their experience with the system and at conclusion of field operation testing period, more than 70% viewed the concept favorably.

2.5.4 Financial Related Studies

Rufolo (2011) researched and collected cost data from the two existing truck MBUF systems in Europe and the state of Oregon's Pilot Project to provide "a starting point" for identifying the major cost components. His estimates of these three systems' average initial set up cost , annual operating cost and annual depreciation were: $2, 255,009, $667,590 and $ 227,449 respectively. Adjustments for currency conversions and the Value Added Taxes (VAT) were made.

He acknowledged that while the cost of the technology is decreasing, the cost of administration and enforcement continues to increase.

Inclusion of the Dutch and the German Truck fee collection cost data, albeit as “a starting point”, may not be the most applicable/prudent approach. Those two systems’ business rules and objectives are not consistent with the Oregon’s Pilot Projects.

Balducci et al. (2011) presented a frame-work for analyses of the alternative revenue generating options such as tolling, cordon pricing, parking pricing, and MBUF costs. A comparison with the current fuel tax system costs is made as well. They collected cost data from the state DOT’s, toll agencies and the Dutch MBUF project. They concluded that, based on the gross margin (gross income divided by the total revenue) the MBUF system fared much better than the toll road system, but was outperformed by the fuel tax. The gross margins were: 99.1%, 93.4%, and 66.5% for the fuel tax, MBUF and tolling respectively.

As acknowledged by Balducci et al. (2011) the MBUF system is nascent and there is limited experience in quantifying economies of scale.

Oh et al. (2007) utilized data from the State of Indiana to establish MBUF rates under various expenditures. They determined that a MBUF of 2.9 cents per mile, plus federal contributions was adequate to cover current expenditures by the Indiana DOT. They argued that incremental increases in the MBUF rates can generate enough revenues to replace various existing funding sources such as vehicle registration fees. They utilized the readily available VMT estimates from the TDM forecasts in conducting their analyses.

Robitaille et al. (2011) also analyzed and compared impacts of a 10 cent increase in gasoline tax and a flat $0.015 per mile fee based on the 2001 NHTS data. Their results were mixed, while some states revenues increased, some other states’ share decreased.

The long term financial impact of these two pricing policies was not analyzed.

2.6 Literature Review Summary and Conclusions

From the literature review, it is evident that the concept of the MBUF has been extensively discussed at the national transportation policy making level. Several pilot projects have served as a test bed to examine various implementation issues and concerns such as: Institutional and Technological aspects. The literature review did not result in any great discovery of substantial work on the topic of financial analyses, particularly those addressing the long term implication of various MBUF pricing policies and the current federal fuel taxes.

As stated in the previous chapter, one of the objectives of this dissertation is financial evaluation and comparison of various pricing policies.

The essential input parameter to any financial analyses is the annual forecast of the study area VMT. Utilization of the traditional TDM poses its problems such as network coding that may not include the entire local and residential street nodes (Grant, 2004). Major data deficiency as it relates to long distance travel and rural area was cited as a problem with the TDMs (Horowitz, 2008). Post model adjustments have to be made to account for every mile driven within the study area. Alternatively, utilization of fuel sales receipts/forecast combined with fleet mix fuel efficiencies and fuel price per gallon have been utilized by some states. Oh et al. (2007) mentioned the following as potential areas of concern when utilizing this methodology of forecasting VMT: Uncertainty about the future price of fuel, and potential inaccuracy of the fuel sale receipts and fleet mix efficiency. Kumapley and Fricker (1996) and WSDOT (2010) were very critical of utilizing gas tax receipts in accurate calculation of the state VMT.

Utilization of regression models based on forecast of future socioeconomic variables for long range estimate of the VMT was thoroughly discussed by Polzin and Chu (2009). They argued that unpredictable factors such as: Economic conditions, energy production, immigration policies, health care condition and longevity, electronic communication, transportation technologies and propulsion technology breakthroughs may influence the ultimate level of travel.

This dissertation uses an Aggregate Uni-Variant Time Series Model, a novel approach, to forecast the future VMT's based on their past trend. A second model utilizing a different time series modeling approach is developed as well, to validate the first model and its performance.

The aggregate uni-variant time series model development for the VMT forecasting, along with construction of a robust and adaptive financial model to assess not only current gallon based fuel taxes, but also future pricing policies, is thoroughly discussed in the next chapters of this dissertation.

3 METHODOLOGY

3.1 Overview

This chapter of the dissertation introduces methodology and process of the VMT forecasting, including: Data collection, Data preparation, and Time Series Models. It also elaborates on the development of the financial model and utilization of this model to assess the financial impacts of the current federal fuel tax regime and potential future pricing policies.

3.2 VMT Forecasting

The starting point of conducting any analyses is the data collection. Since early 2009 (beginning of this dissertation), relevant historical and future forecasts for various parameters utilized in this proposal, such as: State and federal fuel taxes, state and national VMT, state VMT break downs (rural vs. urban, trucks vs. autos and peak vs. off peak), fleet mix fuel efficiencies, and state and federal transportation revenues have been collected. These data, sources, and their utilization in conducting the analyses, are introduced and discussed in subsequent chapters, when the data is first utilized.

Before utilizing any data for any analyses, data preparation is required. The purpose of the data preparation is to observe the data, trends and completeness. Data preparation and good data are required for producing an effective model of any kind (Pyle, 1999).

During the data preparation step of the analyses, a data smoothing step followed by a diagnostic for detecting outlying and influential observation(s) is performed. An observation that is well separated from the rest of the data is called an outlier. To identify the outliers, examination of the observation’s residual value in a smooth/ fit model is performed. Before and after influence analyses of the deleted outlier(s) is also performed and documented to justify the action taken. The prepared (also known as scrubbed) data as result of the data preparation process serves as input to the VMT forecasting model development process.

As presented in a previous chapter, utilization of the traditional traffic demand models for forecasting VMT may not produce an accurate estimate, since not all the local roads may have been coded (Grant,2004) and (Horowitz,2008). Utilization of regression models based on fuel consumption and/or gas receipts for forecasting of VMT was found to be problematic by Oh, et al (2007), WSDOT (2010) and Kumapley and Fricker (1996).

This dissertation is to utilize an aggregate uni-variant time series analyses to forecast the annual VMT for the analyses period (2015 through 2035). The model statistical performance measures are thoroughly tested. A second forecasting model, utilizing a different methodology is to serve as a confirmation and validation of the first model, is developed as well.

Bowerman, et al. 2005, defines time series as a chronological sequence of observations of a particular value. In our case the chronological increment is the annual observation/recording, and the particular value is the VMT.

The uni-variant time series model tries to present the dependant (VMT), to establish trends based on the behavior of the available past time series data and any statistical errors or stochastic variation that may occur. When the dependant (VMT) is based on an individual unit (a household) it is called disaggregate model and aggregate when it is referred to a whole region, state, country or group of countries.

Several methods of time series forecasting are available such as: Vector Auto Regressive (VAR), Linear Regression with Time, Space Time Auto Regressive Integrated Moving Averages (STARIMA), Box-Jenkins (1976), Autoregressive Integrated Moving Average Modal (ARIMA), and Holt-Winters Smoothing/Forecasting, amongst others.

ARIMA models are the most general class of models for forecasting a time series which can become stationary by transformation/fine tuning. The fine-tuning , to remove the all traces of the autocorrelation form the forecast, is consists of adding lags of the differenced series and/or lags of the forecast errors to the prediction equation, as needed.

The term stationary means that the covariance and means of the sequence do not change over time. In real life most of the time series are non-stationary. The non-stationary components such as an increasing trend are removed from the time series by parametric (smoothing) or differencing methods.

This dissertation begins with utilizing the Holt-Winters (Goodwin, 2010) in smoothing the data and identifying outlier(s). The prepared and smoothed (scrubbed) data serves as input to the model(s) development process.

The initial method of time series model development is the continuation of utilizing the Holt-Winters exponential smoothing moving average forecasting method. The Holt-Winters forecasting is based on an internal, automatic and iterative process that results in production and selection of the best model to forecast future VMT.

A true Box-Jenkins ARIMA model development based on autoregressive integrated moving averages is then utilized in constructing a second VMT forecasting model.

Comparison of these two models serves as a confirmation/validation of the model selection and resulting VMT forecasts.

The general ARIMA model introduced by Box and Jenkins (1976) includes, as the name implies, autoregressive integrated moving average parameters of a time series. This model has three types of differencing parameters in its formulation. The three parameters are: The autoregressive parameters (p), the number of differencing passes (d), and the integrated moving average parameters (q).

These time series analyses models are generally summarized as ARIMA (p, q, d). For example a model described as ARIMA (3, 2, 1) means that it contains 3 autoregressive (p) parameters, and 2 integrated moving average (q) parameters that were computed for the series after it was differenced once (d).

A more detailed explanation of the Holt-Winters exponential smoothing, autoregressive, integrated moving average, ARIMA notations and their applicability in forecasting future VMT is provided in the next chapter, titled “Time Series Analyses and Forecasting”.

The statistical software “R”, (R, 2009) which has capabilities for data preparation and analyses, and time series processing including ARIMA Box- Jenkins and Holt-Winters smoothing and forecasting, readily available to the academia and researchers, is used in conducting the time series analyses (R program input and coding are contained in the Appendix A of this dissertation) .

The analyses period is 2015 through 2035. This twenty year analyses period is not only consistent with the common transportation planning horizon, but also decreases the risk of inaccuracies associated with long term forecasting (30 to 50 years) as cited by Polzin and Chu

(2009). The selection of 2015 as the beginning year of the analyses period, takes into consideration the minimum time required to implement a statewide or a regional VMT deployment (Sorensen, et al. 2010) and (Delcan, 2011).

The final product of the aforementioned time series analyses is the forecasts/ estimates of the Florida's annual VMTs for years 2015 through 2035, which serve as the primary input to the financial model.

The state of Florida was selected for our financial analyses due to the following:

Tolls (user fees) have played an important role in providing a transportation funding option/supplement for the State of Florida. The first U.S. toll road to open to traffic after President Eisenhower signed the Highway Act into law in 1956 was the 110 mile Bobtail Turnpike connecting Miami and Fort Pierce (PBCI, 2007). Since then the lane mileage of toll roads for the state of Florida has increased more than eight fold (Regan and Brown, 2011). Toll revenues accounted for more than 10% of the state transportation receipts in FY2010/2011(OFD, 2011). Today with more than 6.5 million on board units/electronic toll collection transponder and free flow tolling, Florida's major urban area motorists depend on a safe, reliable and efficient travel option thru an expansive toll road system. The successful introduction of high occupancy toll lanes in south Florida (I-95 and soon I-595 managed lane projects) and their planned rapid expansion to other urban areas further supports the notion that the state of Florida is uniquely positioned to be the first state to transition from the current gallon based fuel tax to a mileage based user fee system, and the subject of the subsequent financial analyses.

3.3 Financial Model

The next step is the development of a robust and adaptive financial model to assess various pricing policies.

The financial model is capable of decomposing the annual VMT into components such as: Urban and rural, autos and trucks and peak and off peak periods miles.

The model has the capability of examining various MBUF structures including: constant, variable (CPI indexed) or any prescribed annual adjustment/increase rates.

The provision of price elasticity and VMT adjustments is another input to the financial model.

The financial model is a very efficient tool in examining the financial impacts of various transportation policies such as cordon pricing (area type), time of day (peak period) and congestion pricing.

The model can assess the effects of various energy or environmental policies such as: The CAFE's fuel efficiency standards, incentives for alternative fuel auto ownership, telecommuting and the current per gallon fuel tax regime.

The financial impacts can be expressed in an annual bases as well as in Present Day Value (PDV) depending on a prescribed annual discount rate.

4 TIME SERIES ANALYSIS AND FORECASTING

4.1 Overview

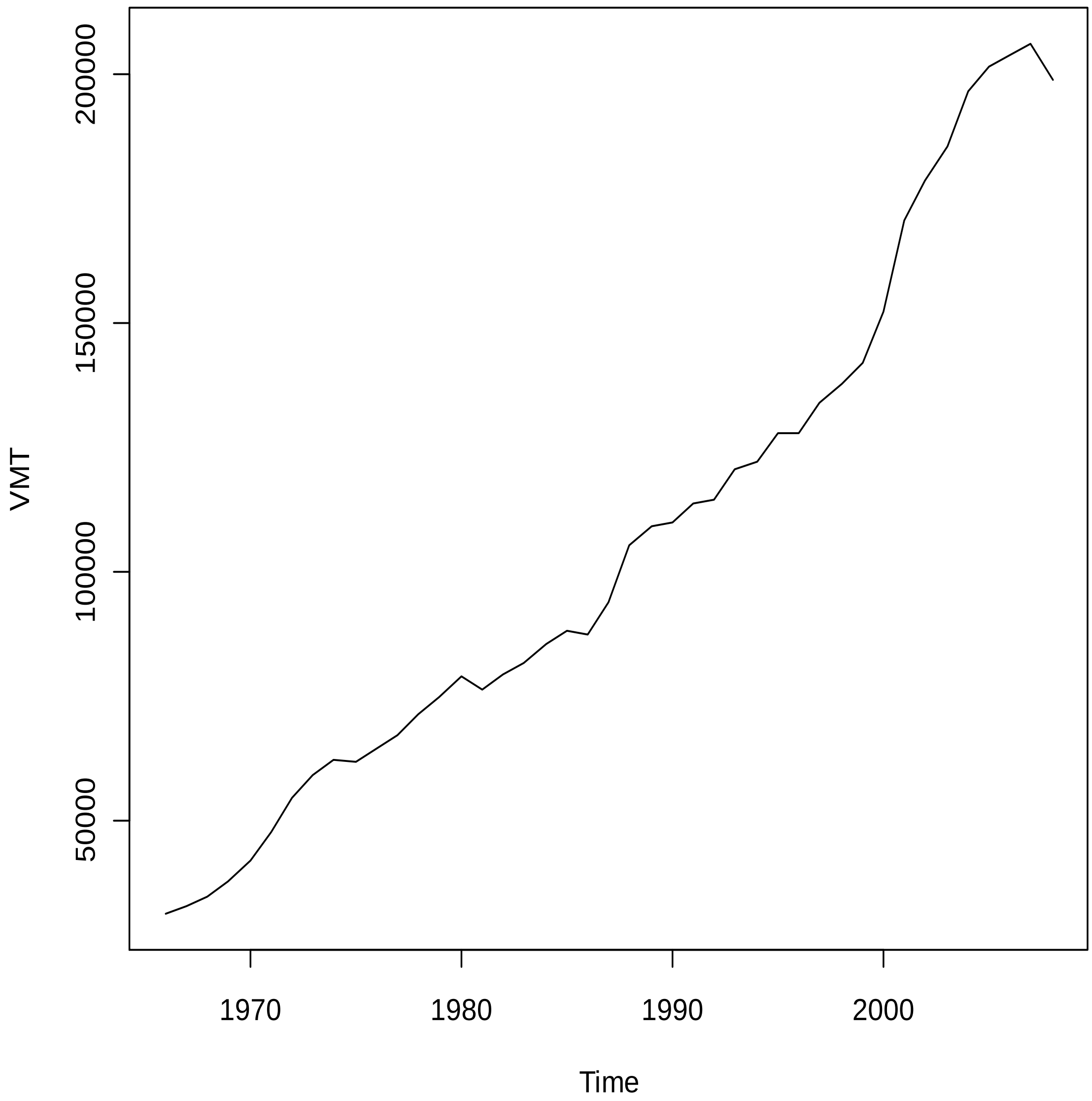
This chapter of the dissertation presents the process, methodology and results of the time series analyses culminating in the development of a VMT forecasting model. The chapter is divided into: Time series data collection and preparation, time series model development and VMT forecasts sections.

4.2 Time Series Data Collection and Preparation

The best place to start with any time series analyses is to graph the sequence diagram of the time series to be forecasted. A sequence diagram is a graph of the data series values, on the vertical axis, against time on the horizontal axis. The purpose of the sequence diagram is to give us a visual impression of the nature of the time series. The visual inspection of the diagram can assist in identifying certain behavioral components such as the series' trend.

Figure 4.1 on the following page depicts the sequence diagram of the Florida's VMT time series for years 1966 thru 2008. The VMT time series data was collected from the FDOT's planning/statistics office web site at www.Dot.state.fl.us/planning/statistics/sourcebook (FDOT, 2010).

A visual inspection of the time series sequence diagram reveals a generally upward trend.



(FDOT, 2010)

Figure 4-1: Florida's VMT Time Series Sequence Diagram

The next step is the smoothing or elimination of the non-stationary component. Due to the upward trend observed in the above sequence diagram of the VMT time series, an exponential smoothing is considered.

The most basic form of exponential smoothing is given by the formula (Holt, 2004):

$$s_1 = x_0$$
$$s_t = \alpha x_{t-1} + (1-\alpha)s_{t-1} = s_{t-1} + \alpha(x_{t-1} - s_{t-1}), t > 1 \qquad (1)$$

Where α is the smoothing factor, and $0 < \alpha < 1$. Thus, the smoothed statistic s_t is a simple weighted average of the previous observation x_{t-1} and the previous smoothed statistic s_{t-1}.

By direct substitution, we get the following:

$$\begin{aligned} s_t &= \alpha x_{t-1} + (1-\alpha)s_{t-1} \\ &= \alpha x_{t-1} + \alpha(1-\alpha)x_{t-2} + (1-\alpha)^2 s_{t-2} \\ &= \alpha\left[x_{t-1} + (1-\alpha)x_{t-2} + (1-\alpha)^2 x_{t-3} + (1-\alpha)^3 x_{t-4} + \cdots\right] + (1-\alpha)^{t-1}x_0. \end{aligned} \qquad (2)$$

In other words, as the iterative process continues the smoothed statistic st evolves into the weighted average of a higher pool of the past data points xt−n, and the weights assigned to previous data points are directly proportional to the terms of the geometric progression {1, (1 − α), (1 − α)2, (1 − α)3, …}.

Simple exponential smoothing does not do well for that data that displays trend. In such situations, double exponential is a better smoothing methodology. Since Florida’s VMT time series displayed a trend, the Holt-Winters double exponential smoothing is used.

Holt-Winters double exponential smoothing works as follows (Holt, 2004):

The raw data is denoted by {xt}, beginning at time t = 0. {st} is smoothed value for time t, and {bt} is the best estimate of the trend at time t. The output is written as Ft+m, an estimate of x at time t+m, m>0 based on the data points to time t. Double exponential formula of smoothing is given by:

$$\begin{aligned} s_0 &= x_0 \\ s_t &= \alpha x_t + (1-\alpha)(s_{t-1} + b_{t-1}) \\ b_t &= \beta(s_t - s_{t-1}) + (1-\beta)b_{t-1} \\ F_{t+m} &= s_t + m b_t, \end{aligned} \tag{3}$$

Where α is the data smoothing factor, $0 < \alpha < 1$, β is the trend smoothing factor, $0 < \beta < 1$, and b_0 is taken as $(x_{n-1} - x_0)/(n - 1)$ for some $n > 1$. F_0 is undefined, because there is no estimation for time 0, and according to the definition $F_1=s_0+b_0$, which is well defined, and further values can be evaluated.

The R (1993) software is used to perform the Holt- double exponential smoothing of the Florida VMT time series. Figure 4-2 in the following page depicts the actual observations in black line and smoothed series in red line, while smoothed values are depicted as small red circles.

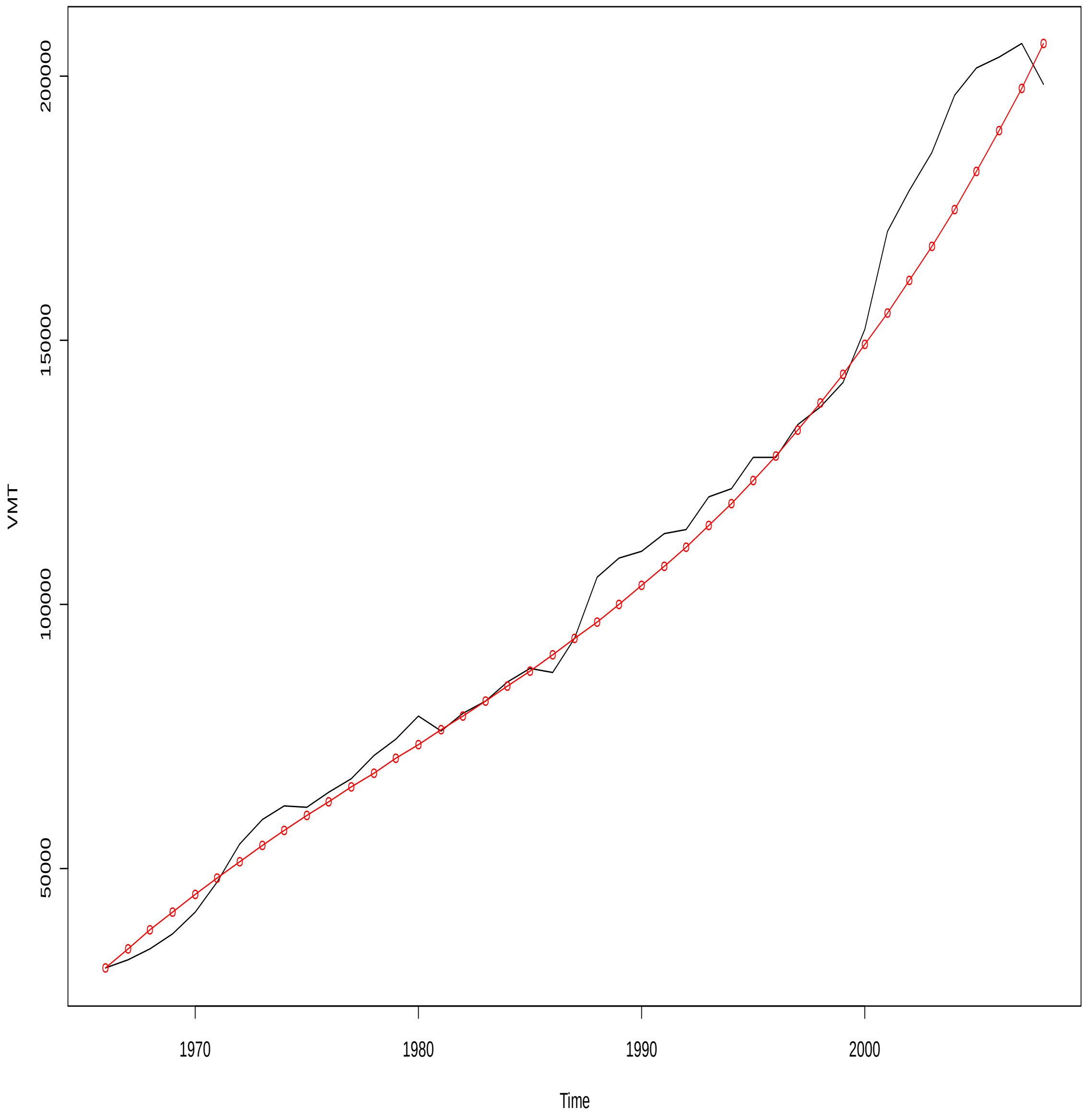


Figure 4-2: Smoothed Florida VMT Time Series

The next step is examination of the data for identification of any outlier(s). A model diagnostic of the residuals for the smoothed time series is utilized. The charts depicted in Figure 4-3, next page, clearly delineate the observation #43 as an outlier.

The plot of the fitted values vs. the residuals (upper left quadrant of the Figure 4.3), shows that all the residuals for all the observations are within +/- 1000 units of the fitted model, however the 43rd observation is more than 2000 units below the fitted model (represented by red line).

The plot of standardized residuals (residual divided by the observation value), as depicted in the upper right quadrant of the Figure 4-3, clearly indicates that all residuals fall within +/- 2% (theoretical quantile), but the 43rd observation falls at a -4% quantile. The broken line is plot of the fitted model and the small black circles are the standardized residuals expressed in theoretical quantile (percentage of a given residual divided by its observed value).

The plot of square root of the standardized residuals (scale location test), as depicted in the lower left quadrant of the Figure 4-3, is yet another indication of the observation 43 as an outlier. Once again the fitted model is shown by the red line and square roots of the residuals are shown in small black circles.

The plot of the standardized residuals vs. their leverage (their effectiveness to influence the fitted model) as depicted in the lower right quadrant of the Figure 4-3, indicates that all observation have less then +/- 2 of Cook's distance, however the 43rd observation has more than 4 units leverage. Cook's distance is a measure (scale) of an observation's leverage/influence.

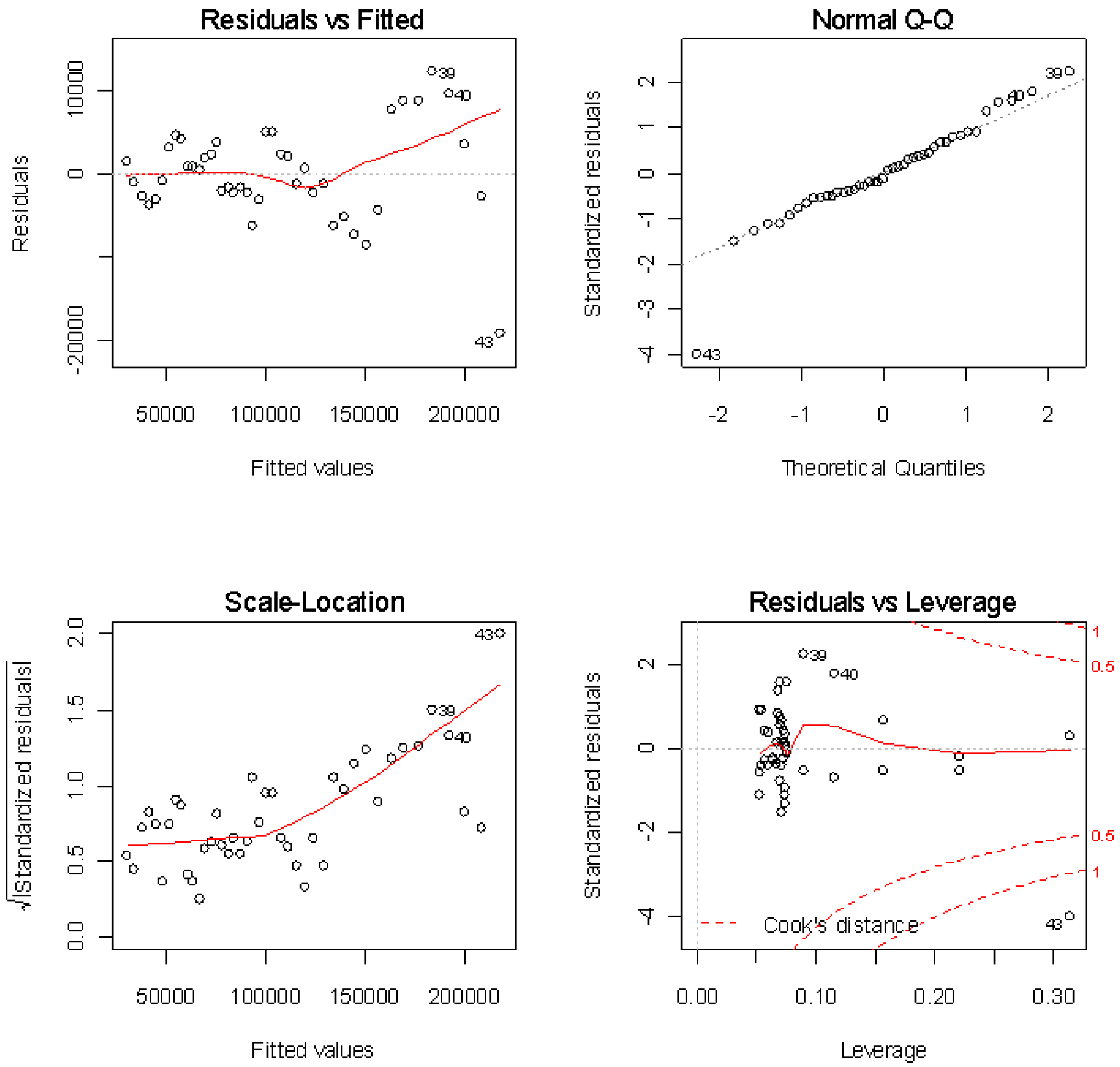


Figure 4-3: Residuals Analysis Results

Another extra test to confirm that the outlier is influential and maybe eliminated from the time series is comparison of the Holt-Winters forecast models with and without the outlier. This step serves another important purpose of utilizing the Holt-Winters exponential smoothing moving average to internally optimize and generate the best model under both scenarios (with and without observation #43). Plots of these two forecast models (Figures 4-4 and 4-5) show the forecast and the corresponding 95% confidence intervals. The actual observations are shown in by the black line, the red line represented the fitted model and the 95% confidence interval forecasts are shown in blue lines. Figure 4-4 depicting the model generation result for the time series with observation #43, clearly confirms the results of our previously presented residual analyses. The forecast model graph displays a significant declining trend for the future years VMT. This is clearly an unexpected and unacceptable trend. Based on the residual analyses and visual comparison of before and after models, the observation #43, as an outlier, is removed from the VMT time series and subsequent analyses. Figure 4-5 depicts the best selected model by utilizing Holt-Winters model selection/optimization and without the observation #43. It is noted that observation # 43 coincided with the beginning of the housing/financial market crisis (year 2008), when the impact on travel demand was the greatest.

In the subsequent section of this chapter, a discussion of identification (ARIMA notations of p, q, d) of this model and also the development of a second model is provided.

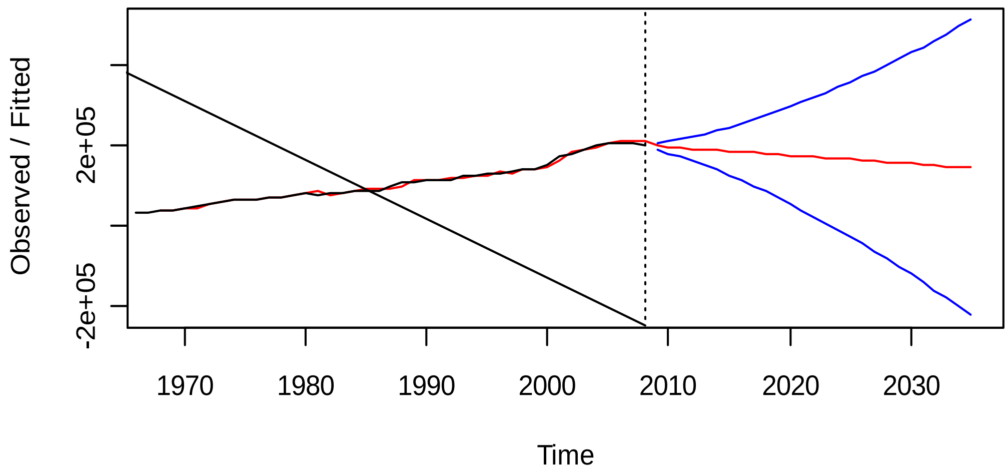


Figure 4-4: Holt-Winters Trend Analysis with the outlier (Observation #43)

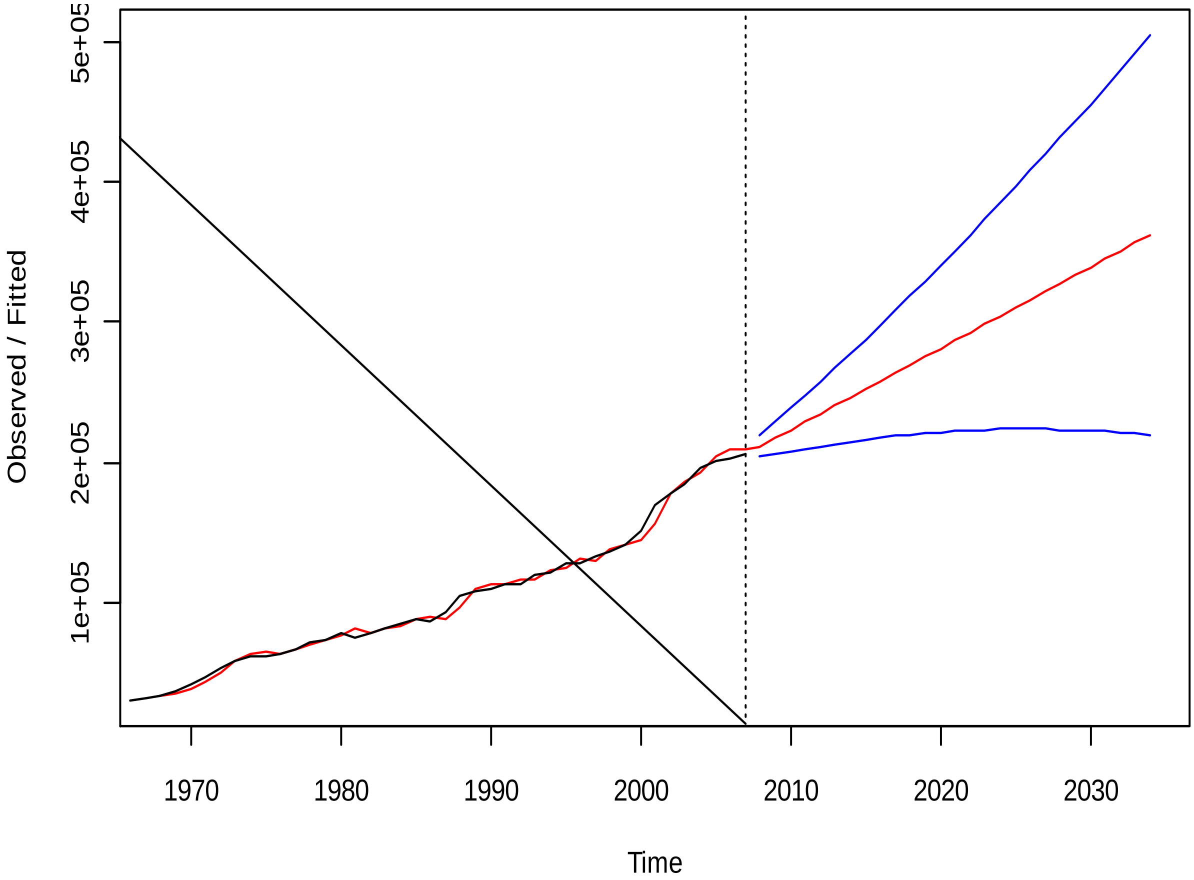


Figure 4-5: Holt-Winters Trend Analysis without the Outlier (Observation#43)

4.3 Time Series Model Development

Examination of the previously developed, Holt-Winters selected best model's Autocorrelation Factor (ACF), Partial Autocorrelation Factors(PACF) and order of differencing, not only assists in identifying that model with an ARIMA designation/notation (p, q, d), but also serves as a guide in selecting a new Box-Jenkins model.

The autocorrelation (Box and Jenkins, 1976) functions (ACF and PACF) can be used for the following two purposes:

1. Identify non-randomness in dataset.
2. Select appropriate time series model

Should we have data points: Y1, Y2, ..., YN at time X1, X2, ..., XN, the lag k (autocorrelation) is:

$$r_k = \frac{\sum_{i=1}^{N-k} (Y_i - \bar{Y})(Y_{i+k} - \bar{Y})}{\sum_{i=1}^{N} (Y_i - \bar{Y})^2} \tag{4}$$

The reason for lack use of the time variable, X, is that the observations are assumed equally spaced (VMTs are on an annual basis).

Autocorrelation is a correlation coefficient between two values of the same variable at times Xi and Xi+k.

The first lag autocorrelation is used to detect non-randomness. But in our case since the autocorrelation is used to identify an appropriate time series model, the autocorrelations is plotted for many lags.

Figure 4-6 depicts the ACF, PACF for 0-16 lags of our VMT time series:

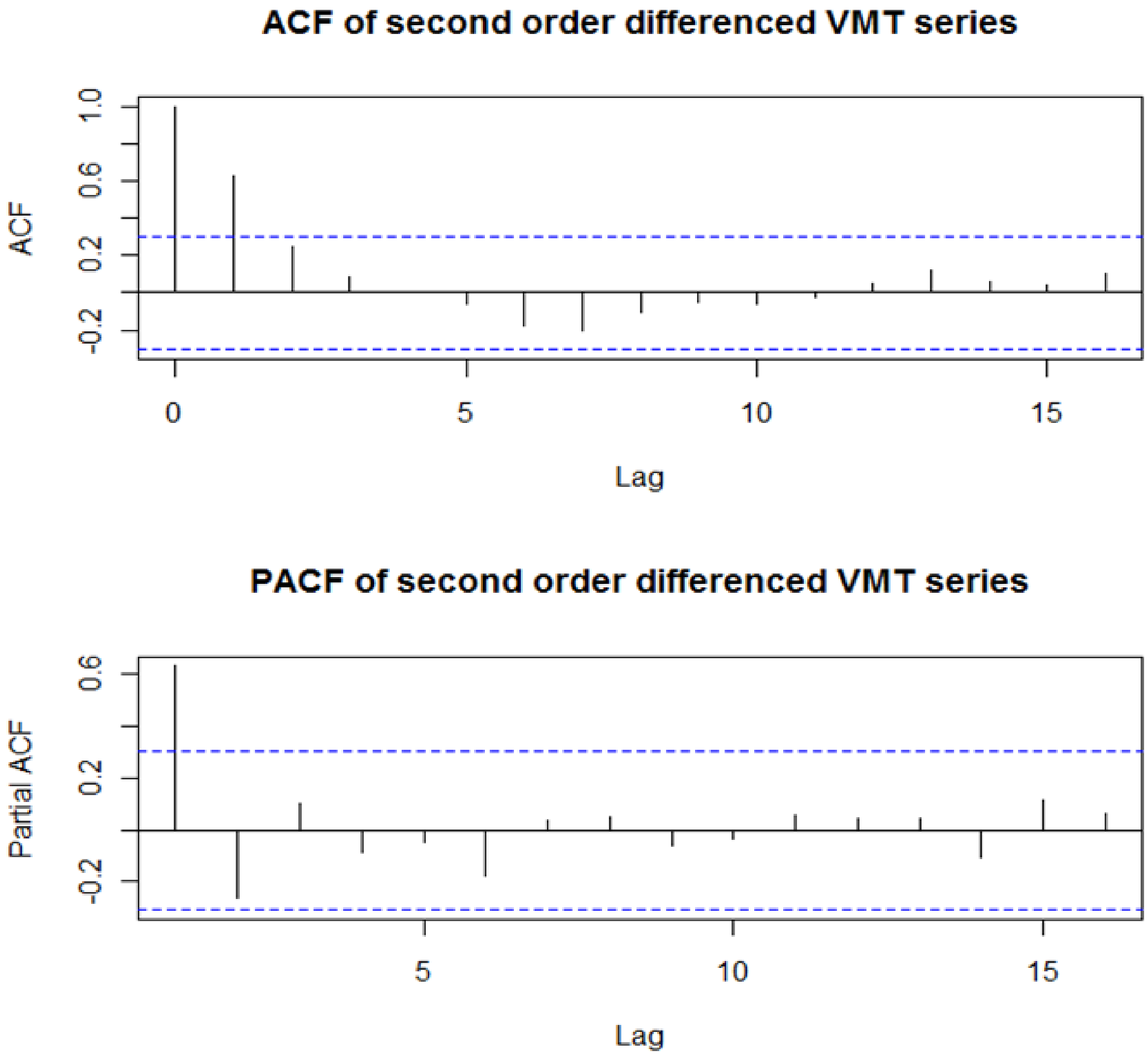


Figure 4-6: ACF and PACF of Holt-Winters Selected Model

The ACF and PACF of Figure 4-6, based on recommendations of Pankratz (1991), show that:

1. ACF having a set of exponential decays, and the PACF spiking at lag 1, a clear indication of one autoregressive (p) parameter, thus p=1.

2. ACF spiking at lag 1 and 2 and no correlation (ACF of -0.25 to + 0.25) for other lags, and PACF having a sine-wave pattern and a set of exponential decays at other lags, a clear indication of two moving average (q) parameter, thus q=2.
3. Since our time series data set was based on an annual observation, no seasonality differencing was performed, thus d=1.

Our first model as graphically depicted in Figure 4-4, and developed by Holt-Winters exponential smoothing method, is then an ARIMA (121).

Based on the above stated observations, we now begin development of the second time series model by utilizing the Box-Jenkins ARIMA methodology.

A commonly used method for model selection in time series analysis is to fit as many competitive models for the same data set and compare them using a model selection approach.

In the model selection process, ARIMA models for: p= 0, 1 and 2, q=1 and 2, and d=0, 1 and 2 a total of eighteen possible models were compared.

Akaike Information Criterion (AIC), a robust model selection tool, was utilized in our model selection process. "AIC is a measure of the relative goodness of fit of a statistical model. It can be said to describe the tradeoff between bias (accuracy) and variance (complexity) in model construction" (Akaike, 1974).

In the general case, the AIC is:

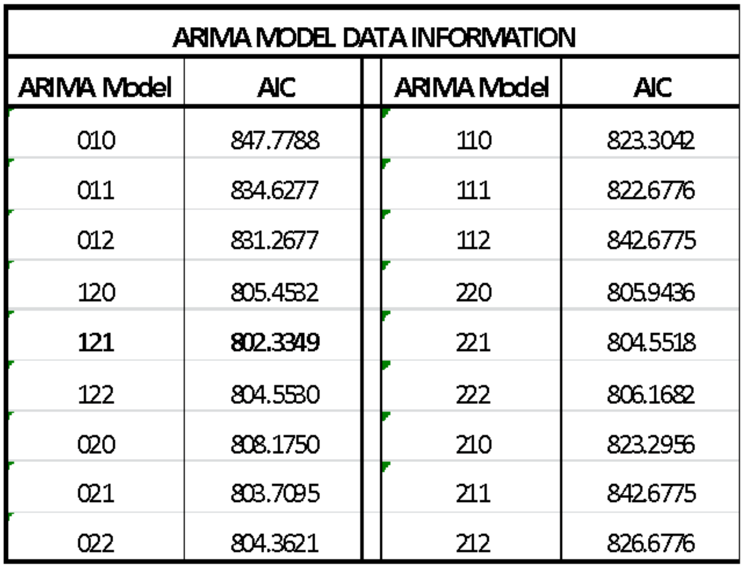
$$AIC = 2k - 2\ln(L) \tag{5}$$

k is the number of parameters in the statistical model, and L is the maximized value of the likelihood function for the estimated model.

The model with the lowest AIC value is the most appropriate model for any given time series.

The resulting AICs for the 18 competing ARIMA models are shown in Table 4-1. As depicted in the AIC list of the Table 4-1, the lowest AIC is for the ARIMA (121). This confirms our earler model selected by Holt-Winters method. Figure 4-6 of the next page depicts the selected Box-Jenkins ARIMA(121) Model plot of forecasts (solid red line) and the corresponding 95% confidence interavels (broken blue lines).

Table 4-1: Arima Model & AIC



ARIMA MODEL DATA INFORMATION			
ARIMA Model	AIC	ARIMA Model	AIC
010	847.7788	110	823.3042
011	834.6277	111	822.6776
012	831.2677	112	842.6775
120	805.4532	220	805.9436
121	**802.3349**	221	804.5518
122	804.5530	222	806.1682
020	808.1750	210	823.2956
021	803.7095	211	842.6775
022	804.3621	212	826.6776

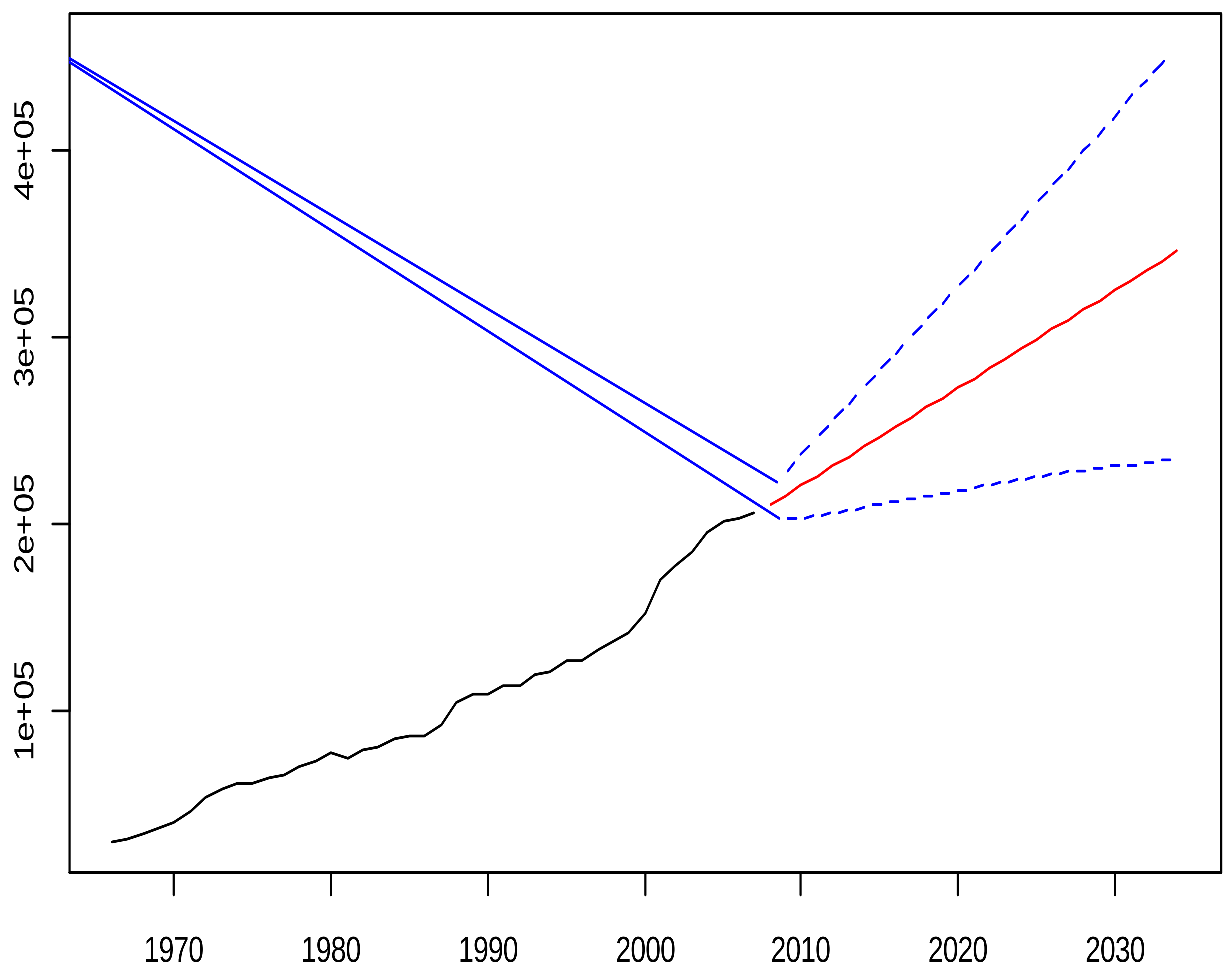


Figure 4-7: Year 2011-2035 VMT Forcasts – ARIMA (121) Model

The estimates of the ARIMA (121) model coefficients (in red ink) are obtained by R, 1993, and are provided below:

```
Arima(order = c(1, 2, 1))

Coefficients:
        ar1      ma1
     0.3139  -0.9244
s.e.  0.1821   0.0941

sigma^2 estimated as 12869686,  AIC = 802.33
```

The “ar1” is the Autocorrelation Regression (AR) coefficient and “ma1” is the Moving Average (MA) coefficient. Sigma^2 is the variance of the errors/residuals (ε).

The final model, per Box-Jenkins definition, is then estimated as:

$$(1-0.9244\mathrm{L})(1-L)^2 y_t=(1+0.3139\,L)\varepsilon_t. \tag{6}$$

Where: y_c is the observation for year t, t is current/first forecasting year, t-1 is the year before, t-2 is two year ago and so on. L, short for Lag, is the order of exponential smoothing, in our case L=1.

The same model can be put in more familiar form as:

$$y_t-2\mathrm{y}_{t-1}+y_{t-2}-0.9244\,y_{t-1}+1.8488\mathrm{y}_{t-2}-0.9244\,y_{t-3}=\varepsilon_t+0.3139\varepsilon_{t-1}. \tag{7}$$

$$y_t=2.9244\,y_{t-1}-2.8488\mathrm{y}_{t-2}+0.9244\,y_{t-3}+\varepsilon_t+0.3139\varepsilon_{t-1}. \tag{8}$$

Finally, a model diagnoses is run. The Ljung-Box Statistic is utilized in assessing the selected model performance.

The Ljung–Box test can be defined as follows (Ljung and Box, 1978).

H_0: The data are independently distributed (i.e. the correlation is 0).

H_a: The data are not independently distributed.

The test statistic is:

$$Q = n\left(n+2\right)\sum_{k=1}^{h}\frac{\hat{\rho}_k^2}{n-k} \tag{9}$$

In the above equation *n* is the sample size, $\hat{\rho}_k$ is the sample autocorrelation at lag *k*, and *h* is the number of lags. For α degree of confidence, the rejection region of $\mathbf{H_0}$ is

$$Q > \chi^2_{1-\alpha,h} \tag{10}$$

The results of model diagnoses from R, 1993, are presented below and indicate that:

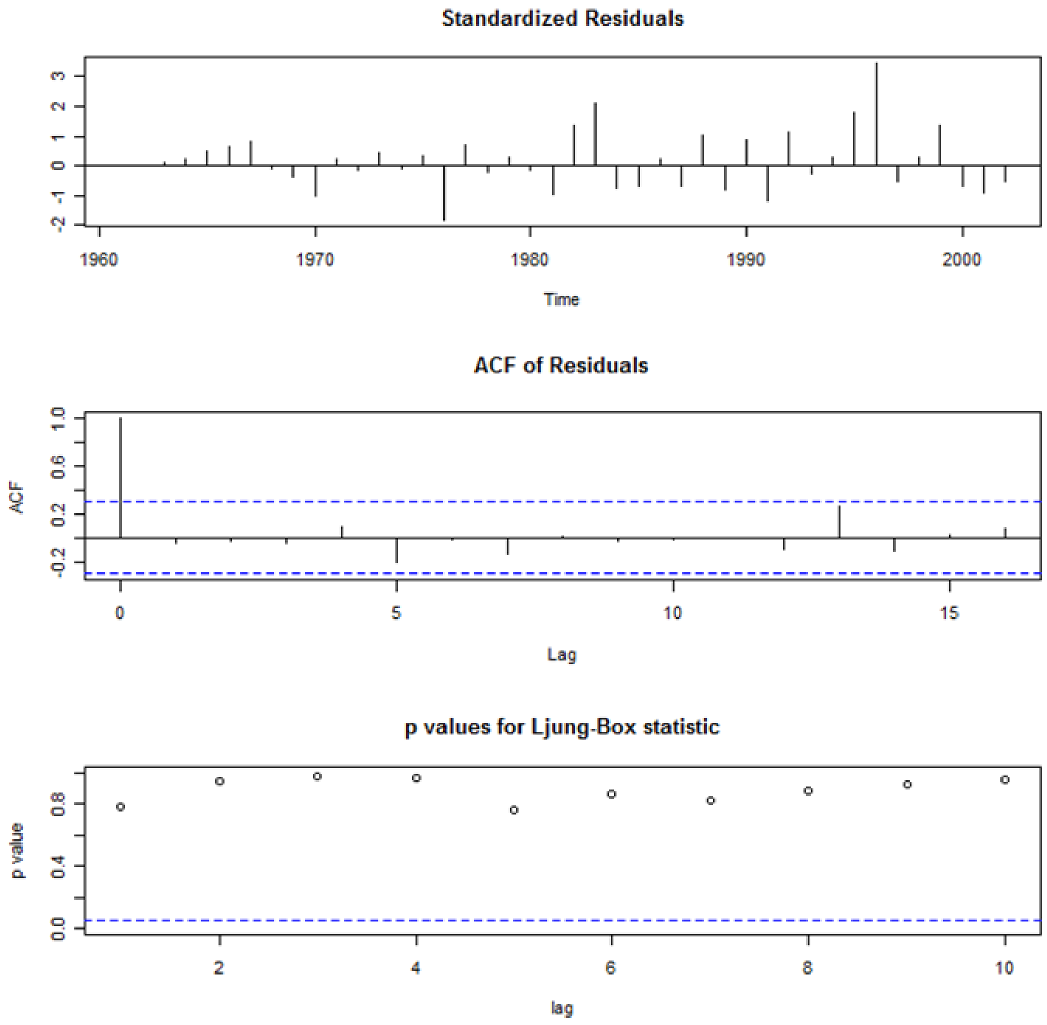


Figure 4-8: Model Diagnosis from R

1. As can be seen in the very bottom display of the previous page, the Lejung-Box Statistic values at all lag levels are very close to 1, suggesting there is almost no-correlation.
2. The top graph depicting the estimated values of the standardized residuals shows them within 3 units from zero and not displaying any pattern, a great indication of no-correlation.
3. Lastly yet another clear indication of no-correlation, as displayed by the middle graph of the ACF values. The ACF values are within the -.0.25 and + 0.25 range at all lag level from 1 to 16.

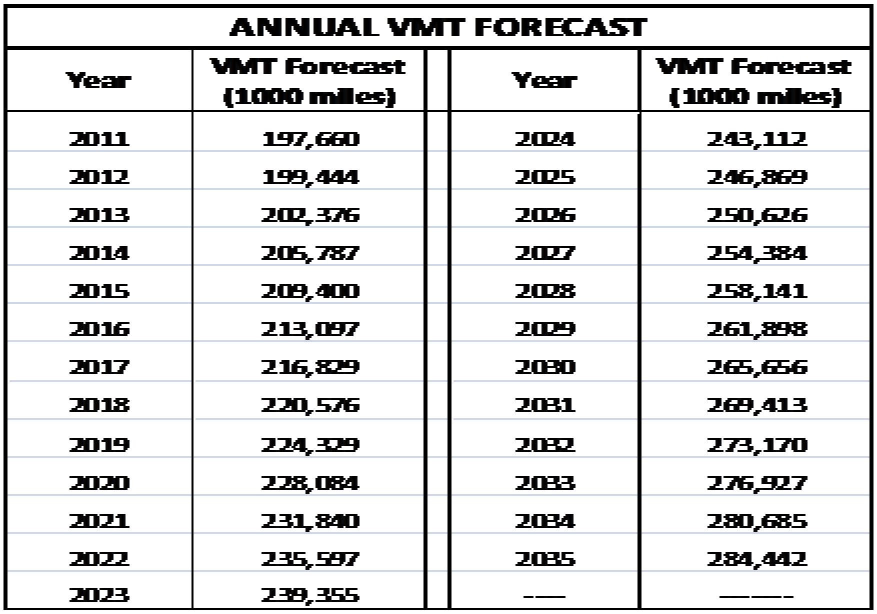
It is concluded that the ARIMA (121) is an appropriate model for the Florida VMT time series data and forecast.

The next section of this chapter presents the VMT forecasts for the future years and corresponding 95% confidence intervals.

4.4 VMT Forecasts

Utilizing the (R, 1993) software and our selected ARIMA (121) model we now can generate future annual VMT forecasts for our analyses period. The predicted values for years 2011 through 2035 from the R, 1993 are presented in Table 4-2.

Table 4-2: VMT Forcast Values (Year 2011 through 2035)



ANNUAL VMT FORECAST			
Year	**VMT Forecast (1000 miles)**	**Year**	**VMT Forecast (1000 miles)**
2011	197,660	2024	243,112
2012	199,444	2025	246,869
2013	202,376	2026	250,626
2014	205,787	2027	254,384
2015	209,400	2028	258,141
2016	213,097	2029	261,898
2017	216,829	2030	265,656
2018	220,576	2031	269,413
2019	224,329	2032	273,170
2020	228,084	2033	276,927
2021	231,840	2034	280,685
2022	235,597	2035	284,442
2023	239,355	---	-----

The forecasts display a moderate and reasonable annual growth rate of approximately 1.4% for the period between 2011 and 2035. This growth rate is noticeably lower than both the state and national VMT of the past 25 years (FHWA, 2011). At a national level and similarly for the State of Florida, the annual VMT grew at a rate of approximately 2.3% from 1984 to 2009. Polzin and Chu 2009 attributed these more moderate rates (forecasted 1.4% vs. historical 2.3%) of annual vehicle miles of travel growth in future to national mobility trends, socio-demographic conditions and travel behavior.

The State of Florida's population growth for the analyses period was researched to draw a comparison to the model generated VMT forecast. State's population for the year 2010 is estimated grow from 18.843 million to 26.639 million by the year 2035(Woods and Poole, 2009). This population annual growth rate of 1.4% equals the VMT annual growth rate of our

Time Series forecasted model. Employment of 9.780 million in 2010 is expected to grow to 14.980 million by 2035 at an annual growth rate of 1.7% (Woods and Poole, 2010). Bureau of Economic and Business Research (BEBR) in their 2010 Florida Statistical Abstract (BEBR, 2010) provided population forecasts for the state of Florida at an annual growth rate of 1.2% for the analyses period. It is noted that BEBR, 2010 provided three set of forecast annual growth rates, low, medium and high. The 1.2% utilized above is the medium growth scenario.

Another comparison of the model generated VMT annual growth rate was achieved by researching the national annual economic growth rate. While the model forecast of VMT for the analyses period yielded an annual growth rate of 1.4%, the national annual economic growth rate is projected to be 2.7% for the same forecast period (Holtberg, 2011). BEBR, 2010 forecasted an employment annual growth rate of 3.1% for the non-agricultural jobs between 2009 and 2017 for the state of Florida..

During the past 25 years, the State of Florida has accounted for approximately 6.8% of the national VMT.

The Florida's annual VMT forecasts for year 2015 through 2035 is utilized in the financial analyses of the next chapter in assessing impacts of various pricing policies/strategies.

5 FINANCIAL ANALYSES

5.1 Overview

This chapter is to utilize the Florida's VMT forecasts of years 2015 through 2035 (analyses period) as an input to the financial model in order to assess the revenue impacts of various pricing strategies.

The financial model's first entry is the annual VMT forecast. Based on a calculated (historical and estimated) truck percentage (truck factor; the percentage of truck VMT to total VMT), the VMT for autos and truck is then calculated. Truck and auto VMT's are then divided to their corresponding fuel efficiencies to calculate the gasoline and diesel gallons consumption for auto and trucks respectively. Multiplication of appropriate local, state and federal gas/diesel taxes produces the annual gas/diesel revenues for autos and trucks. Subtracting the cost of administration and collection of the diesel/gas taxes, the net annual revenue is then calculated.

On the cases of the MBUF, the auto and truck VMT's are simply multiplied by the per mile equivalent of the local, state and federal taxes (fees) to produce the annual gross revenues. The net annual revenues are then calculated by subtracting the administration and collection costs from the gross annual revenues.

In subsequent sections, further decomposition (rural and urban, peak period and non-peak period) of the auto and truck VMT is performed to assess the financial impacts of various pricing policies.

A discount rate is then applied to convert the annual revenues to the Present Day Value (PDV) or year 2015 dollars.

The first two sections of this chapter provide an assessment of the current per gallon pricing (current fuel tax regime), and the calculation of the equivalent per mile rates for the current fuel tax regime. The remainder of this chapter examines financial impacts of various pricing strategies/scenarios by utilizing the financial model.

The Cases to be financially assessed include:

1. Examination of revenue impacts of current fuel taxes (TPG) – this is the baseline. Included in this section are the financial analysis for the impacts of the CAFE standards and potentially CPI indexing the federal taxes.
2. Examination of the revenue impacts due to conversion of the current TPG to an MBUF rate equivalent of the current per gallon taxes (MBUFE).
3. Examination of the revenue impacts due to area type pricing (ATMBUF). In this scenario, the travel on the State Highway System (SHS) in the urban area is charged an additional 25% on top of the MBUFE.
4. Examination of the revenue impact due to time of day pricing (ToDMBUF). In this scenario, the travel on SHS during the peak period is charged an additional 25% on top of the MBUFE.
5. Examination of the congestion pricing (CPMBUF). In this scenario, travel during peak periods in urban area on SHS is assessed an additional %50 on top of the MBUFE. This reflects the combined effect of scenarios 3 and 4. Urban off peak and rural peak on SHS are assessed an additional %25 on top of the MBUFE. All other travels are assessed at the MBUFE.

Table 5-1 depicts the rates for the above pricing policies and will be thoroughly discussed in the subsequent sections.

Table 5-1: Pricing Policy Rates

Pricing Policy	**Non-SHS**	**SHS**			
		Urban		**Rural**	
		Peak Period	**Non-Peak Period**	**Peak Period**	**Non-Peak Period**
MBUF	MBUFE	MBUFE	MBUFE	MBUFE	MBUFE
ATMBUF	MBUFE	1.25*MBUFE	1.25*MBUFE	MBUFE	MBUFE
ToDMBUF	MBUFE	1.25*MBUFE	MBUFE	1.25*MBUFE	MBUFE
CPMBUF	MBUFE	1.5*MBUFE	1.25*MBUFE	1.25*MBUFE	MBUFE

5.2 Assessment of the current per gallon fuel tax regime

Fuel taxes are the oldest continuous source of funding for the transportation infrastructure in the State of Florida (OFD, 2011). Levied at a rate of one cent per gallon beginning in 1921, the tax escalated to a rate of 8 cents per gallon by 1971. The state fuel tax remained unchanged until 1983; the proceeds were shared by FDOT (4 cents per gallon) and local governments (4 cents per gallon) evenly. Beginning in 1972, counties were empowered to impose additional fuel taxes of their own and receive the associated proceeds. Because of these so-called “local options”, taxes now take several forms.

In April 1983, the state fuel taxes were dramatically revised. The FDOT share of the existing excise tax was repealed to a point that all that remained, was the local government share, which has been distributed to the counties (3 cents per gallon) and cities (one cent per gallon). In place of the FDOT’s four cents per gallon, a sales tax was applied to the sales of all roadway users gasoline and diesel fuels, with all proceeds going to the FDOT.

In 1990, the Florida legislature passed the biggest transportation tax increase in the history of the FDOT. The fuel sales tax was raised (and indexed to increase annually based on the general CPI), additional fuel excise taxes were levied, and other user fees (motor vehicle license, initial registration, motor vehicle title, and rental car) were imposed (F. S. 206, 2011). As the latter user fees are not fuel taxes and are not collected on a per gallon consumption/purchase basis, they are not the subject of this proposal and any subsequent analyses.

Along with raising the rate and modifying the composition of the fuel taxes, the 1990 legislature enacted levying an additional excise tax on all roadway fuels.

This new excise fuel tax is known as; State Comprehensive Enhanced Transportation System (SCETS) tax. The SCETS has three unique features: First, its proceeds must be spent (as practical as possible) in the transportation district that the tax was generated. Second, the rate of the gasoline tax varies by county and was initially set at two-thirds of the total optional fuel tax rate that existed in each county, not to exceed four cents per gallon. Third, the SCETS tax on diesel fuel was imposed at a standard rate of one cent per gallon in every county, and increased at the rate of one cent per year until it reached the maximum SCETS tax on gasoline.

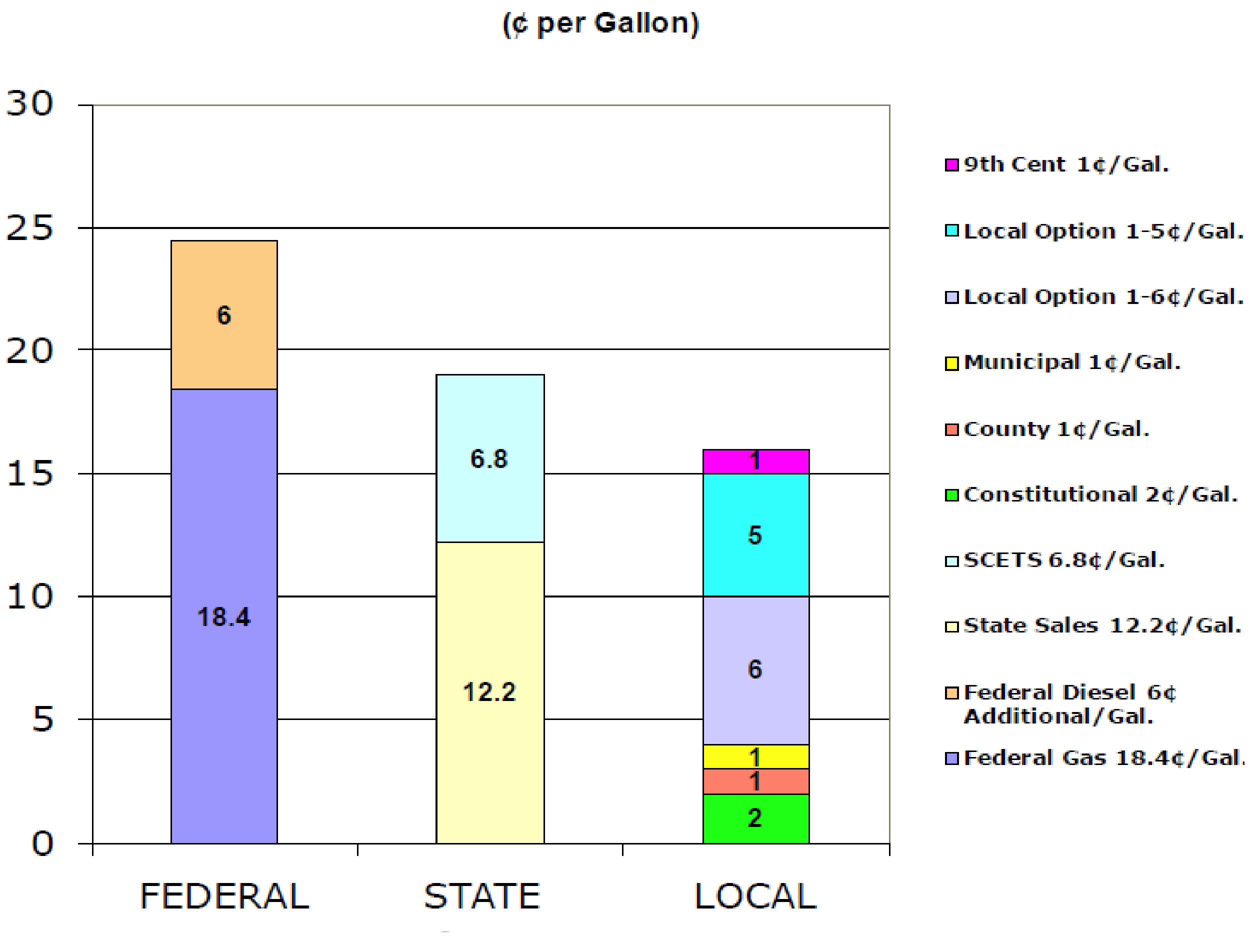
Similar to the fuel sales tax, the SCETS tax is indexed to the general rate of the inflation (CPI, all items).

Figure 5-1 depicts the current (year 2011) fuel tax rates for the Florida motorists.

The first column of the Figure 5-1 displays the current federal gasoline and diesel tax rates of 18.4 and 24.4 cents per gallon respectively. The federal taxes have not increased since 1993. The second column displays the current state fuel taxes, which is annually CPI adjusted. The third column is the “Local Option” fuel taxes. These taxes have generally reached their legal ceiling.

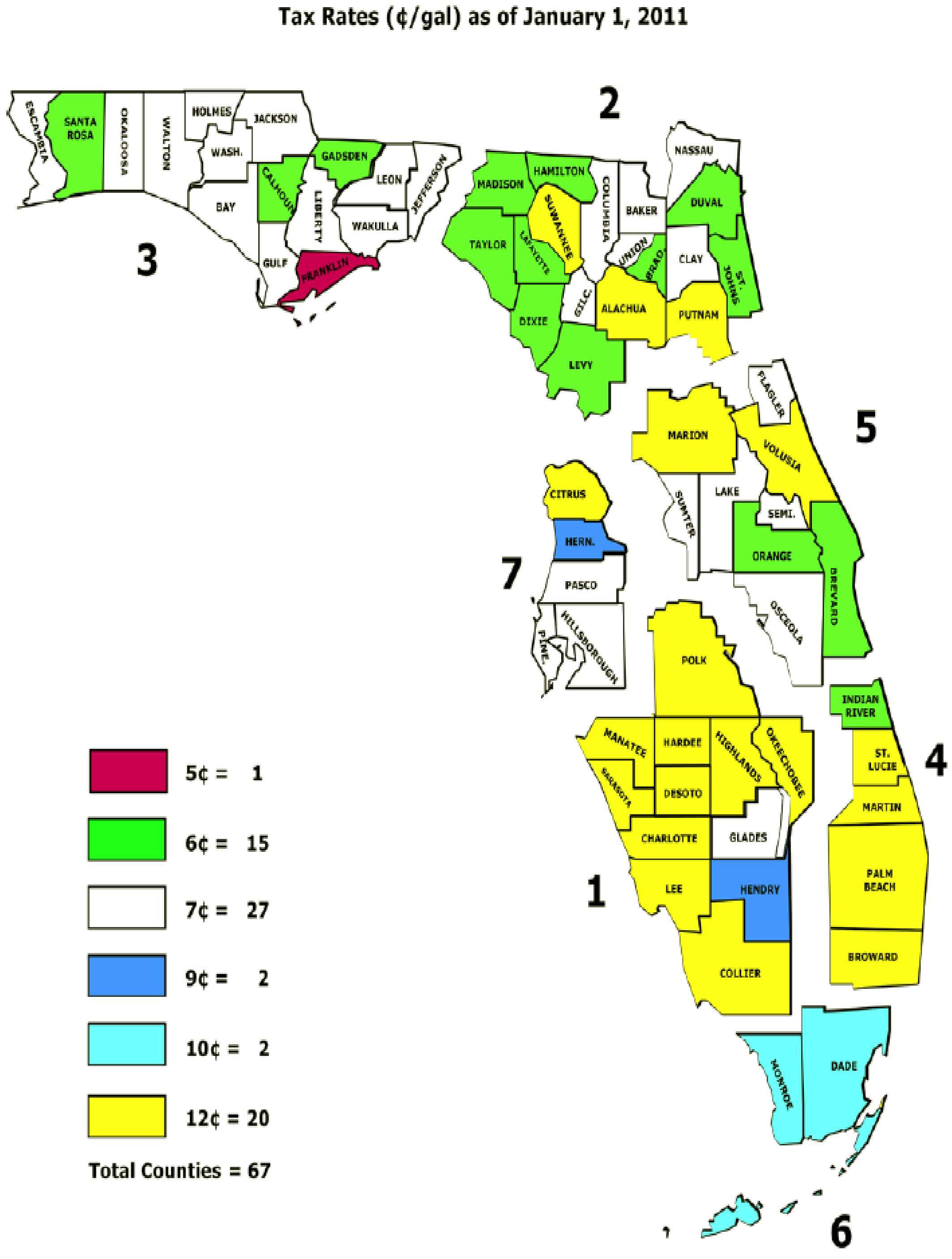
Figure 5-2 on the following page depicts the year 2011, locally imposed motor fuel taxes for Florida’s counties.

Federal excise taxes on fuels used in roadway travel were initially levied beginning in 1932 at a rate of one cent per gallon. This rate went through periodic increases and reached the four cent per gallon rate by 1959. It remained unchanged until January 1, 1979, when gasohol was accorded a full exemption from the entire tax. On April 1, 1983, the rates on diesel and gasoline were raised to nine cents per gallon. On August 1, 1984, the tax on diesel was raised to fifteen cents per gallon. The Omnibus Budget Reconciliation Act of 1990, whose primary purpose was to manage the budget deficit, imposed new fuel taxes. One half of these increases were directed to the general funds and the remaining half to the highway trust fund. In general, this law increased the federal gasoline tax from nine to fourteen cents per gallon, and the diesel tax from fifteen to twenty cents per gallon.



(OFD, 2011)

Figure 5-1: Florida’s Motor Fule Taxes



(OFD, 2011)

Figure 5-2: Florida's Locally Imposed Motor Fuel Taxes

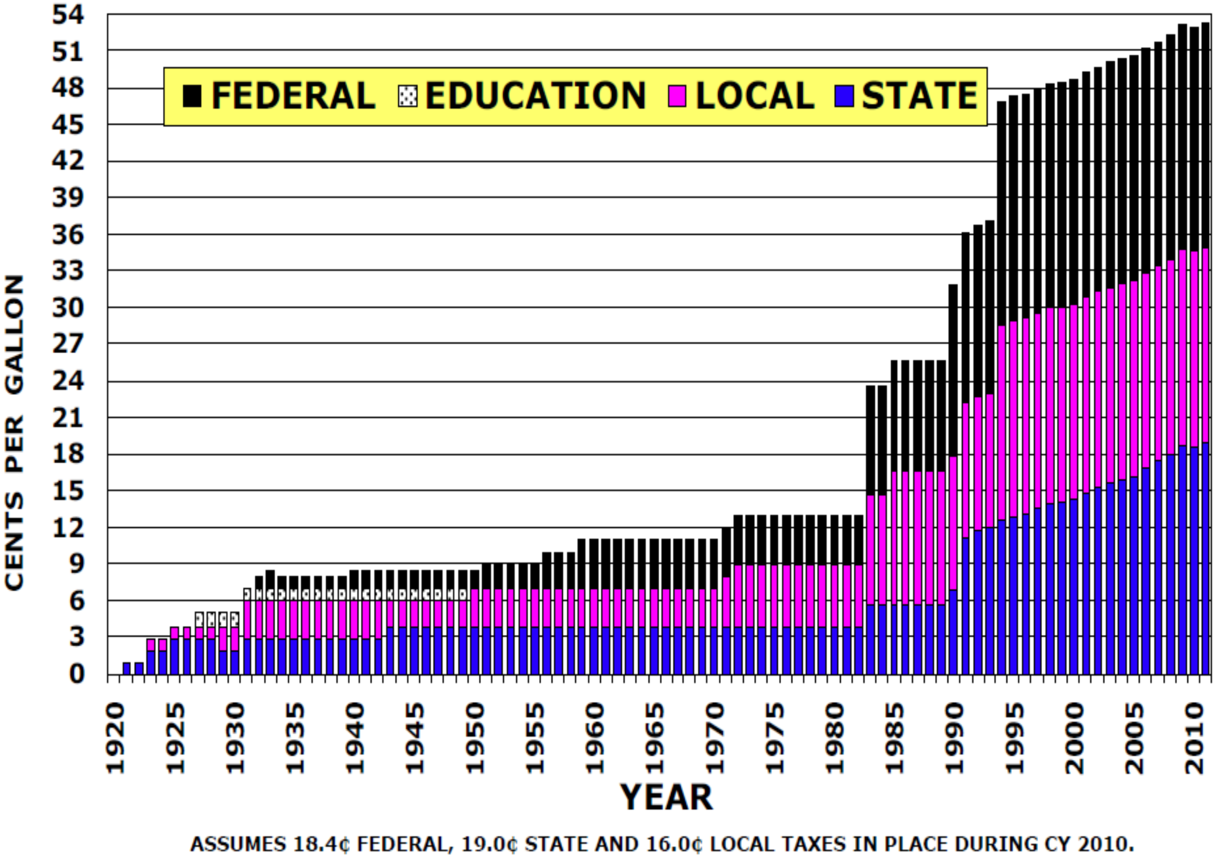
In another effort to decrease the federal budget shortfall, congress enacted the Omnibus Budget Reconciliation Act of 1993.

This legislation added another 4.3 cents per gallon to the rates of fuel taxes, with all proceeds going to the general revenue fund to reduce the deficit. In 1997, with an improved budget deficit outlook, congress redirected the 4.3 cents gas tax back to the highway trust fund (FHWA, 2005).

Figure 5-3, on the following page depicts the historical gasoline tax rates from 1921 to 2010 for the State of Florida's consumers/motorists.

As stated previously, and graphically evident in the Figure 5-3, the federal gasoline taxes have remained constant since 1993 (at a flat rate of 18.4 cents per gallon). Similarly, the local taxes have reached and remained at the sixteen cents per gallon rate level. The state fuel tax rates (fuel sales and SCETS), due to CPI indexed pricing; have generally experienced an annual average increase of 2.66% for the past twenty years. In accordance with the current federal, state and local tax laws, the analyses of the subsequent sections utilizes constant federal and local fuel tax rates, while the state fuel tax rates are CPI indexed. To examine the sensitivity of the financial analyses to the federal fuel taxes, a CPI indexed federal fuel tax is also utilized in some of the subsequent analyses.

The next section of this chapter presents the calculation of per mile tax rates equivalent of the current fuel tax regime.



(OFD, 2011)

Figure 5-3: Florida's Historical Motor Fuel Taxes

5.3 Calculation of the equivalent per mile rates for the current fuel tax regime.

As described in the previous section, the current per gallon rates of the local, state and federal taxes for the State of Florida's motorist, as depicted in the Table 5-2, are:

Table 5-2: Per Gallon Fuel Taxes (in cents)

Fuel Type	Federal Tax	Local Tax	State Tax	Total Tax
Gasoline	18.4	19	16	53.4
Diesel	24.4	19	16	59.4

(OFD, 2011)

The fleet fuel efficiency, in terms of miles per gallon, for autos/ light trucks, and medium/heavy trucks is utilized to convert the above per gallon rates to the corresponding per mile rates.

Auto and light trucks are defined as vehicles with gross weights less than 8,500 pounds, while medium and heavy trucks are defined as trucks with gross weights more than 8.500 pounds (Portney and Morrison, 2002).

The autos' average fleet fuel efficiency has improved dramatically since 1975. According to an Environmental Protection Agency (EPA) report (Morris, 2008), a fuel efficiency improvement of 42.8% for years 1975 to 2008 has been achieved, bringing the national average from approximately 14 MPG to nearly 20 MPG. More detailed discussion of the improved fuel efficiency rates, contributing factors, projection of future rates as result of the CAFE standards and their impacts to fuel tax revenues is provided in the subsequent sections.

The latest estimate for the national average fuel efficiency (passenger cars and light trucks) for the year 2010 is approximately 20.2 MPG (Davis, et al. 2011).

The aforementioned MPG estimate pertains mainly to gasoline consuming vehicles (passenger cars and light trucks), and is utilized in conversion of the per gallon tax rates to equivalent per mile tax rates.

For conversion of the per gallon tax rates to their per mile equivalents for diesel, a heavy truck fuel efficiency rate of 5.1 MPG is utilized (NHTSA. 2010).

Based on per gallon tax rates of Table 5-2 and estimated fuel efficiencies of 20.2 MPG and 5.1 MPG for autos and trucks respectively, per mile equivalent rates for 2011 Florida's federal, state and local taxes are calculated.

Table 5-3: MBUFE of Florida's 2011 TPG (in cents)

2011	Fuel Type	Federal Tax	Local Tax	State Tax	Total Tax
TPG (cents per gallon)	Gasoline	18.4	19	16	53.4
	Diesel	24.4	19	16	59.4
MBUFE (cents per mile)	Gasoline	0.9109	0.9406	0.7921	2.6436
	Diesel	4.7843	3.7255	3.1373	11.6471

The above tabulated MBUFE's are utilized as a basis of the subsequent sections financial analyses.

5.4 Examination of the revenue impacts due to CAFE and other federal fuel efficiency mandates/initiatives

This section of the dissertation is to examine the fuel tax revenue impacts of CAFE standards and other federal fuel efficiency mandates/initiatives. First, a chronological summary of the past fuel efficiency laws and initiatives is provided, followed by an elaboration on the data and parameters utilized as input to the financial model, and lastly, an explanation of the six financial model runs and revelation of the results from these financial model runs.

The CAFE regulations, first enacted in 1975, and intended to improve fuel efficiency of cars and light trucks in the US, in the aftermath of the 1973 Arab Oil Embargo. It traditionally is the sales volume weighted harmonic mean of fuel efficiency for the model passenger cars and light trucks with less than 8,500 pounds gross weight. If the average fuel efficiency of an auto maker's annual fleet falls below the specified standard, the manufacturer must pay a penalty. Its initial near term goal was to double the fuel efficiency of the cars by year 1985, reaching 27.5 MPG as an average. CAFE has different standards for passenger cars and light trucks.

The market share of light trucks has grown steadily from 9.7% in 1979 to 47% in 2001 and has remained in 50% numbers up to 2011.

The NHTSA regulates CAFE standards, and the US EPA measures vehicles fuel efficiency.

The Energy Tax Act of 1978 established a "Gas Guzzler" tax on individual passenger car model (not trucks, vans, minivans or sport utility vehicles) that get less than 22.5 miles per gallon (NHTSA, 2007). The CAFE standards have historically been expressed in harmonic mean, not a simple arithmetic mean.

The CAFE standards received their first revision in more than thirty years by the passage of the Energy Independence and Security Act of 2007. This act required that auto makers increase their model year fleet gas mileage to 35 MPG by the year 2020. This requirement applied to both passenger cars and light trucks.

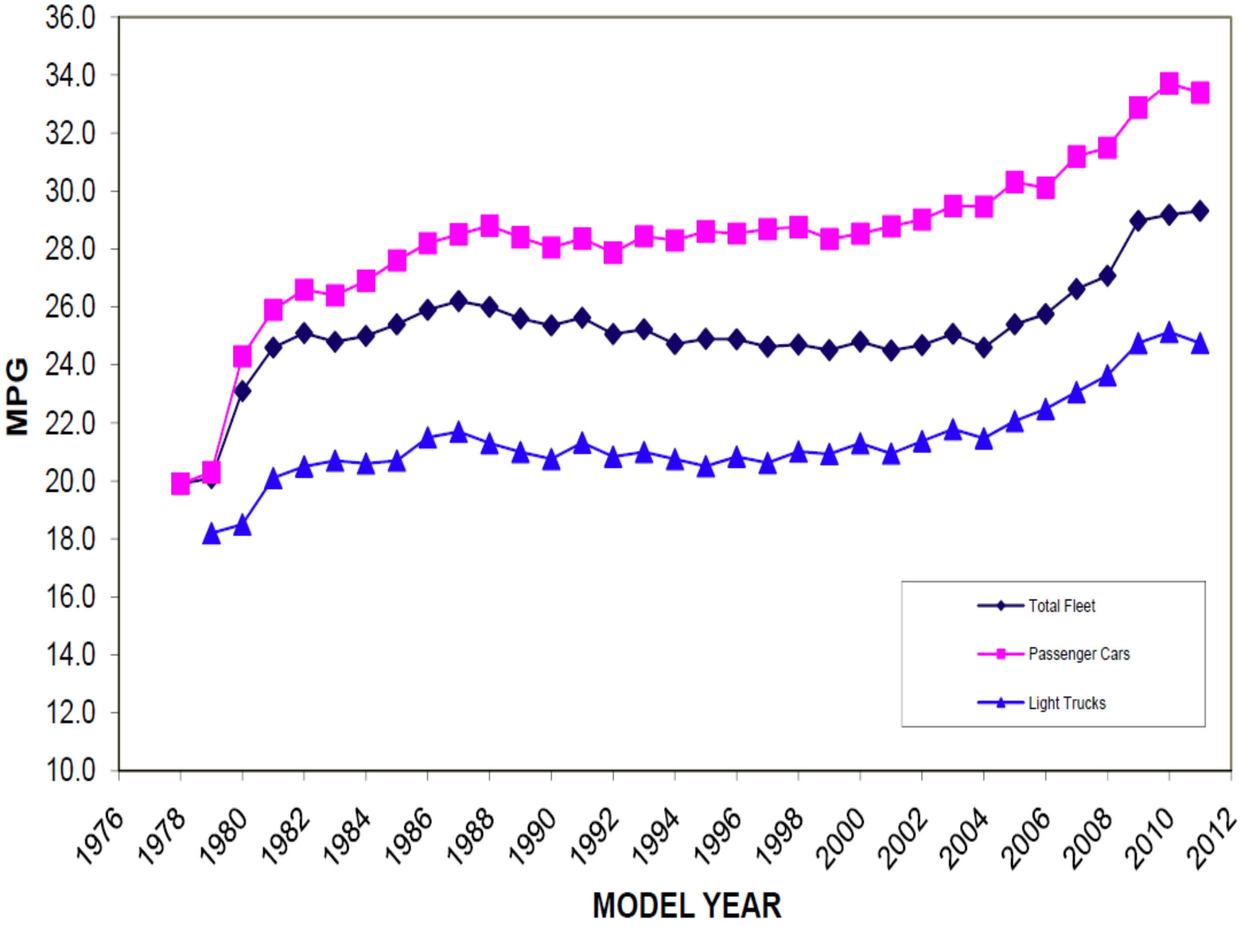
On May 19, 2009 the Obama administration proposed a new federal fuel economy initiative to bring about uniform standards to improve both fuel economy and greenhouse gas emissions. It raised the standards for years 2012 through 2016 to an average of 35.5 MPG (39

MPG for passenger cars and 30 MPG for light trucks). More recently, on July 29, 2011, the White House press released the Administration's CAFE standards for years 2017 through 2025.

The new CAFE goals are 54.4 MPG for the model year fleet-wide average, 61 MPG for average passenger car and 44 MPG for light trucks by the year 2025 (White House Press, 2011).

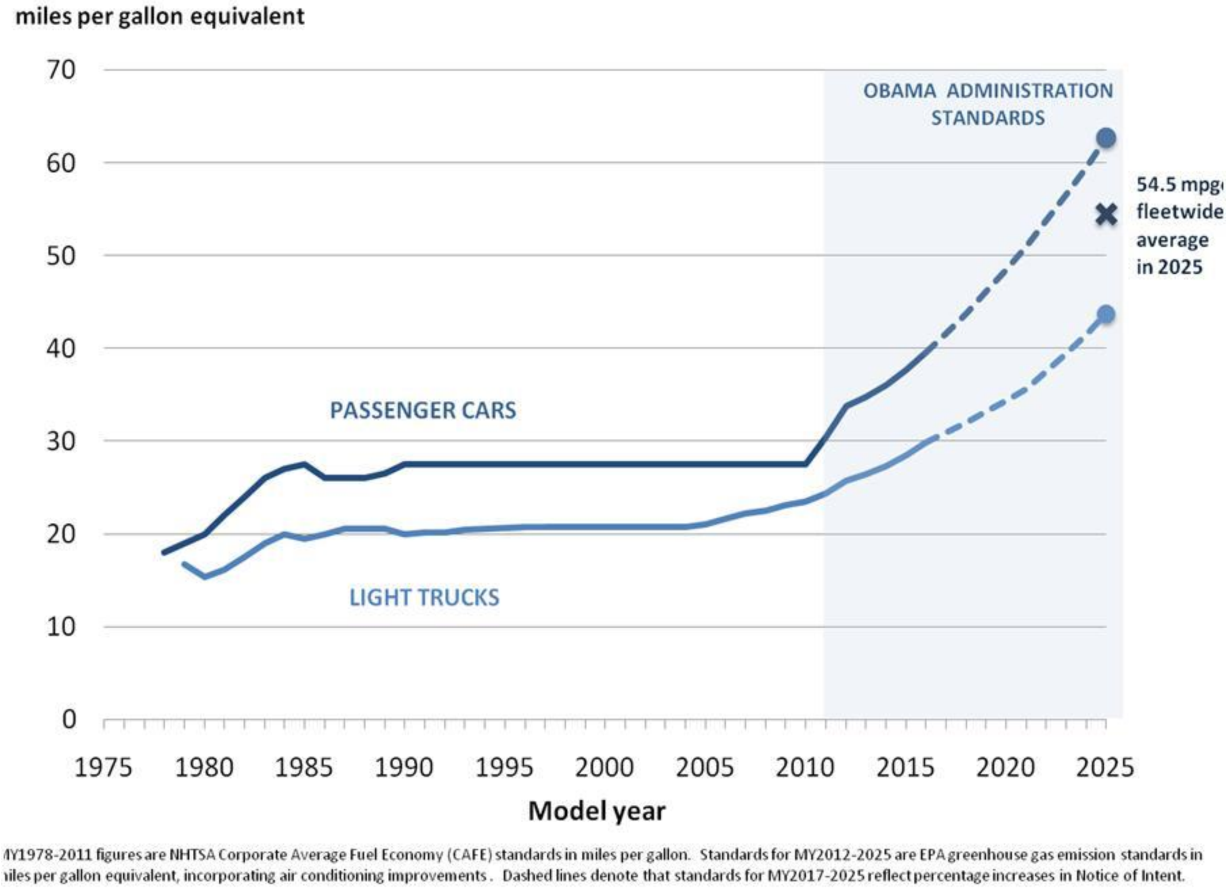
Figures 5-4 and 5-5 on the following pages depict the historic CAFE standards and President Obama's proposals. These trends/ standards are later discussed during the data entry for the financial model.

In August 2011, for the first time ever, the Obama Administration announced the fuel efficiency standards for medium and heavy trucks (gross weight more than 8,500 pounds). The new standards are for truck models 2014 through 2018 and are to increase the fuel efficiency by 20% (EPA, 2011).



(White House Press, 2011)

Figure 5-4: Historic CAFÉ Standards (Arithmetic Means)



Y1978-2011 figures are NHTSA Corporate Average Fuel Economy (CAFE) standards in miles per gallon. Standards for MY2012-2025 are EPA greenhouse gas emission standards in iles per gallon equivalent, incorporating air conditioning improvements. Dashed lines denote that standards for MY2017-2025 reflect percentage increases in Notice of Intent.

(White House Press, 2011)

Figure 5-5: New CAFÉ Standards (Arithmetic Means)

In order to assess the tax contributions of autos and trucks based on their fuel efficiencies and tax rates, the annual VMT's need to be decomposed. The VMT decomposition will result in annual auto VMT and annual truck VMT.

Trucks have accounted for approximately 6.4% of Florida's total VMT during the past ten years (FDOT, 2010). Table 5-4 presents the historical truck percentages of the total annual VMT for years 2001 thru 2010.

Table 5-4: Historical Truck Percentages

Year	01	02	03	04	05	06	07	08	09	10	Average
Truck Factor (%)	7.9	7.0	6.8	6.5	6.1	6.0	6.0	5.8	6.1	6.1	6.4

(FDOT, 2010)

In subsequent analyses, and as an entry to the financial model, the average value of 6.4% for truck percentage as a baseline is utilized in decomposing the total VMT into, auto and truck annual VMT. However, a range of 5.5% to 7.5% in 0.5% increments for the truck percentage (also refer to as truck factor is the ratio of trucks VMT to the total VMT for any given period) is also utilized to assess the sensitivity of the results due to the varying truck factor.

The next entries to the financial model are the tax rates. As described in the previous section, two fuel taxing cases are assumed in the analyses. The first case, consistent with current state, local and federal tax laws, keeps the federal and local rates constant, while CPI indexes the state fuel taxes. In the second case, the federal fuel taxes are also CPI indexed, beginning in 2015. The second case examines the financial impact of a potential recognition of the highway trust fund short falls, and condition of our aging transportation infrastructures would motivate the Congress to take action.

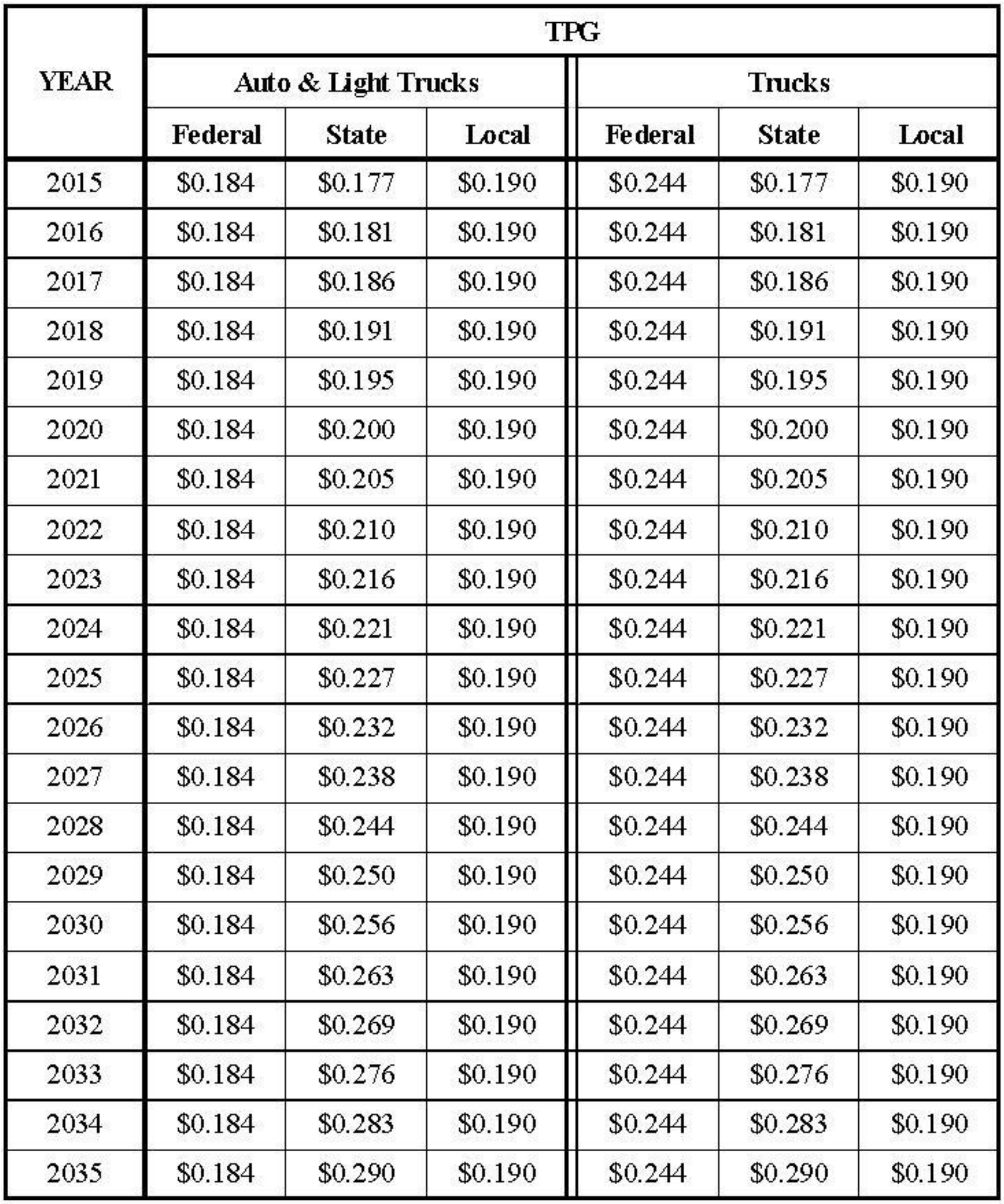
The consumer price index for all items has grown at an annual average of 2.5% for the past 20 years (USDOL, 2011). The aforementioned fuel tax rates and corresponding MBUFE's (where applicable) are indexed at this 20 year historic average of 2.5% per year in subsequent financial analyses. A sensitivity analyses for the un-indexed and indexed federal fuel taxes is also performed. Tables 5-5 and 5-6 depict the annual TPG and MBUFE for the analyses period.

The next sets of data/parameters for entry into the financial model are the fuel efficiencies of autos and trucks.

The current medium and heavy trucks (diesel fuel users) fuel efficiency is first increased by 20% to obtain the 2018 new CAFE standards for that year. This CAFE standard results in an increase from 5.1 MPG in 2010 to 6.1 MPG in 2018. For the years 2019 through 2035, an annual fuel efficiency increase of 0.4%, consistent with the Department of Energy - Annual Energy Outlook of 2011 (Holtberg, 2011), is utilized.

For autos and light trucks fuel efficiency, the dampened values of the CAFE standards for years 2015 through 2025 are utilized in the financial model. The actual average annual MPG's typically, lag the CAFE standards for any given model year requirement. The reason is that the fleet mix average MPG is influenced by the less fuel efficient older models. The lower MPG (previous years) vehicles have a dampening effect on the average annual actual on street MPG's. The CAFE standards of years 2015 through 2025 (from Figure 4-5) were lowered to reflect the analyses year estimated stock fuel efficiency averages (Holtberg, 2011) and are depicted in the Figure 5-6.

Table 5-5: Analysis Period TPG Rates



YEAR	TPG					
	Auto & Light Trucks			Trucks		
	Federal	State	Local	Federal	State	Local
2015	$0.184	$0.177	$0.190	$0.244	$0.177	$0.190
2016	$0.184	$0.181	$0.190	$0.244	$0.181	$0.190
2017	$0.184	$0.186	$0.190	$0.244	$0.186	$0.190
2018	$0.184	$0.191	$0.190	$0.244	$0.191	$0.190
2019	$0.184	$0.195	$0.190	$0.244	$0.195	$0.190
2020	$0.184	$0.200	$0.190	$0.244	$0.200	$0.190
2021	$0.184	$0.205	$0.190	$0.244	$0.205	$0.190
2022	$0.184	$0.210	$0.190	$0.244	$0.210	$0.190
2023	$0.184	$0.216	$0.190	$0.244	$0.216	$0.190
2024	$0.184	$0.221	$0.190	$0.244	$0.221	$0.190
2025	$0.184	$0.227	$0.190	$0.244	$0.227	$0.190
2026	$0.184	$0.232	$0.190	$0.244	$0.232	$0.190
2027	$0.184	$0.238	$0.190	$0.244	$0.238	$0.190
2028	$0.184	$0.244	$0.190	$0.244	$0.244	$0.190
2029	$0.184	$0.250	$0.190	$0.244	$0.250	$0.190
2030	$0.184	$0.256	$0.190	$0.244	$0.256	$0.190
2031	$0.184	$0.263	$0.190	$0.244	$0.263	$0.190
2032	$0.184	$0.269	$0.190	$0.244	$0.269	$0.190
2033	$0.184	$0.276	$0.190	$0.244	$0.276	$0.190
2034	$0.184	$0.283	$0.190	$0.244	$0.283	$0.190
2035	$0.184	$0.290	$0.190	$0.244	$0.290	$0.190

Table 5-6: Analysis Period MBUFE Rates

YEAR	MBUFE					
	Auto & Light Trucks			Trucks		
	Federal	State	Local	Federal	State	Local
2015	$0.009	$0.009	$0.009	$0.048	$0.035	$0.037
2016	$0.009	$0.009	$0.009	$0.048	$0.036	$0.037
2017	$0.009	$0.009	$0.009	$0.048	$0.036	$0.037
2018	$0.009	$0.009	$0.009	$0.048	$0.037	$0.037
2019	$0.009	$0.010	$0.009	$0.048	$0.038	$0.037
2020	$0.009	$0.010	$0.009	$0.048	$0.039	$0.037
2021	$0.009	$0.010	$0.009	$0.048	$0.040	$0.037
2022	$0.009	$0.010	$0.009	$0.048	$0.041	$0.037
2023	$0.009	$0.011	$0.009	$0.048	$0.042	$0.037
2024	$0.009	$0.011	$0.009	$0.048	$0.043	$0.037
2025	$0.009	$0.011	$0.009	$0.048	$0.044	$0.037
2026	$0.009	$0.011	$0.009	$0.048	$0.046	$0.037
2027	$0.009	$0.012	$0.009	$0.048	$0.047	$0.037
2028	$0.009	$0.012	$0.009	$0.048	$0.048	$0.037
2029	$0.009	$0.012	$0.009	$0.048	$0.049	$0.037
2030	$0.009	$0.013	$0.009	$0.048	$0.050	$0.037
2031	$0.009	$0.013	$0.009	$0.048	$0.052	$0.037
2032	$0.009	$0.013	$0.009	$0.048	$0.053	$0.037
2033	$0.009	$0.014	$0.009	$0.048	$0.054	$0.037
2034	$0.009	$0.014	$0.009	$0.048	$0.055	$0.037
2035	$0.009	$0.014	$0.009	$0.048	$0.057	$0.037

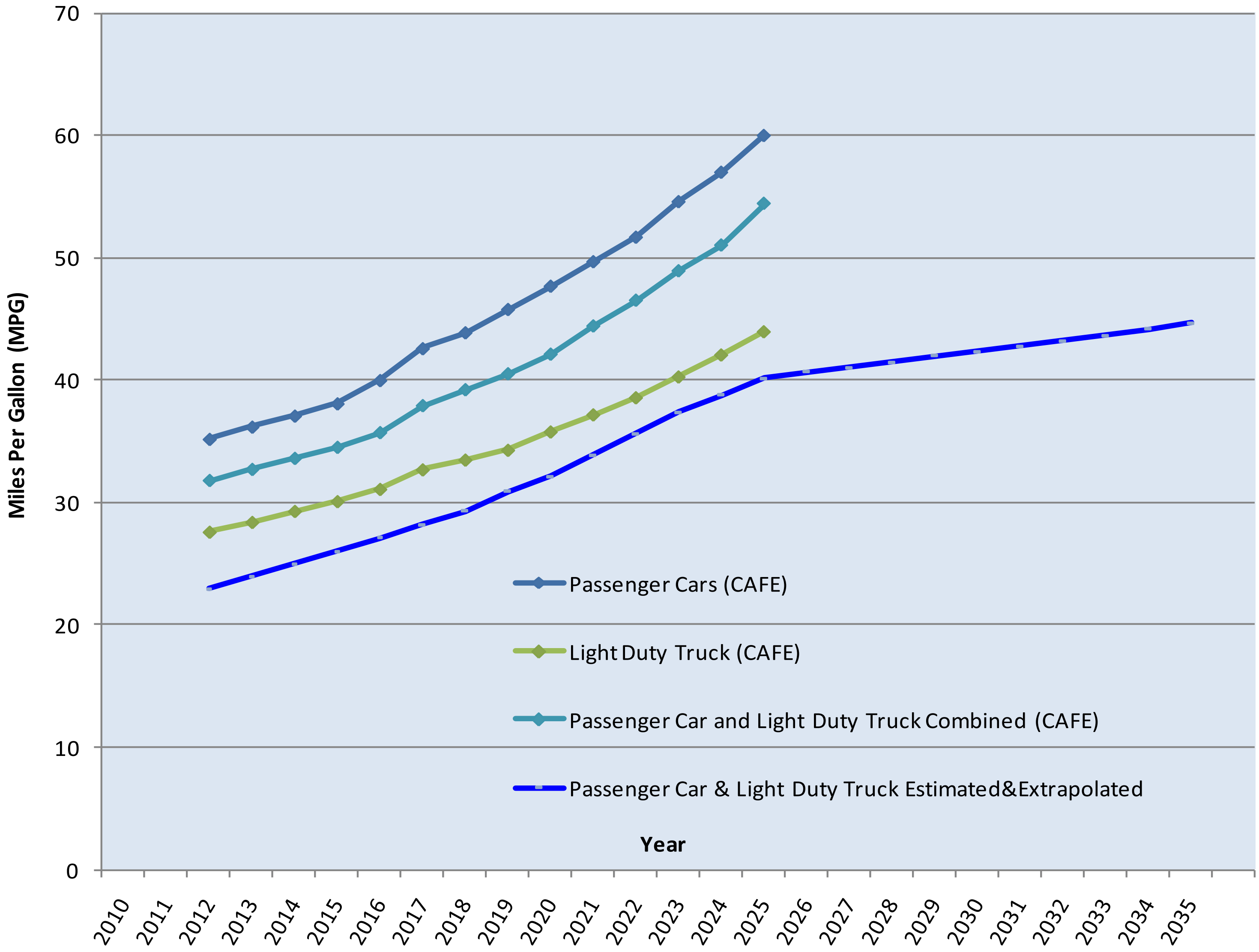


Figure 5-6: Estimate and Extrapolated Annual Average MPG

For the years 2026 to 2035, an annual fuel efficiency increase of 1.0 % is utilized (Holtberg, 2011).

The next entry to the financial model is the cost of collection/administration of the fuel taxes.

According to previous research, estimated costs of collection/administration for fuel taxes as a percentage of the gross revenues are generally 1% (Balducci et al., 2011 and Rufolo, 2011). The cost to collect/administer a MBUF system is subject to great uncertainty. The research showed a wide range (4% to 25% as a percentage of the gross revenue). Actual administration and collection cost depends on two variables: System complexity and implementation scale. German heavy vehicle MBUF system, both complex and generally at a small scale experienced a 25% annual cost of administration and collection (Rufolo, 2011). While pricing systems in Switzerland, Singapore and Austria report costs of 4%, 7% and 9% of revenues, respectively (Balducci et al., 2011). A recent study for the state-wide MBUF implementation for the New York, based on the Oregon pilot project data, utilized 17.87% of revenues (Rufolo, 2011). A 2009 report prepared for the USDOT's Office of Economic and Strategic Analyses, documents a 12% as annual operation cost of a Global Positioning System (GPS) of toll collection (Balducci et al., 2011).

15% and 20% of annual revenues for administration and collection of MBUF are utilized in the subsequent financial analyses. For implementation/conversion of the existing TPG to a MBUFE 15% is used, however for pricing policies of ToDMBUF, ATMBUF and CPMBUF, due to their complexities, 20% of annual revenue for the administration and collection cost is utilized. With every collection system, there are certain inherent evasion, non-payment and enforcement costs. As these costs are common to all taxing/fee collection scenarios analyzed, they are neglected in subsequent financial analyses.

Lastly, to bring the future year's revenue estimates to the base year (2015), for comparison purposes, a discount rate of 4.0 is utilized in the financial model. However, due to the volatility of the financial market and uncertainties associated with the discount rate, a range of 3% to 6% at 0.5% increments is also utilized to examine the sensitivity of the revenue projections.

5.4.1 Case One – Impact of the CAFE: Current Tax Rates/Laws

Case one of the financial analyses is to assess the revenue impacts of the CAFE standards/initiatives, based on the current federal and local tax rates and CPI indexed state fuel taxes. Three financial model scenarios are conducted as follow:

Scenario#1: Calculation of annual revenues by utilizing current fuel efficiencies and a per gallon fuel tax collection system. This scenario is indicative of potential revenues if CAFE standards were not continued beyond the current average fleet fuel efficiency levels and if the current per gallon taxation system remained in place.

Scenario#2: Calculation of annual revenues by utilizing the CAFE mandated improved fuel efficiencies, current fuel taxes, and per gallon fuel tax collection system. Scenario#2 is indicative of potential revenues if the CAFE standards and current per gallon taxation and collection remained in place.

Scenario#3: This is the same as Scenario#2 and utilizes the CAFE mandated improved fuel efficiencies, however in lieu of the gas taxes, the road user fees are being assessed at

MBUFE of the current tax rates. Scenario # 3 is indicative of potential revenues if the CAFE standards and an MBUF collection system were in place.

Figure 5-7 depicts the annual net revenue estimates for the above captioned scenarios as result of the financial model runs.

Under scenario#1, net revenues are estimated at $6.882 billion in year 2015 and gradually climbing to $11.223 billion by year 2035. The analyses period revenues expressed in 2015 dollars are $130.55 billion.

Under Scenario#2, net revenues are estimated at $5.56 and $5.878 billion for years 2015 and 2035 respectively. The annual revenues continue to decrease through 2025, mostly due to improved fuel efficiencies. There is a mild increase in annual revenues between years 2025 to 2035. This is mainly due to the annual increase in travel demand, CPI indexed Florida taxes, and an assumed tempered fuel efficiency improvements. The analyses period revenues expressed in 2015 dollars are $80.877 billion.

Under Scenario#3, net revenues are estimated at $5.905 and $9.627 billion, for years 2015 and 2035 respectively. The annual revenue growth during the analyses period is mainly due to increased travel demand, CPI indexed Florida fuel fees and irrelevancy of the improved fuel efficiencies. The analyses period revenues expressed in 2015 dollars are $111.999 billion.

Comparing Scenarios# 1 and 2 revenue estimates clearly indicates an increasing revenue loss due to the CAFE improved fuel efficiencies. Total revenue loss for the analyses period is estimated at approximately $50 billion (in 2015 dollars).

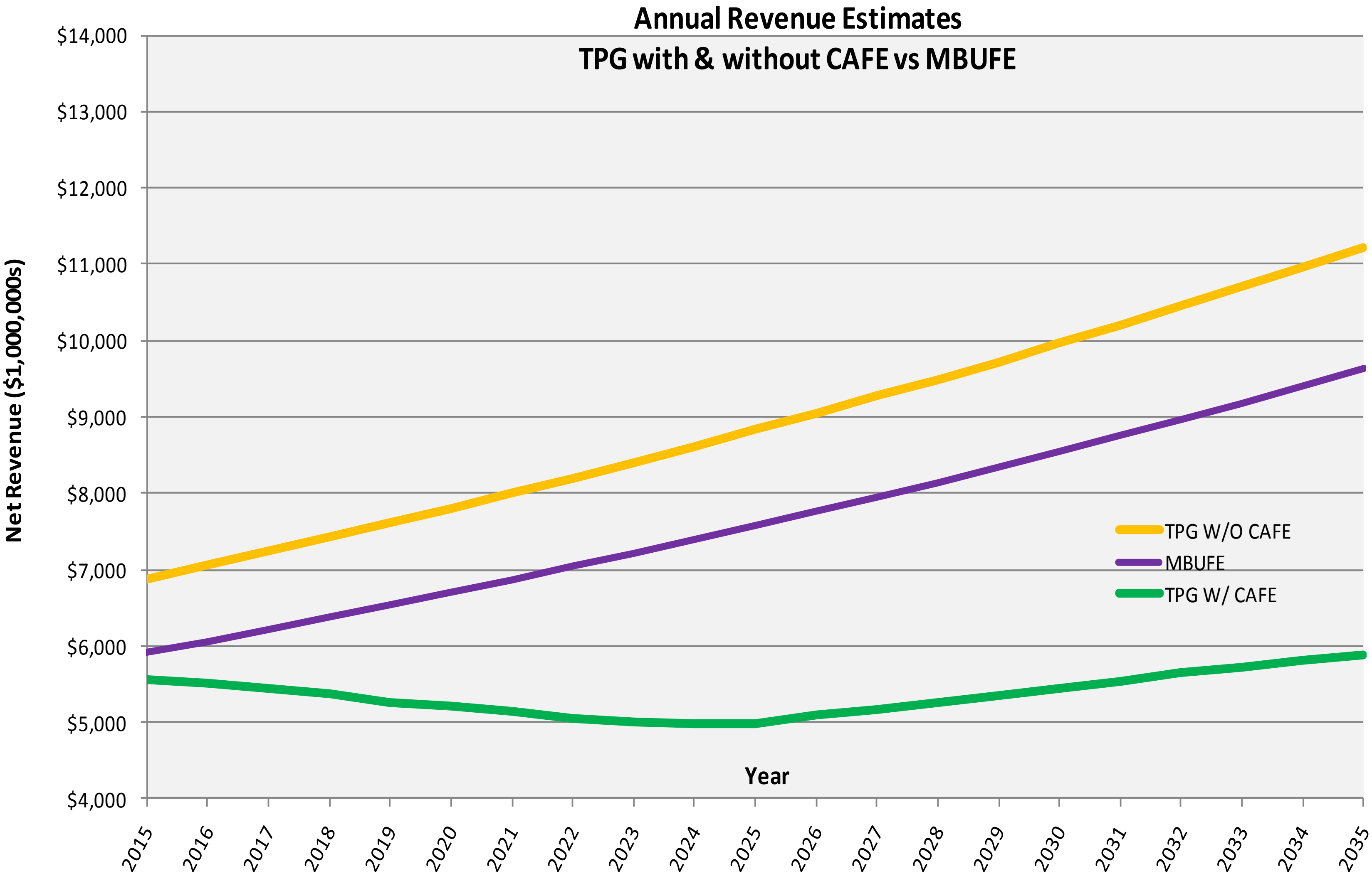


Figure 5-7: Revenue Comparison (TPG W & W/O CAFÉ VS. MBUFE)

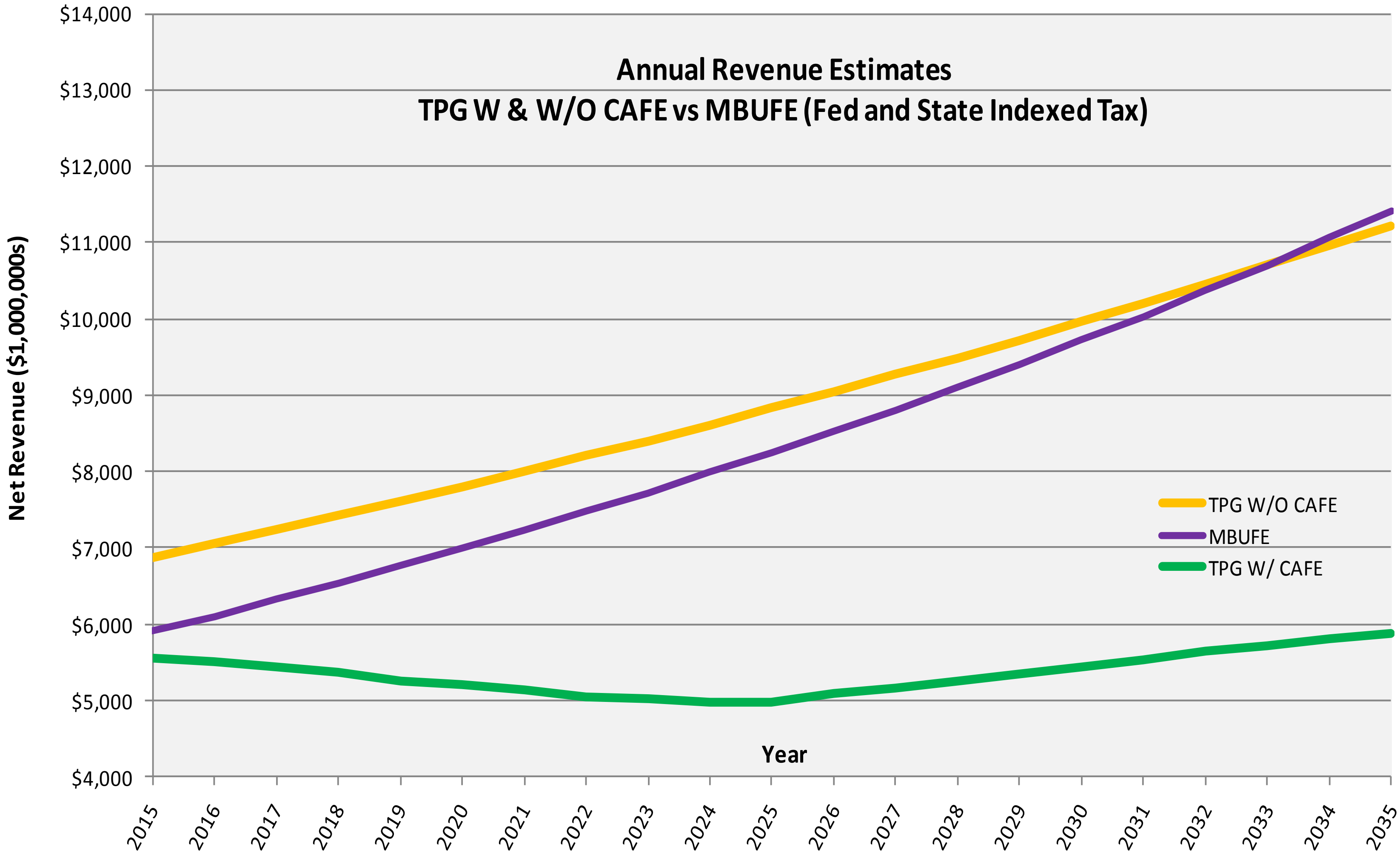


Figure 5-8: Revenue Comparison (TPG W & W/O CAFÉ VS. Fed Indexed MBUFE)

Since standards /mandates may be irreversible, then a comparison of Scenarios 1 and 3 can assess the financial impact of an MBUF strategy.

Even with a higher collection/administration cost of 15%, an MBUF system may generate approximately $31 billion (in 2015 dollars), more than the current per gallon fuel tax regime, during the analyses period.

5.4.2 Case Two – Impact of the CAFE: CPI Indexed Federal MBUFE's

Case two of the financial analyses is to assess the revenue impacts of the CAFE standards/initiatives, based on the current local and federal tax rates and CPI indexed state fuel taxes. This case assumes that the severity of the nation's transportation funding shortfalls would result in a federal fuel tax indexing according to the CPI (similar to the current Florida's state tax codes), beginning in 2015. Three financial model scenarios are conducted as follow:

Scenario#1: Calculation of annual revenues by utilizing current fuel efficiencies and a TPG collection system. This scenario is indicative of potential revenues if CAFE standards were not continued beyond the current average fleet fuel efficiency levels and if the current per gallon tax collection system remained in place.

Scenario#2: Calculation of annual revenues by utilizing the CAFE mandated improved fuel efficiencies, state CPI indexed fuel taxes, and TPG collection system. Scenario#2 is indicative of potential revenues if the CAFE standards and current per gallon collection remained in place.

Scenario#3: This is the same as Scenario#2 and utilizes the CAFE mandated improved fuel efficiencies, however, in lieu of the TPG, the MBUFE are being assessed and the state and federal CPI indexed MBUFE rates. Scenario # 3 is indicative of potential revenues if the CAFE standards and an MBUF collection system were in place.

Figure 5-8 depicts the annual net revenue estimates for the above captioned scenarios as result of the financial model runs.

Under scenario # 1, net revenues are estimated at $6.882 billion in year 2015 and gradually climbing to $11.223 billion by year 2035. The analyses period revenues expressed in 2015 dollars are $130.55 billion.

Under Scenario#2, net revenues are estimated at $5.56 and $5.878 billion for years 2015 and 2035 respectively. The annual revenues continue to decrease through 2025, mostly due to improved fuel efficiencies. There is a mild increase in annual revenues between years 2025 to 2035. This is mainly due to the annual increase in travel demand, CPI indexed state taxes, and an assumed tempered fuel efficiency improvements. The analyses period revenues expressed in 2015 dollars are $80.877 billion.

Under Scenario#3, net revenues are estimated at $5.905 and $11.417 billion, for years 2015 and 2035 respectively. The annual revenue growth during the analyses period is mainly due to increased travel demand; CPI indexed state and federal MBUFE's and irrelevancy of the improved fuel efficiencies. The analyses period revenues expressed in 2015 dollars are $121.631 billion.

Comparing scenarios three of case one and case two, indicates a potential of approximately $10 billion increase in revenues during the analyses period if the federal fees/taxes were CPI indexed.

It is noted that without continuation of the CAFE standards and mandates the current TPG, results in higher annual revenues in early years, basically due to higher collection and administration of the MBUF's, but by year 2032 the annual net revenues of an MBUF system begin surpassing the TPG's (without CAFE) annual revenues.

5.4.3 Sensitivity Analyses

Our research, as discussed earlier, had concluded that a truck ratio of 6.4% was a conservatively reasonable rate. To assess the sensitivity of the period net revenues to truck portion of the overall annual VMT, all other input parameters were held constant, while truck ratios of 5.5% to 7.5% at 0.5% increments were applied. Figure 5-9 depicts the result of this analysis.

As expected, the annual net revenue increases as truck ratio increases. This is solely due to the higher per mile user fee rates for trucks. The increase in annual revenue grows from $330 million to $530 million for years 2015 to 2035 respectively when applying truck ratios of 5.5% and 7.5%.

A similar sensitivity analysis was conducted for the discount rate. In our financial analyses a 4% per year discount rate was utilized. To assess the sensitivity of the annual revenues to the discount rate, all other parameters were held constant, while the discount rates of 3% to 6% at 0.5% increments were applied. Figure 5-10 depicts the result of discount rate sensitivity analysis.

Comparison of net revenues for years 2015 ($ 6,259 million) and 2035 ($6,056 million), indicates that the impacts of annual VMT growths and CPI indexed state MBUFE's are nearly neutralized after application of a 3% discount rate. However application of a 6% discount rate results in a 40% reduction of present day value of the annual revenues from $5,490 million to $3,182 million for years 2015 and 2035 respectively. The disparity of net annual revenues, a function of time and as expected, increases as the discount increases.

5.5 Examination of peak period Time of Day Mileage Based User Fee (ToDMBUF) Strategy

This section of the dissertation examines the financial impacts of pricing the peak periods at a higher MBUF rate than the remaining non-peak periods.

Peak period is the part of the day during which traffic congestion on roads is at its highest. In urban areas this occurs twice a day, in the morning and in the evening, the times when most people commute.

The concept of the peak period pricing has been utilized by many service providers. The utility companies have set a higher premium for their services during the high demand periods such as: holiday season airline tickets, daytime cell phone rates and peak period and peak season electricity rates.

Introducing peak period pricing on highway facilities discourages overuse during rush hours by motivating motorist to travel by other modes, ride-share or traveling at other times of day (DeCorla-Souza, 2006).

As discussed earlier, the Traffic Choices Project (Kitchen, 2008) in the greater Seattle area utilized this concept by setting the road user fee during the rush hours at twice as the non-peak period. Similar peak period pricing has been adapted for the following facilities as elaborated in the next sub-section:

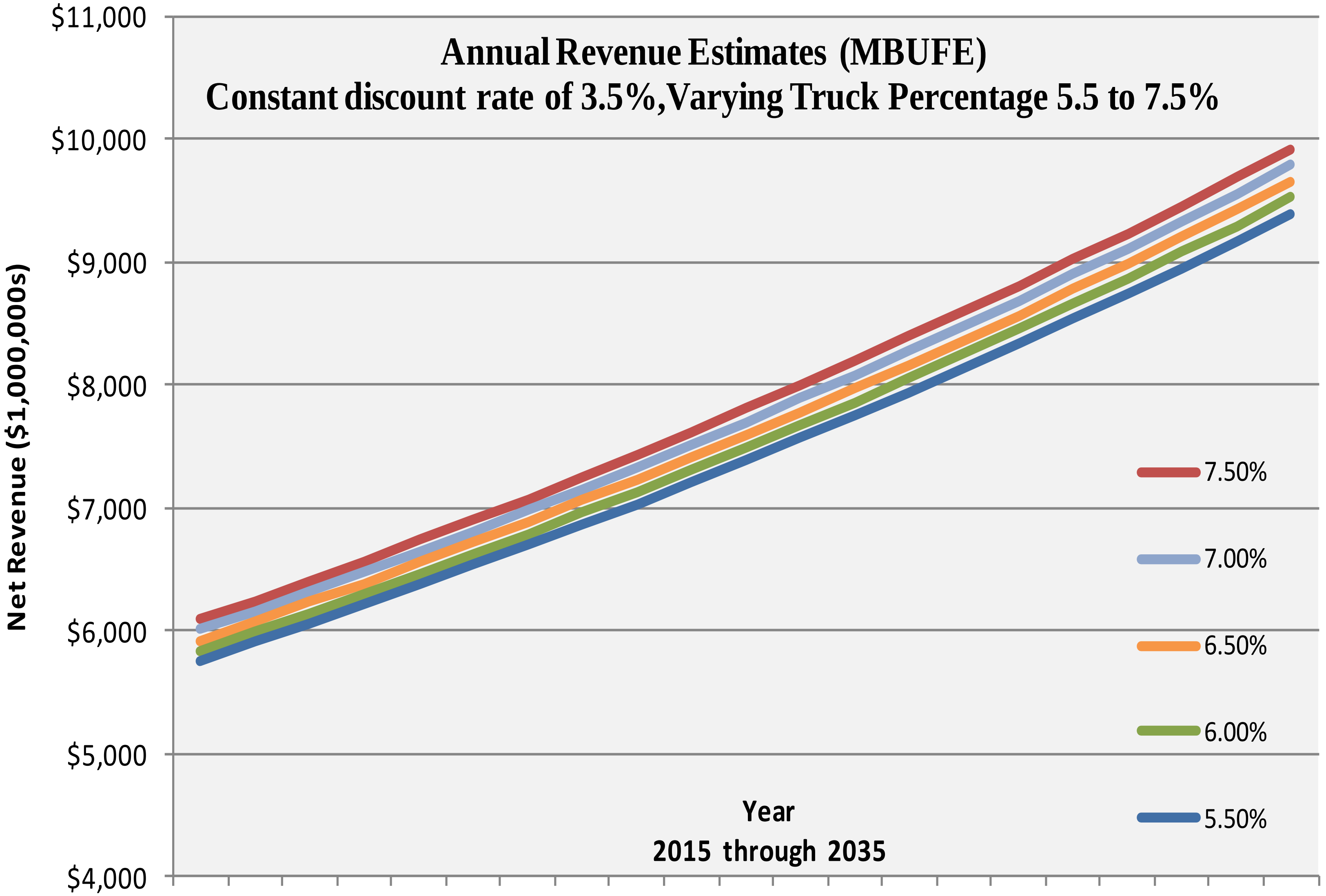


Figure 5-9: Truck % Truck % Sensitivity Analysis Results

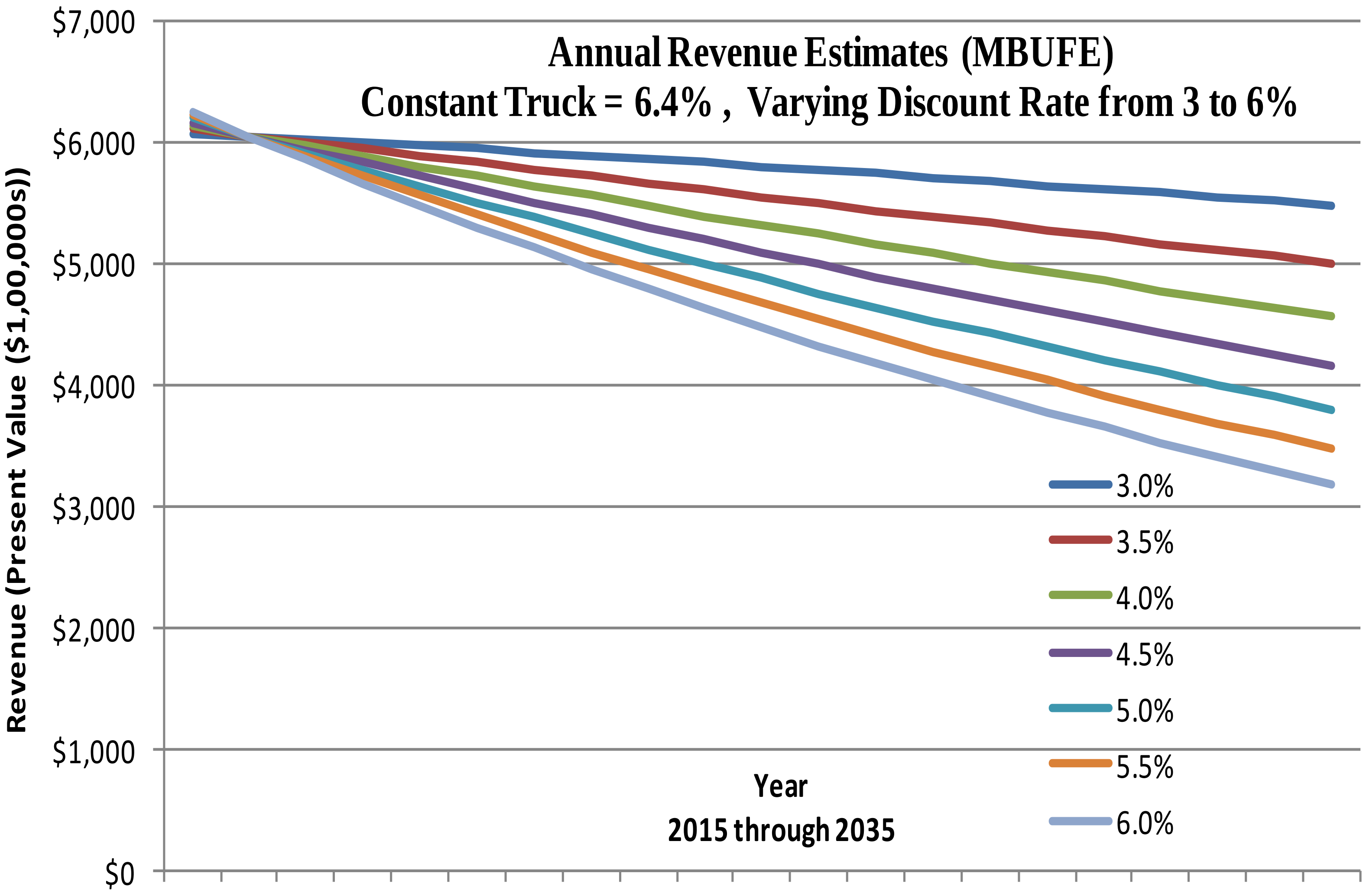


Figure 5-10: Discount Rate Sensitivity Analysis Results

5.5.1 Peak Period Pricing Rates/Premiums

A. Orange County, California SR 91 Express Lanes: The most recently published (OCTA, 2012) user fee for this ten mile express lanes connecting the employment center of Irvine to the bed-room community (suburban area) of Riverside fluctuates from a low rate of $1.30 during the no-peak period to the high rate of $9.75 for the peak direction, peak hour and peak day (Eastbound, 3 PM to 4 PM on Fridays). Typical price for the peak period is about four times higher than the non-peak period ($5.20 vs. $1.30). Figures 5-11 and 5-12 depict the latest variable user fee rates (effective April 2012) for the SR 91 Express Lanes.

B. Miami, Florida 95 Express Lanes: Phase one of this project, approximately 11 miles long, with planned subsequent northerly expansion phases into the Fort Lauderdale area, has a non-peak period rate of $0.25. The highest peak period, peak direction, peak day rate of $7.00 has been established, but typical peak period rate has generally been in the $2.50 to $3.50 range (FDOT, 2012). This peak period price range translates to a 10 to 14 time higher rate than the non-peak price.

C. Houston, Texas Katy Managed Lanes: These managed lanes provide peak priced travel option for the residents of Katy and the communities to the west of Houston along the I-10 to the employment centers of the Galleria, Medical Center and the I-610 (Western Loop) at a rate of $1.00 during the off peak period and $4.00 during the peak period for the entire length (via three overhead electronic gantries). The peak period rate is generally 4 times the off peak period rate (HCTRA, 2012). Figure 5-12 depicts the latest published variable toll rates.

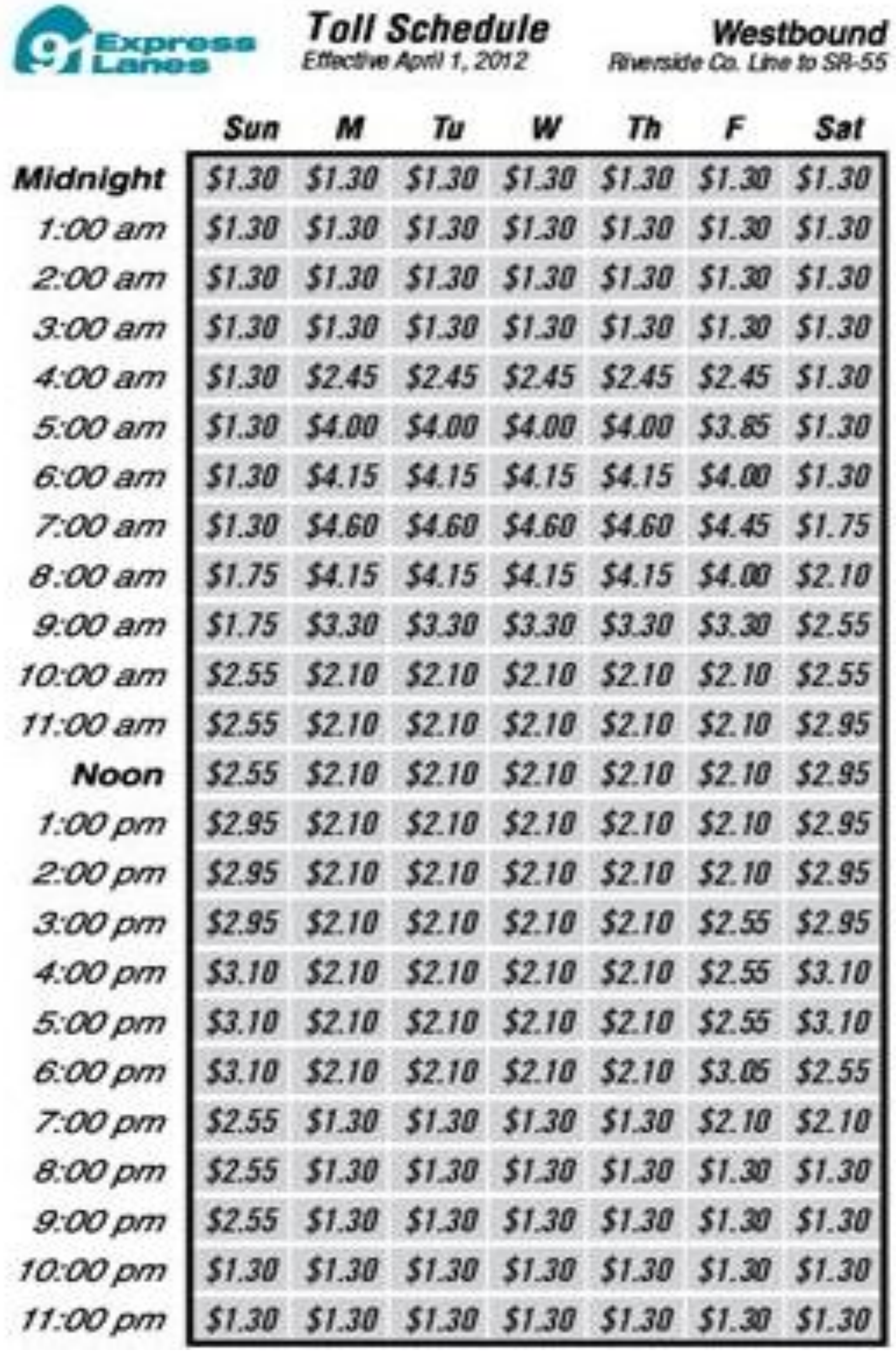
D. Minneapolis, Minnesota, I-35West and I-394 Express Lanes: These two system operate during peak periods of the weekday commute times (6 to 10 AM and 2 to 7 PM, Mondays through Fridays). Some sections are reversible. The system provides two peak period priced connections for the southern and western suburban areas into and out of the Minneapolis Central Business District. While the non-peak period motorists do not pay any additional road user fees, the peak period commuters could pay between $1.00 and $4.00 for utilizing the express lanes (MNDOT, 2012).

E. Denver, Colorado I-25 Managed lanes: This seven mile peak period priced facility, opened in June 2006, it connects downtown Denver to US Highway 36 to the north. The off peak rate is $0.50 and the peak period is priced at $3.50 to $4.00 or 7 to 8 times higher than the off-peak rate (CDOT, 2012).

F. Seattle Washington SR 167 HOT Lanes: This nine mile peak period priced facility connects the towns of Renton and Auburn to the east of Seattle, and opened to traffic on May 2009. Traffic during the non-peak period of 7 PM to 5 AM is not assessed any fees, however the off-peak period rate is $0.50, highest rate is established at $9.00 and the typical peak period fee has ranged in $1.50 to $2.00 range (WSDOT, 2012).

Table 5-7 summarizes the off-peak and peak period rates of the above described variable pricing projects:

For the purpose of our financial analyses a conservative 125% ratio (vs. 500%, the average above) or a 25% premium MBUF for the peak period demand is utilized.



91 Express Lanes

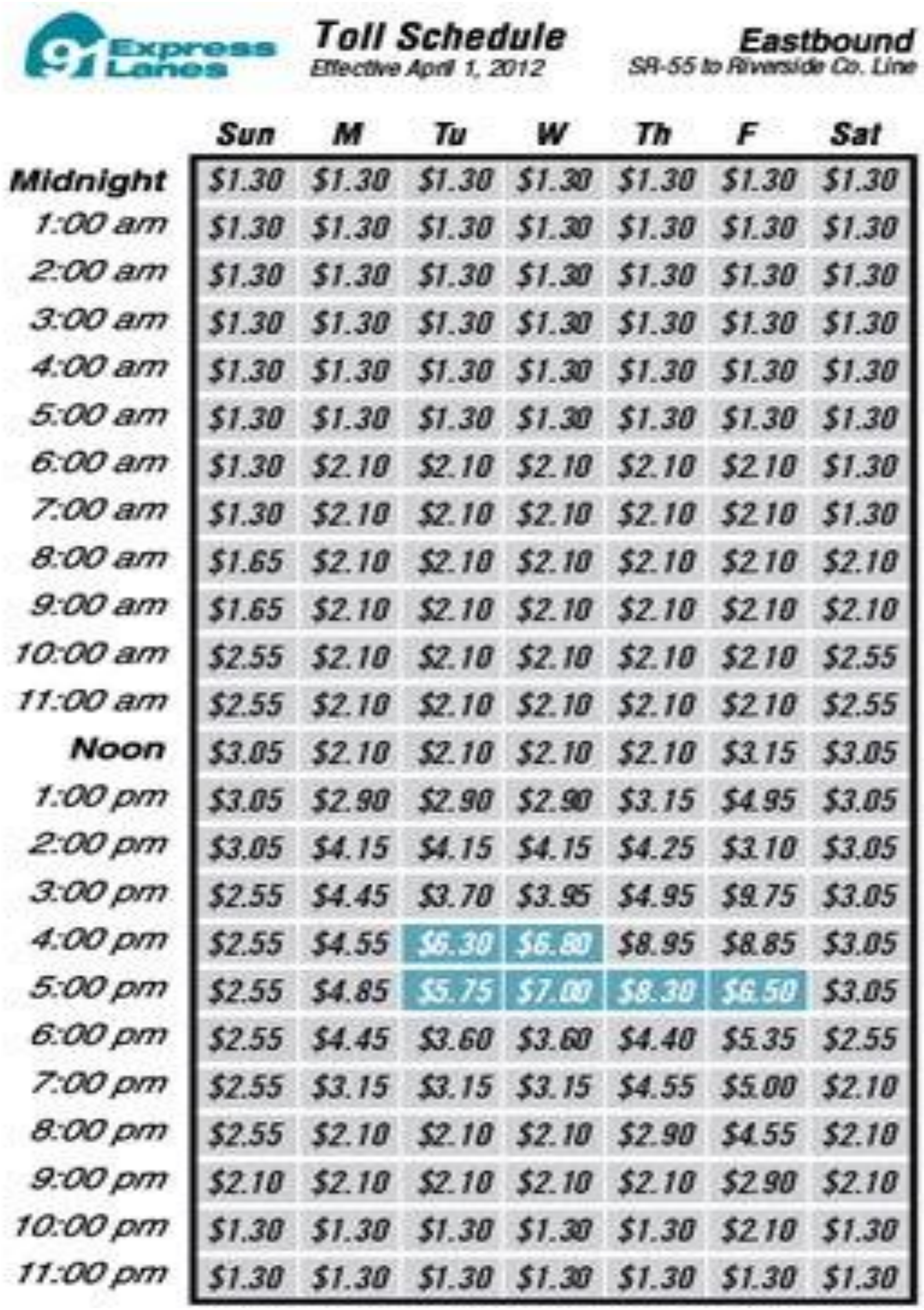
Toll Schedule
Effective April 1, 2012

Westbound
Riverside Co. Line to SR-55

	Sun	M	Tu	W	Th	F	Sat
Midnight	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
1:00 am	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
2:00 am	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
3:00 am	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
4:00 am	$1.30	$2.45	$2.45	$2.45	$2.45	$2.45	$1.30
5:00 am	$1.30	$4.00	$4.00	$4.00	$4.00	$3.85	$1.30
6:00 am	$1.30	$4.15	$4.15	$4.15	$4.15	$4.00	$1.30
7:00 am	$1.30	$4.60	$4.60	$4.60	$4.60	$4.45	$1.75
8:00 am	$1.75	$4.15	$4.15	$4.15	$4.15	$4.00	$2.10
9:00 am	$1.75	$3.30	$3.30	$3.30	$3.30	$3.30	$2.55
10:00 am	$2.55	$2.10	$2.10	$2.10	$2.10	$2.10	$2.55
11:00 am	$2.55	$2.10	$2.10	$2.10	$2.10	$2.10	$2.95
Noon	$2.55	$2.10	$2.10	$2.10	$2.10	$2.10	$2.95
1:00 pm	$2.95	$2.10	$2.10	$2.10	$2.10	$2.10	$2.95
2:00 pm	$2.95	$2.10	$2.10	$2.10	$2.10	$2.10	$2.95
3:00 pm	$2.95	$2.10	$2.10	$2.10	$2.10	$2.55	$2.95
4:00 pm	$3.10	$2.10	$2.10	$2.10	$2.10	$2.55	$3.10
5:00 pm	$3.10	$2.10	$2.10	$2.10	$2.10	$2.55	$3.10
6:00 pm	$3.10	$2.10	$2.10	$2.10	$2.10	$3.05	$2.55
7:00 pm	$2.55	$1.30	$1.30	$1.30	$1.30	$2.10	$2.10
8:00 pm	$2.55	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
9:00 pm	$2.55	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
10:00 pm	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
11:00 pm	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30

(OCTA, 2012)

Figure 5-11: SR 91 Westbound Fee Schedule



91 Express Lanes

Toll Schedule
Effective April 1, 2012

Eastbound
SR-55 to Riverside Co. Line

	Sun	M	Tu	W	Th	F	Sat
Midnight	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
1:00 am	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
2:00 am	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
3:00 am	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
4:00 am	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
5:00 am	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
6:00 am	$1.30	$2.10	$2.10	$2.10	$2.10	$2.10	$1.30
7:00 am	$1.30	$2.10	$2.10	$2.10	$2.10	$2.10	$1.30
8:00 am	$1.65	$2.10	$2.10	$2.10	$2.10	$2.10	$2.10
9:00 am	$1.65	$2.10	$2.10	$2.10	$2.10	$2.10	$2.10
10:00 am	$2.55	$2.10	$2.10	$2.10	$2.10	$2.10	$2.55
11:00 am	$2.55	$2.10	$2.10	$2.10	$2.10	$2.10	$2.55
Noon	$3.05	$2.10	$2.10	$2.10	$2.10	$3.15	$3.05
1:00 pm	$3.05	$2.90	$2.90	$2.90	$3.15	$4.95	$3.05
2:00 pm	$3.05	$4.15	$4.15	$4.15	$4.25	$3.10	$3.05
3:00 pm	$2.55	$4.45	$3.70	$3.95	$4.95	$9.75	$3.05
4:00 pm	$2.55	$4.55	$6.30	$6.80	$8.95	$8.85	$3.05
5:00 pm	$2.55	$4.85	$5.75	$7.00	$8.30	$6.50	$3.05
6:00 pm	$2.55	$4.45	$3.60	$3.60	$4.40	$5.35	$2.55
7:00 pm	$2.55	$3.15	$3.15	$3.15	$4.55	$5.00	$2.10
8:00 pm	$2.55	$2.10	$2.10	$2.10	$2.90	$4.55	$2.10
9:00 pm	$2.10	$2.10	$2.10	$2.10	$2.10	$2.90	$2.10
10:00 pm	$1.30	$1.30	$1.30	$1.30	$1.30	$2.10	$1.30
11:00 pm	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30

(OCTA, 2012)

Figure 5-12: SR 91 Eastbound Fee Schedule

Table 5-7: Peak Pricing Summary

Facility	Off- Peak Rate ($)	Typical Peak Rate ($)	Ratio of Peak/Off-Peak	Highest Peak Rate ($)
Miami 95	0.25	2.50 to 3.50	12	7.00
CA 91	1.30	5.20	4	9.75
Houston Katy	0.30 to 0.40	1.20 to 1.60	4	NA
MnPass	1.00	4.00	4	NA
Denver I-25	0.50	3.50 to 4.00	7.5	NA
WA SR167	0.50	1.50 to 2.00	3.5	9.00
Average	0.65	3.20	5	8.60

*Note: Rates shown are per section and not per mile

5.5.2 VMT and Fuel Price Elasticity

The arguments have been made that with implementation of CAFE standards (more fuel efficient vehicles), the cost to drive a mile decreases, so people would drive more (increased VMT). Small and Van Dender, 2007 have researched the elasticity of gasoline price by calculating the "VMT Effect" and "Fuel Efficiency Effect". Their research of two periods, (1966-2004 long term) and (2000-2004 short term) of driver behavior, has concluded that the combination of the VMT effect and fuel efficiency effect (which is not exactly the sum of the two due to an interaction between them) produces the fuel price elasticity. The resultant gasoline price elasticity is documented at (- 0.237) for long terms. Our financial analysis of MBUF for the proposed pricing policies will utilize the long term elasticity of (- 0.237) for our analyses period (years 2015 thru 2035). It is noted that price elasticity of the fuel taxes are imbedded in the total per gallon (per mile) fuel prices.

5.5.3 Calculation of VMT Adjustments Due to Fuel Price Elasticity of the MBUFE Rate Increases

Utilizing Table 5-3 of the previous section, current gasoline/diesel per gallon price, long term price elasticity discussed earlier, and assuming constant 2011 year dollar value, Table 5-8 depicting our VMT annual adjustments is prepared.

The second column of the Table 5-8 depicts the current per gallon fuel prices, while the third column depicts the current fuel taxes. Columns four and five depict the increases in fuel taxes as a result of pricing policies described previously. These tax increases result in per gallon fuel price percentages of columns six and seven. Multiplying the fuel price percentage increases of columns six and seven by the fuel price elasticity of (- 0.237) (Small and Van Dender, 2007), the VMT adjustments of columns nine and ten are calculated.

Trucks and autos VMT's utilized in the MBUFE scenario financial analyses are accordingly adjusted downward to account for the price elasticity as presented in columns nine and ten of the Table 5-8.

5.5.4 Florida's Peak Period Characteristics

According to the FDOT 's Sourcebook (FDOT, 2012), for years 2003 through 2010, the peak hour and peak period VMT's have accounted for 7.9% and 23.25% of the daily VMT respectively. Assuming even hourly distribution, this suggests that as an average, the length of the AM and PM peak periods (rush hours) is slightly less than three hours. Our subsequent financial analyses conservatively assume that this peak period VMT ratio would remain constant throughout our analyses period. The main reason for this assumption is that even though, due to employment and population growths, the number of daily trips and commuter trips naturally increase as well, but due to the peak period pricing policy, the ratio of the peak period to the total daily VMT is managed to remain nearly constant.

5.5.5 Florida's Public Roads

As of September of 2010, there were more than 121,701 miles of public roads in the state of Florida. These public roads are mostly owned and operated by the state, county or city governments.

Table 5-8: VMT Adjustments Due to Fuel Price Elasticity and Pricing Policies

Fuel Type	**Constant 2011 Dollars**				**% Increase to Per Gallon Price**		**Fuel Price Elasticity**	**Resultant VMT Adjustments**	
	Fuel Price per Gallon ($)	**Taxes per Gallon ($)**	**25% Increase in Taxes ($)**	**50% Increase in Taxes ($)**	**@ 25%**	**@ 50%**		**@25%**	**@50%**
Gasoline	4.00	0.534	0.133	0.266	3.325	6.65	-0.237	-0.8%	-1.6%
Diesel	4.12	0.534	0.148	0.297	3.524	7.048		-0.9%	-1.7%

City roads have grown from 27.6 thousand miles in 1987 to 37.5 thousand miles in 2010, at an annual expansion rate of 1.3%. County roads have grown from 64.8 thousand miles in 1987 to 69.8 thousand miles in 2010, at an annual expansion rate of 0.3%. The State Highway System (SHS) has grown from 11.5 thousand miles in 1984 to 12.1 thousand miles in 2010, or an annual expansion rate of 0.2% (Appendix B at the end of this dissertation contains relevant traffic characteristic for the state of Florida used as a basis of these analyses).

SHS currently accounts for slightly less than the 10% of the state's total public road centerline miles, but it carries in excess of 53.7% of the state's total annual VMT (FDOT, 2012). Our subsequent financial analysis proposes implementation of the pricing policies (ToDMBUF, ATMBUF and CPMBUF) for the SHS only, while the remaining roadways (city and county) are not assessed additional time of day, area type or any other pricing premium.

This approach provides a more affordable alternative for not only the rural and /or non-peak period users but also for those motorists that utilize the city and county roads as an alternative to the SHS in the urban areas and during the peak periods.

5.5.6 Financial Model Runs

Three financial model runs are performed to assess and compare the financial impact of the ToDMBUF policy:

a. Current Fuel Tax Per gallon (TPG)

   This model run was previously described and presented earlier. It basically assumes that fuel taxes are assessed and collected based on the gallons of fuel consumed. It incorporates the anticipated CAFE fuel efficiency standards and mandates to estimate the annual gross revenues for both trucks and autos for the analyses period. It assumes a 1% cost to collect and administer the fuel taxes in calculating the annual net revenues. The annual net revenues are then converted to the PDV by utilizing the prescribed discount rate.

b. MBUFE

This model run was also previously described and presented earlier. It assumes implementation of the MBUFE. As this is a distance based fee assessment, it simply multiplies the VMT for auto and/or trucks by the MBUFE to produce annual gross revenues. An administration and collection cost of 15% then is utilized to calculate the annual net revenues. A prescribed discount rate is then applied to obtain the PDV of the annual net revenues for the analysis period.

c. ToDMBUF

For this model run the annual VMT is decomposed based on the ratio of peak period to the daily VMT as well as the SHS's VMT to total state VMT. Only the peak period VMT portion of the SHS mileage is assessed the additional 25% peak period pricing premium. The remaining city roads, county roads and off peak period SHS VMTs' are assessed the MBUFE.

Table 5-1 depicted the pricing policy, while Tables 5-9 and 5-10 of the subsequent section depict the VMT decomposition input and output to the financial model.

Figure 5-13 depicts the annual net revenues for the above described model runs and Table 6-1 in the subsequent chapter presents the annual revenues.

The TPG revenues range from $5.56 billion in 2015 to $5.878 billion in 2035. The PDV (in year 2015 dollars) of the analysis period revenues under the current TPG regime are estimated at $80.88 billion.

Our financial analyses results show that by converting to a MBUFE, it is estimated to produce annual revenues of $5.905 billion and $9.627 billion for years 2015 and 2035 respectively. The PDV (in year 2015 dollars) of the analysis period revenues by converting to a MBUFE are estimated at $112 billion, or an increase of more than $31 billion.

If the ToDMBUF pricing strategy was to be implemented annual revenues of $5.649 billion and $9.21 billion for years 2015 and 2035 respectively can be expected. The total revenue for the analysis period when expressed in 2015 dollars may reach $107.14 billion.

Implementing this strategy, results in additional analysis period revenues of $27 billion greater than the current TPG strategy.

ToDMBUF due to its higher collection and administration cost (20% vs. 15%) is estimated to generate approximately $5 billion less than MBUFE strategy. This revenue reduction may also be a result of our low MBUF rate for the peak period travel. Fee rate setting schemes to meet both revenue generation and demand management can be implemented after the initial start up period, once more traffic trend and price elasticity data is collected.

This strategy, even though resulting in less net revenues than an MBUFE, serves traffic demand management and environmental objectives (decrease peak period traffic).

Application of Intelligent Transportation System (ITS) and development of traffic algorithms may offer dynamic pricing capabilities.

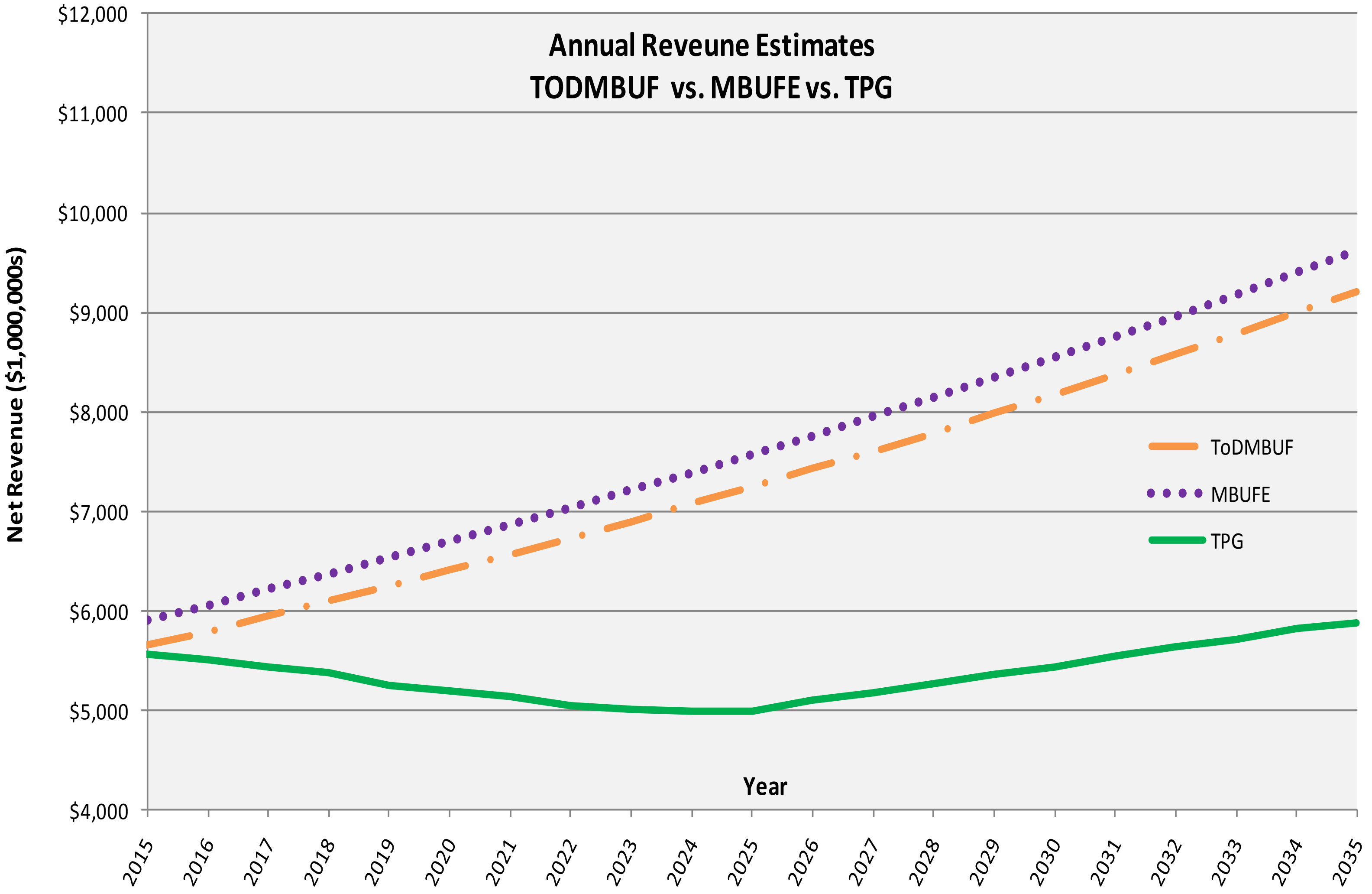


Figure 5-13: ToDMBUF Annual Revenue Projections

5.6 Examination of peak period Area Type Mileage Based User Fee (ATMBUF) Strategy

This pricing strategy assumes fees associated to drive within or into a designated area. When the charges are assessed at the entry points to the area, it is more commonly called the Cordon Pricing. However when the per mile charges are assessed for driving within an area then the Area-Wide Pricing is the used term. The State of Oregon's MBUF (Whitty, 2008) and the Puget Sound Regional Council's Traffic Choices Project (Kithchen, 2008) are two US examples of this pricing strategy (DeCorla-Souza, 2006). International implementation of this strategy is discussed in the next sub-section.

5.6.1 International Cordon/ Area-Wide Pricing Policy Implementations

a. Singapore Area-Wide Pricing: Introduced in 1975, with three entry point to assess the road user charges for the CBD area, has grown to 34 overhead all electronic gantries now (transformation from Cordon to Area-Wide pricing). The operating hours are 7:30 AM to 7:00 PM week days and special holidays (Yap, 2005). The charging system has not only generated additional revenues but also has dramatically stabilized the traffic flow within and into the CBD. Since the buses, motorcycles and public transport vehicles are assessed discounted or no fees, the modal shift from the single occupancy vehicle to mass transit has been dramatic.

b. London Cordon Pricing: Since 2003 the city of London has charged a fee for private vehicles in its central area during the hours of 7AM to 6:30 PM week days. The fee started at 5 British Pound per vehicle and has increased to 8 B.P. since 2008.

c. The pricing Stockholm Cordon Pricing: Trial period began on January 2006 and lasted seven months. The project allowed for assessing a fee for entering and leaving the Stockholm business district during weekday's business hours. It's primary purpose was to reduce traffic congestion and improve the environmental situation in central Stockholm. The funds collected were to be used for new road construction in and around Stockholm. In September 2006 a referendum was held and by the majority vote the system was approved for permanent implementation. An 18% reduction in traffic congestion has been reported due to the pricing project (Eliasson and Karlstorm, 2009).

Additional area type pricing projects were discussed previously in the Literature Search chapter of this dissertation.

5.6.2 Florida Urban Travel

FDOT Sourcebook (FDOT, 2012) defines urban areas as cities with a population of over 50,000 inhabitants. Urban travel has accounted for 66.5% of total travel in the past 8 years.

Due to population growth and land use/development expansion, it is logical to assume an increase in the urban travel level, However our subsequent financial analyses assumes that the ratio of the urban VMT to total VMT would remain nearly constant. The natural growth of the urban VMT ratio is discounted by the impacts of area-wide charging, in-field land developments, modal diversion to mass transit, increase in telecommuting and ride-sharing etc.

5.6.3 Financial Model Run

The financial model run assumes area wide pricing of the urban travel on SHS at a MBUF plus an added 25% charge.

The annual VMT is first decomposed into SHS and non-SHS VMT's. The SHS VMT is then decomposed into Urban and Rural. The non-SHS VMT and rural VMT are then applied a flat MBUFE, while the SHS Urban VMT is assessed the MBUF plus an added 25% area-type premium as previously presented in Table 5-1. The gross annual revenues are then calculated. After deducting the 20% collection and administration costs, the net annual revenues are computed. A prescribed discount rate is then applied to convert all the annual net revenues to the PDV for the study period.

Figure 5-14 on the following page, depicts the annual revenue projections of this pricing policy along with TPG and MBUFE strategies for comparison purposes. Table 6-1 of the subsequent chapter presents annual revenue projections of all the pricing strategies.

Implementation of this strategy is anticipated to generate annual revenue ranging from \$6.052 billion in 2015 to \$9.867 billion in 2035, with analysis period revenues when expressed in 2015 dollars exceeding \$144.78 billion.

This strategy can result in \$35 billion additional revenue over the current TPG during the analysis period.

Due to high traffic volumes in the urbanized area on the SHS, this strategy also generates \$7.5 billion more revenues than peak period pricing (ToDMBUF) during the analysis period.

Implementation of this pricing strategy not only can greatly encourage ride-sharing, carpooling, telecommuting and increased utilization of the public transportation, but also generate much needed operation, maintenance and improvement funding for the SHS within Florida's urban boundaries.

The pricing premium rates for the urban SHS can be adjusted to the price index of operation, construction and improvement costs of these facilities.

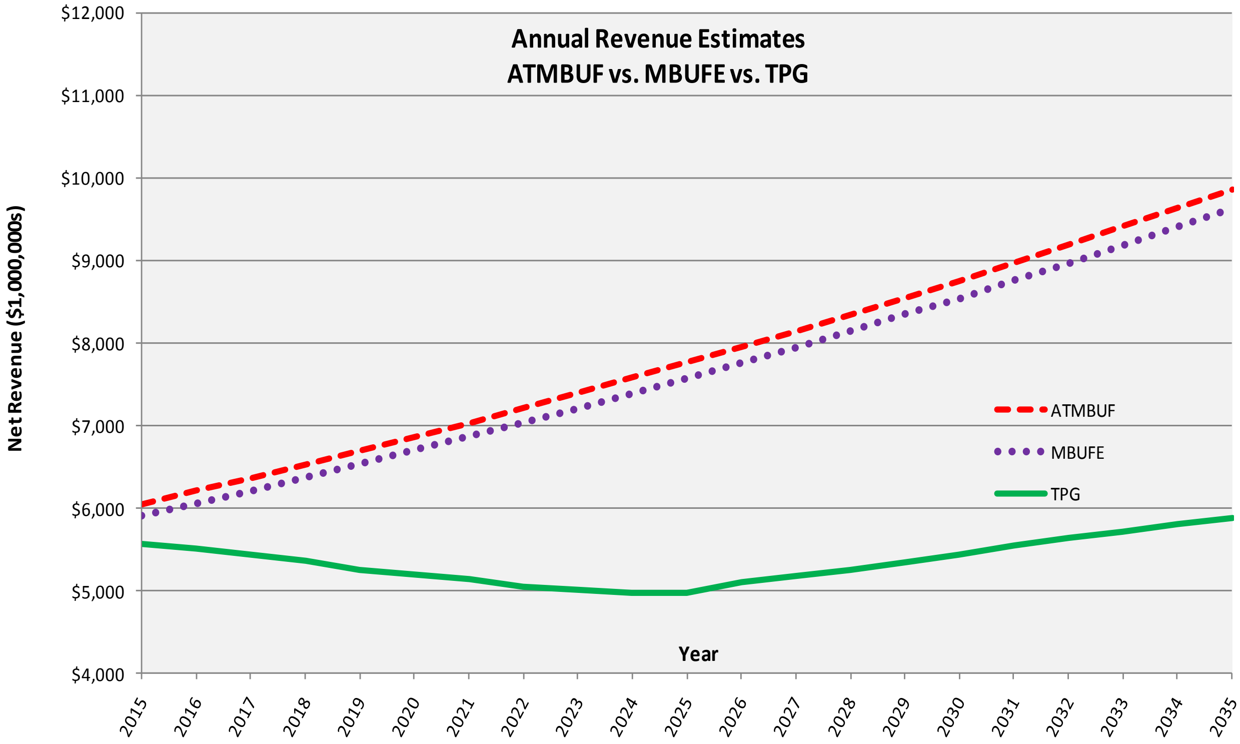


Figure 5-14: ATMBUF Annual Revenue Projection

5.7 Examination of peak period Congestion Level Mileage Based User Fee (CPMBUF) Strategy

This pricing policy combines the two previously discussed strategies of pricing the urban areas during the peak periods. It is in reality and effectively a congestion pricing policy.

It utilizes all the previously discussed traffic and land use characteristics and parameters. The total VMT is decomposed into autos and trucks; each VMT is then decomposed into urban and non-urban. Next decomposition is SHS and non-SHS VMT's. And lastly is the decomposition of peak period and non-peak period VMT's. Tables 5-9 and 5-10 depict the input and output of the VMT decomposition of the financial model.

In this pricing scenario, as previously presented in Table 5-1, the non-SHS VMT's (regardless of urban or rural, Peak or off-peak) is assessed the flat MBUF. The urban off peak on SHS and the rural peak on SHS is assessed the MBUF plus a 25% charge, while the urban peak SHS is assessed the MBUF and a 50% charge.

Similar to the congestion pricing results of the previously discussed implementations (London, Singapore and Stockholm), a 10% reduction of the SHS peak period urban VMT due to the congestion reduction impact of this policy is made. This results in a peak period to daily ratio of 20.93% vs. the original 23.25% for the autos.

Similarly a 20% reduction to the truck's SHS peak period urban VMT is made. This resulted in peak period to daily ratio of 18.6% vs. the original 23.25% for the trucks (see Table 5-1, Pricing Policy Rates).

Figure 5-15 depicts the projected annual revenues as a result of this pricing strategy and Table 6-1 in the subsequent chapter presents summary of the annual revenue projections. As before, the TPG and MBUFE's annual revenues for the comparison purposes are also presented.

Table 5-9: VMT Decomposition Input

Decomposition	% of Total VMT	% of Total VMT	Total VMT
Vehicle Type	Autos 93.6%	Trucks 6.4%	100%
Facility Type	SHS 53.7%	Non-SHS 46.3%	100%
Area Type	Urban 66.5%	Rural 33.5%	100%
Congestion Level Rural (Autos & Trucks)	Peak 23.25%	Non-Peak 77.75%	100%
Congestion Level Urban* (Autos)	Peak 20.93%	Non-Peak 79.07%	100%
Congestion Level Urban* (Trucks)	Peak 18.60%	Non-Peak 81.40%	100%

Note that there is a 10% reduction for autos and 20% reduction for trucks of the SHS peak period urban VMT due congestion reduction impact of CPMBUF pricing policy

The annual net revenues as a result of the implementation of a CPMBUF, are estimated to begin at $6.184 billion in year 2015 and steadily increasing to $10.083 billion by year 2035. Total analysis period revenues are projected to exceed $117.31 billion. This is an approximate $37 billion total revenue increase over the current TPG for the analysis period.

Implementation of CPMBUF is estimated to generate approximately $7 billion more revenue than an MBUFE strategy.

Once again the application of ITS technologies and the provision of dynamic congestion pricing can offer a balance of desired policies and objectives such as revenue generation, transportation demand management and environmental controls.

Table 5-10: VMT Decomposition Output

YEAR	Total Vehicle VMT (millions)			Roadway Type VMT (millions)				SHS VMT (millions)							
								Auto & Light Trucks VMT (millions)				Trucks VMT (millions)			
	All	Auto & Lt	Trucks	County / City		S.H.S		Urban Area		Rural Area		Urban Area		Rural Area	
				Auto & Lt	Trucks	Auto & Lt	Trucks	Peak	Non Peak	Peak	Non Peak	Peak	Non Peak	Peak	Non Peak
2015	209,400	195,999	13,402	90,747	6,205	105,251	7,197	14,649	55,343	8,198	27,061	890	3,896	561	1,850
2016	213,097	199,459	13,638	92,349	6,314	107,109	7,324	14,908	56,320	8,342	27,539	906	3,964	570	1,883
2017	216,829	202,952	13,877	93,967	6,425	108,985	7,452	15,169	57,306	8,489	28,021	922	4,034	580	1,916
2018	220,576	206,459	14,117	95,590	6,536	110,868	7,581	15,431	58,296	8,635	28,506	938	4,104	590	1,949
2019	224,329	209,971	14,357	97,217	6,647	112,755	7,710	15,694	59,288	8,782	28,991	954	4,173	600	1,982
2020	228,084	213,487	14,597	98,844	6,759	114,642	7,839	15,956	60,281	8,929	29,476	970	4,243	611	2,015
2021	231,840	217,003	14,838	100,472	6,870	116,530	7,968	16,219	61,273	9,076	29,961	986	4,313	621	2,049
2022	235,597	220,519	15,078	102,100	6,981	118,419	8,097	16,482	62,266	9,223	30,447	1,002	4,383	631	2,082
2023	239,355	224,036	15,319	103,729	7,093	120,307	8,226	16,745	63,259	9,370	30,933	1,017	4,453	641	2,115
2024	243,112	227,553	15,559	105,357	7,204	122,196	8,355	17,008	64,252	9,518	31,418	1,033	4,523	651	2,148
2025	246,869	231,069	15,800	106,985	7,315	124,084	8,484	17,271	65,245	9,665	31,904	1,049	4,593	661	2,181
2026	250,626	234,586	16,040	108,613	7,427	125,973	8,614	17,533	66,238	9,812	32,389	1,065	4,663	671	2,215
2027	254,384	238,103	16,281	110,242	7,538	127,861	8,743	17,796	67,231	9,959	32,875	1,081	4,732	681	2,248
2028	258,141	241,620	16,521	111,870	7,649	129,750	8,872	18,059	68,224	10,106	33,360	1,097	4,802	691	2,281
2029	261,898	245,137	16,761	113,498	7,761	131,638	9,001	18,322	69,218	10,253	33,846	1,113	4,872	701	2,314
2030	265,656	248,654	17,002	115,127	7,872	133,527	9,130	18,585	70,211	10,400	34,331	1,129	4,942	711	2,347
2031	269,413	252,170	17,242	116,755	7,983	135,415	9,259	18,848	71,204	10,547	34,817	1,145	5,012	721	2,381
2032	273,170	255,687	17,483	118,383	8,095	137,304	9,388	19,111	72,197	10,694	35,303	1,161	5,082	731	2,414
2033	276,927	259,204	17,723	120,011	8,206	139,193	9,517	19,373	73,190	10,841	35,788	1,177	5,152	741	2,447
2034	280,685	262,721	17,964	121,640	8,317	141,081	9,647	19,636	74,183	10,988	36,274	1,193	5,222	751	2,480
2035	284,442	266,238	18,204	123,268	8,429	142,970	9,776	19,899	75,176	11,136	36,759	1,209	5,292	761	2,513

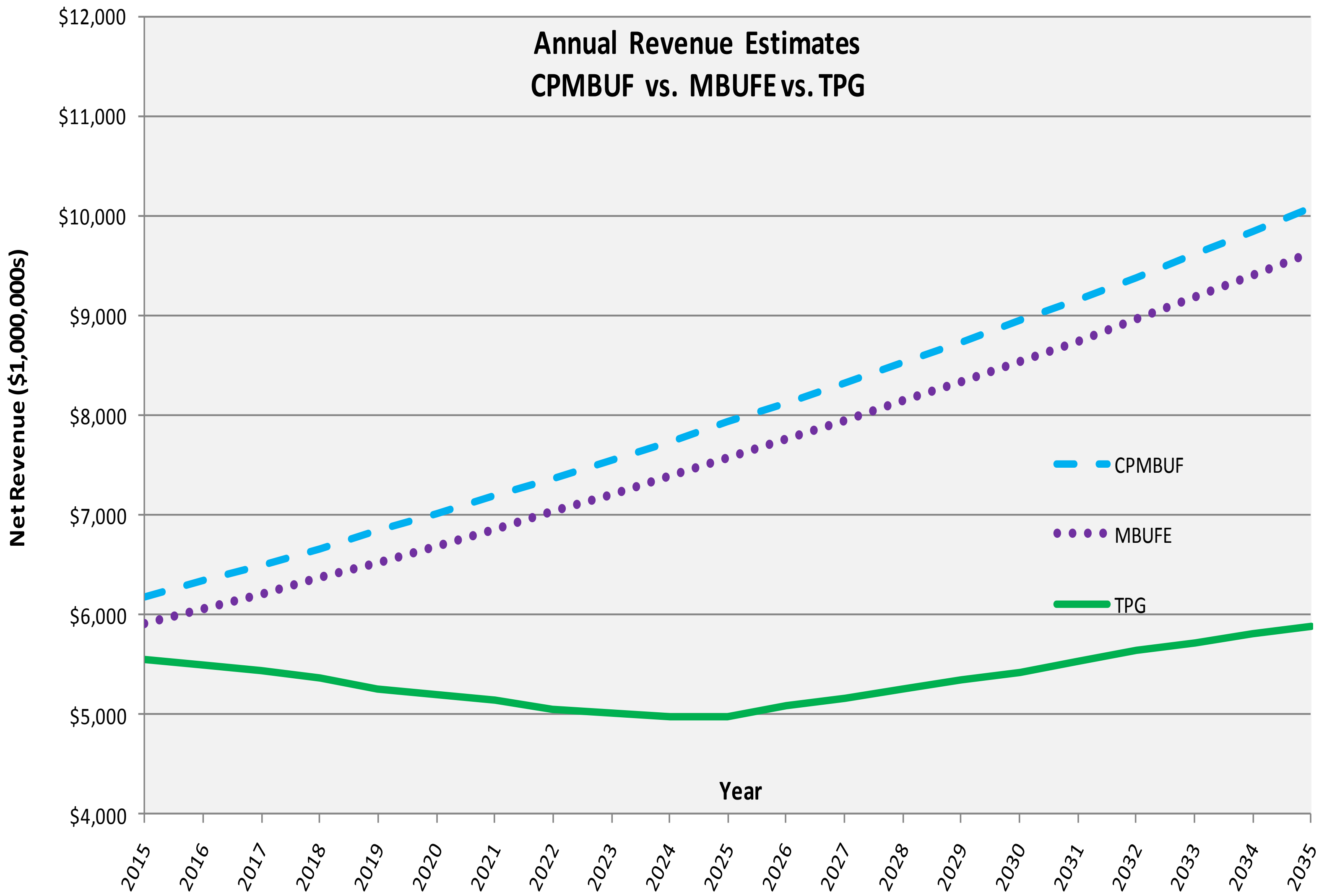


Figure 5-15: CPMBUF Annual Revenue Projections

6 CONCLUSIONS, SUMMARY, AND FUTURE RESEARCH

6.1 Overview

This chapter is divided into three sections. The first section elaborates on the results of our application of the financial model in assessing the revenue impacts of the federal environmental and energy policies (CAFE), and the significance of an MBUF to apply various pricing and demand management strategies, as a more sustainable transportation funding mechanism. The second section provides a summary of the work done in preparation of this dissertation. And lastly the third section elaborates on the future research and further studies that may utilize this dissertation as a stepping stone.

6.2 Conclusions

Motor fuel taxes have been a significant portion of the transportation funding for the past century. Due to higher fuel efficiency standards enacted since 1975 and lack of an increase in federal fuel taxes since 1993, the balance of the HTF has been decreasing dramatically.

Planning, evaluation and implementation of CAFE standards, addressing our nation's energy, vehicular safety, environmental and national security objectives, have failed to evaluate and mitigate the revenue impacts to the HTF.

The financial analysis has evaluated the impact of the recent CAFE initiatives and concluded a significant loss of revenues due to improved fleet fuel economy as mandated by CAFE. Instead of the current TPG, an MBUFE strategy was utilized to assess the reduction of the revenue loss as result of the CAFE. It was concluded that nearly all of the revenue losses may be recovered by implementing an MBUFE strategy.

The results of our financial analyses and assessing the impacts of the federal CAFE standards, clearly documented the adverse effect of the federal energy and environmental policies/initiatives on transportation revenues and funding challenges of our present and future mobility needs.

Replacement of the current TPG, with an MBUF strategy of: MBUFE, ATMBUF, ToDMBUF or CPMBUF has resulted in substantial increases in annual revenues. Table 6-1 depicts the net annual revenues for the five pricing strategies discussed in the previous chapter, while Figure 6-1 presents the revenue streams of these strategies (Appendix C at the end of this dissertation contains the worksheet from the financial model for all the financial analyses).

Conversion from the current TPG to an MBUFE, ToDMBUF, ATMBUF or CPMBUF is shown to result in approximately $31 billion, $27 billion, $34 billion or $37 billion in increased revenues, respectively, during the analysis period.

If the policy objective is to maximize fuel revenues, then CPMBUF, ATMBUF, MBUFE and ToDMBUF, in their order of appearance, are the ranked strategies.

Should the traffic demand management and environmental concerns be the policy priorities then the ranking of the strategies is as follows: CPMBUF, ATMBUF, ToDMBUF and MBUFE.

The CPMBUF provides optimal delivery and balance of the revenue generation, traffic demand management and environmental objectives and policies.

Our analyses assumed (-0.8%) and (-1.6%) reduction in peak period travel for autos due to 25% and 50% increases in MBUFE price elasticity respectively. While the reduction percentages of truck travel during peak period due to price elasticity of 25% and 50% increase in MBUFE were (-0.9%) and (-1.7%) respectively.

We further assumed a 10% and 20% shift from peak period to non-peak period for autos and trucks respectively during the congestion pricing scenario. Despite all these travel decreases/ diversions (demand management), the above mentioned net revenue increases were realized.

These additional revenues can better address the SHS needs (maintenance, operation, rehabilitation and expansion), as well as improve the public transportation in and near major urbanized areas. The congestion pricing policy can assist in achieving a balance between demand management, environmental impacts and revenue needs. A distance based road user fee may also discourage urban sprawl and the need for construction of new alignment roadways or expansion/widening of the existing ones.

With recent and rapid advancements in electronic toll collection, satellite, cellular phones, on board navigation systems, WI-FI and photo enforcement technologies; implementation of a mileage based user fee regime is more technologically achievable than ever.

The key to success is early public awareness and acceptance. The environmental, economic and social benefits of congestion priced MBUF are very strong selling points of this financially viable policy.

In closing, the CPMBUF can be a viable pricing and demand management policy for shrinking the Florida's transportation funding gap. Florida's 2040 unfunded needs on just the

State Intermodal System- Highway Component expressed in 2010 dollars were estimated to be $136.3 billion in 2010 dollars (Reichert, 2011).

Our conclusion is based on very conservative financial analyses. More savings can be achieved by streamlining, merging and automation of collection/administration of other current transportation related taxes fees (license plate, vehicle registration, title, and tire and battery fees (for trucks)).

It is recommended that the concept of MBUF receives more consideration in future transportation financing plans. It is also recommended that any future energy, environmental or national security policy affecting the gas tax revenues includes a thorough financial impact analyses as it relates to the transportation funding.

Table 6-1: Financial Model Results

YEAR	NET ANNUAL REVENUES ($ millions)				
	TPG	**MBUFE**	**ToDMBUF**	**ATMBUF**	**CPMBUF**
2015	$5,560	$5,905	$5,649	$6,052	$6,184
2016	$5,505	$6,056	$5,793	$6,207	$6,343
2017	$5,433	$6,211	$5,942	$6,366	$6,506
2018	$5,370	$6,370	$6,094	$6,528	$6,672
2019	$5,250	$6,532	$6,248	$6,694	$6,841
2020	$5,201	$6,697	$6,406	$6,863	$7,014
2021	$5,138	$6,865	$6,567	$7,036	$7,190
2022	$5,054	$7,037	$6,731	$7,212	$7,370
2023	$5,013	$7,212	$6,899	$7,391	$7,553
2024	$4,984	$7,391	$7,070	$7,574	$7,741
2025	$4,983	$7,573	$7,244	$7,761	$7,932
2026	$5,097	$7,759	$7,422	$7,952	$8,127
2027	$5,170	$7,949	$7,604	$8,147	$8,326
2028	$5,261	$8,143	$7,790	$8,346	$8,529
2029	$5,353	$8,342	$7,980	$8,549	$8,737
2030	$5,430	$8,544	$8,174	$8,757	$8,949
2031	$5,543	$8,752	$8,372	$8,969	$9,166
2032	$5,640	$8,963	$8,574	$9,186	$9,388
2033	$5,712	$9,180	$8,781	$9,408	$9,614
2034	$5,812	$9,401	$8,993	$9,635	$9,846
2035	$5,878	$9,627	$9,210	$9,867	$10,083
Total in 2015 Dollars	**$80,877**	**$111,999**	**$107,140**	**$114,783**	**$117,303**

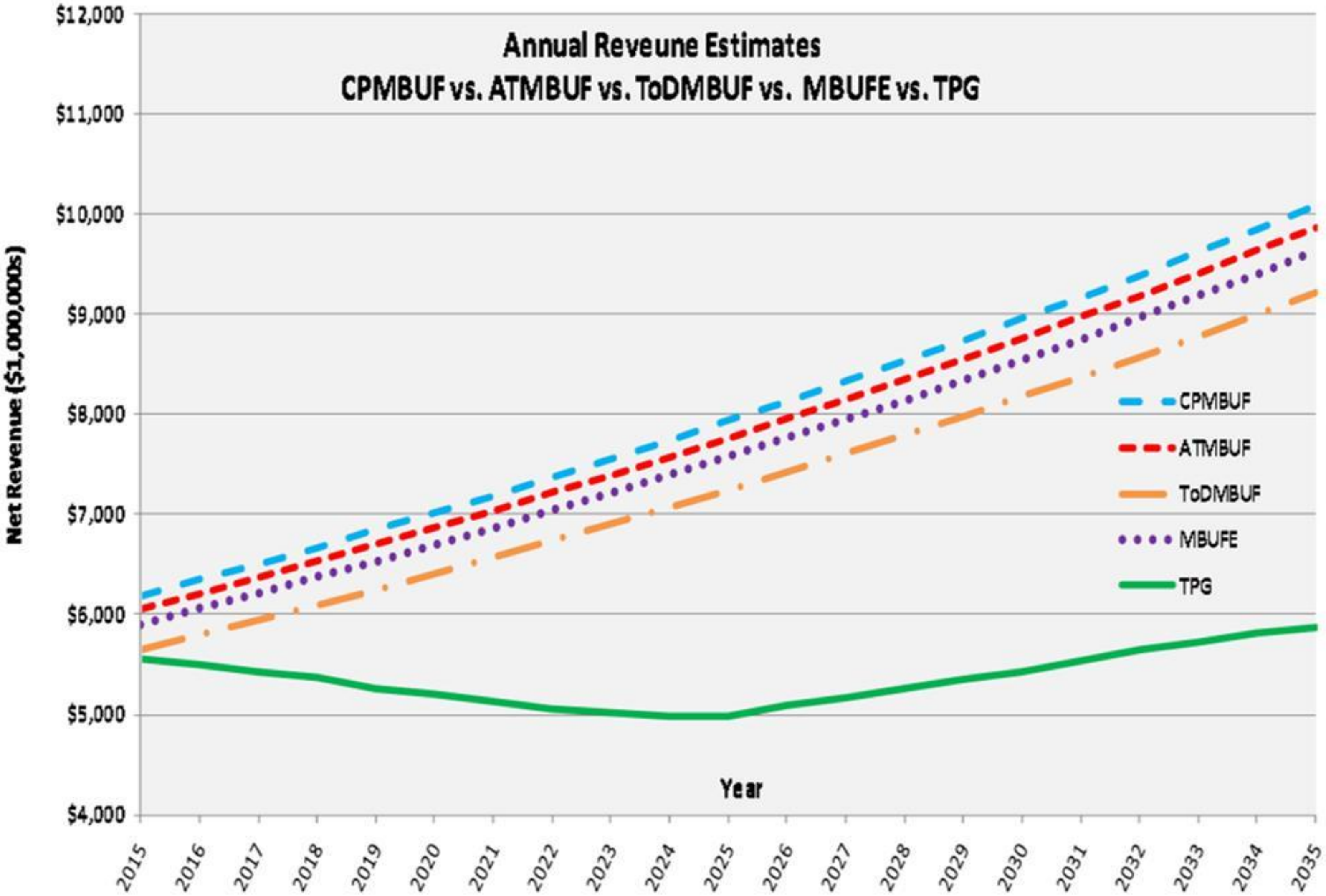


Figure 6-1: Summary of Pricing Strategies Annual Revenue Projections

6.3 Summary

This section of the dissertation presents the summary of the research and analyses efforts. After the initial identification of the area of research and topic selection; a rigorous data collection and literature review was conducted. More than four hundred sources of data and studies were researched. Ninety of these sources have been cited.

This study began by examining the sustainability of the existing TPG fuel tax policy. It was quickly concluded that the transportation revenues were not keeping pace with the ever growing funding needs of our aging infrastructure and increasing demand. Financial viability of an MBUF fee was then to be assessed.

State of Florida and a 20 year analysis period (2015-2035) were chosen for this case study.

A uni-variant aggregate time series modeling based on historic Florida's VMT was utilized to forecast the future VMT's. Two time series model selection process as (Holt-Winters and Box- Jenkins) confirmed an ARIMA 121 model as the best suited forecasting tool. The resultant model VMT forecasts were further validated by appropriate socio-economical parameters, forecasts and trends. This forecasting methodology is scalable (can be used for regional or national applications) and affordable (free public use of the R Software and easily collected historic VMT data sets).

A robust financial model was developed to assess the financial impacts of shifting from a TPG to an MBUFE and a variety of demand management pricing policies utilizing MBUF collection regime. The spreadsheet based financial model allowed for sensitivity analyses of all input parameters as well as financial assessment of various pricing policies/demand management strategies.

The input parameters of the financial models were thoroughly researched not only from an historical prospective, but also for a range of reasonableness that ensured a conservative approach in conducting the financial analyses.

Even though the primary focus of this study was the state of Florida, the VMT forecasting methodology and subsequent financial model application are both transportable and scalable.

They can be utilized by any state to conduct similar analyses. The size of the area/jurisdiction is irrelevant as these models (VMT forecasting and financial) can be utilized by a city, county, or any other taxing authority or nationally.

As result of, and in conjunction with, the work conducted in preparation of this dissertation, four peer reviewed journal articles have been submitted for publication. One article (Moradi and Al-Deek 2012(a) is scheduled for publication by July, 2012, while the remaining three (Al-Deek and Moradi, 2011, Al-Deek-Moradi 2012(b and c) are undergoing typical reviews.

6.4 Future Research

The scope of this dissertation, as stated in the first chapter, has been primarily a financial evaluation of various pricing policies as relates to the fuel taxes/fees.

The research showed that the public acceptance of a shift from the current TPG to an MBUF remains to be a hurdle, with personal privacy as the main issue. Another issue is the public's lack of awareness of transportation funding shortfalls and its unsustainability. In light of the above stated institutional concerns, further research in public perception of the nation's transportation challenges (congestion, cost of operation and maintenance, level of current taxes and their erosion) thru focus group or state of performance surveys is needed.

The financial model developed for this dissertation is highly transferable and scalable, its application for assessment of various pricing strategies in a regional setting, such as the southeastern states, gulf coast states or at a national level, can serve as an area of further utilization of this model.

Similarly, the methodology used in forecasting the state's annual VMT can be easily applied for forecast of regional or national VMT's. The R program free to the public is a highly adaptive program with limited input data requirement, which utilizes a variety of time series analyses and modeling approaches in forecasting future VMT or other time series events /values.

Some of the input parameters to the financial model were held constant for all years of the analysis period. A constant truck factor of 6.4% was used for years 2015 through 2035. The cost of collection and administration of TPG and MBUFE remained at constant rates of 1% and 15% respectively. Peak period traffic to daily ratio or level of urban travel to total travel are other examples of these constant parameters as input to the financial model.

The financial model can be enhanced by an introduction of variable input parameters through extensive research and statistical analysis (regression, time series etc). Prediction of future values for truck factor, peak period to daily ratio, level of urban traffic, cost of collection and administration, and their utilization in the financial model may serve as the fine tuning and a better replication of the future condition effecting the revenue streams and policy decisions.

APPENDIX A: “R” PROGRAM INPUTS AND CODINGS

```
vmt<-ts(read.table("vmt.txt", header=T), start=1966)

#3rd degree polynomial to show 43rd obs might be outlier.
t<-time(vmt)
modelpoly3<-lm(vmt~t+I(t^2)+I(t^3))
plot(vmt)
############
par(new=T)
plot(predict(modelpoly3), col="red", axes=F, xlab="", ylab="", type="o")
#43 observation is an outlier and influential based on graphs
par(mfrow=c(2,2))
plot(modelpoly3)
###################3
newvmt<-vmt[-43]
#Holt's Trend Corrected Model
modelholt<-HoltWinters(vmt, gamma=F)
p<-predict(modelholt, n.ahead=27, prediction.interval=T, level=.95)
plot(modelholt, p)
###########New data
modelholtn43<-HoltWinters(newvmt, gamma=F)
p<-predict(modelholtn43, n.ahead=27, prediction.interval=T)
plot(modelholtn43, p)
#ARIMA MODELS
for (p in 0:2){
for (q in 1:2){
for (r in 0:2){
model<-arima(vmt, c(p,q,r))
print(c(p,q,r))
print(model$aic)
###############Above is for model selection, now the models
model021<-arima(vmt,c(0,2,1))
x.fore = predict(model021, n.ahead=27)
U = x.fore$pred + 2*x.fore$se
L = x.fore$pred - 2*x.fore$se
minx=min(vmt,L)
maxx=max(vmt,U)
ts.plot(vmt,x.fore$pred,col=1:2, ylim=c(minx,maxx))
lines(U, col="blue", lty="dashed")
lines(L, col="blue", lty="dashed")
#####################3
model122<-arima(vmt,c(1,2,2))
x.fore = predict(model122, n.ahead=27)
U = x.fore$pred + 2*x.fore$se
L = x.fore$pred - 2*x.fore$se
```

```
minx=min(vmt,L)
maxx=max(vmt,U)
ts.plot(vmt,x.fore$pred,col=1:2, ylim=c(minx,maxx))
lines(U, col="blue", lty="dashed")
lines(L, col="blue", lty="dashed")
 ########################
model222<-arima(vmt,c(2,2,2))
x.fore = predict(model222, n.ahead=27)
U = x.fore$pred + 2*x.fore$se
L = x.fore$pred - 2*x.fore$se
minx=min(vmt,L)
maxx=max(vmt,U)
ts.plot(vmt,x.fore$pred,col=1:2, ylim=c(minx,maxx))
lines(U, col="blue", lty="dashed")
lines(L, col="blue", lty="dashed")
########################
newvmt<-ts(vmt[-43], start=1966, freq=1)
model121n43<-arima(newvmt,c(1,2,1))
x.fore = predict(model121n43, n.ahead=27)
U = x.fore$pred + 2*x.fore$se
L = x.fore$pred - 2*x.fore$se
minx=min(newvmt,L)
maxx=max(newvmt,U)
ts.plot(newvmt,x.fore$pred,col=1:2, ylim=c(minx,maxx))
lines(U, col="blue", lty="dashed")
lines(L, col="blue", lty="dashed")
####model coefficients for model121n43
model121n43
########################side by side plots of models
par(mfrow=c(2,2))
modelholtn43<-HoltWinters(newvmt, gamma=F)
p<-predict(modelholtn43, n.ahead=27, prediction.interval=T)
plot(modelholtn43, p)
model122<-arima(vmt,c(1,2,2))
x.fore = predict(model122, n.ahead=27)
U = x.fore$pred + 2*x.fore$se
L = x.fore$pred - 2*x.fore$se
minx=min(vmt,L)
maxx=max(vmt,U)
ts.plot(vmt,x.fore$pred,col=1:2, ylim=c(minx,maxx))
lines(U, col="blue", lty="dashed")
lines(L, col="blue", lty="dashed")
model222<-arima(vmt,c(2,2,2))
x.fore = predict(model222, n.ahead=27)
```

```
U = x.fore$pred + 2*x.fore$se
L = x.fore$pred - 2*x.fore$se
minx=min(vmt,L)
maxx=max(vmt,U)
ts.plot(vmt,x.fore$pred,col=1:2, ylim=c(minx,maxx))
lines(U, col="blue", lty="dashed")
lines(L, col="blue", lty="dashed")
model121n43<-arima(newvmt,c(1,2,1))
x.fore = predict(model121n43, n.ahead=27)
U = x.fore$pred + 2*x.fore$se
L = x.fore$pred - 2*x.fore$se
minx=min(newvmt,L)
maxx=max(newvmt,U)
ts.plot(newvmt,x.fore$pred,col=1:2, ylim=c(minx,maxx))
lines(U, col="blue", lty="dashed")
lines(L, col="blue", lty="dashed")
############################
#fixes graph window to one per page
par(mfrow=c(1,1))
```

APPENDIX B: FLORIDA’S TRAVEL DATA AND CHARACTERISTICS

In Section B2:

Road System Definitions

Public Road System Summaries

National Highway System

Florida Intrastate Highway System (FIHS)

Strategic Intermodal System (SIS)

Functional Classification

Road System Definitions

Public road: A road open to the traveling public and operated by a governmental organization. Private residential subdivision roads and shopping center driveways are not public roads as that term is used in this publication.

State Highway System (SHS): Roads owned and maintained by the State of Florida. Includes roads signed as Interstate highways, U.S. routes, and State Roads.

County Highway System: Roads owned by the counties of Florida. Includes some roads that pass through urban areas.

City Street System: Roads and streets that are owned by the cities and municipalities of Florida.

Federal Roads: Roads that are owned by agencies of the U. S. Government. They include many (but not all) roads in National Parks, National Forests, and Indian reservations, as well as roads owned by the U.S. Army Corps of Engineers, the US Fish and Wildlife Service, and the National Aeronautical and Space Administration. Interstate highways are owned by the states, not by the federal government.

Federal-aid eligible roads: Roads that are always eligible for federal highway funds. They are either on the National Highway System or part of the Surface Transportation Program. Eligibility is determined by functional classification; public roads classified as principal arterials, minor arterials, urban collectors, or rural major collectors are federal-aid eligible. Roads classified as rural minor collectors, rural local, or urban local are not federal-aid eligible. However, a limited amount of federal highway funds can be spent each year on rural minor arterials.

Road Jurisdiction Transfers: City, County, or State agencies may transfer jurisdictional responsibility for a road among themselves, by mutual agreement. A road transfer to or from the State Highway System requires a formal agreement between Florida DOT and the other agency, and the signed approval of the Secretary of the Department.

Public Road System Summaries

System	Miles[1]	% of Public Mileage	DVMT[2] (1000's)	% of Public DVMT	% Paved
Public Roads	121,701	100.0%	536,315	100.0%	
County	69,865	57.4%			77.6%
City	37,548	30.9%			96.8%
State	12,085	9.9%			100.0%
Federal	2,203	1.8%			
SHS	12,085	9.9%	288,185	53.7%	100.0%
FIHS	3,980	3.3%	156,150	29.1%	100.0%
SIS[3]	4,297	3.5%	159,169	29.7%	100.0%
NHS[4]	4,286	3.5%	166,489	31.0%	100.0%

NOTES:

[1] Roadway segments can have multiple designations. Therefore, the sum of roadways across all designation types exceeds that actual total of Public Roads.

[2] DVMT is Daily Vehicle Miles Traveled, the product of a road segment's length (in miles) and its annual average daily traffic (AADT).

[3] The SIS data above include only the SIS Highways and Emerging SIS Highways. There are also 181.454 miles of SIS Connectors and Emerging SIS Connectors.

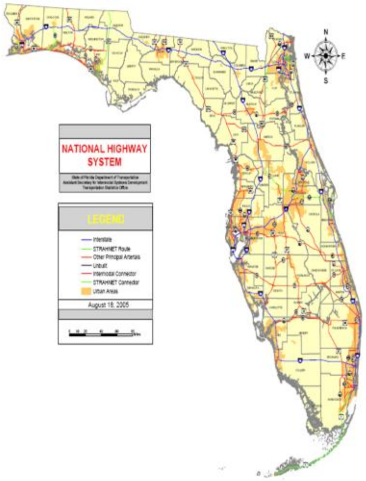
[4] The NHS data above include only the State Highway System portion of the NHS.

National Highway System (NHS): Public roads that have been designated by Congress or the Federal Highway Administration as nationally important.

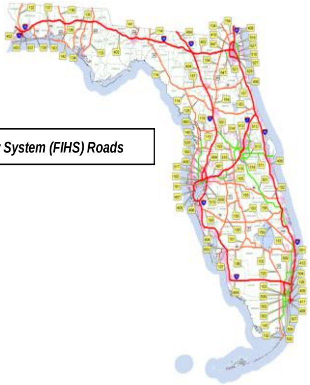
The NHS in Florida is mostly on the SHS, but some NHS roads (primarily connectors to defense installations or intermodal transportation facilities) are on the County Highway System or the City Street System.

In Florida, the NHS includes 4,359 miles of roads (of which 4,286 are on the SHS), and more than 5,000 major road segments for which FHWA requires specific data.

NHS designation allows the use of federal funds set aside for that system. It also carries certain restrictions on outdoor advertising.



Florida Intrastate Highway System (FIHS): A part of the SHS that is designated by the Florida Legislature and is intended to connect urban and rural areas throughout the state, and to connect to global markets through airports, seaports and rail terminals. Some roads on the FIHS are being upgraded, and additional roads will be constructed. When complete, about 60% of the FIHS will be limited access roads similar to Interstate highways. More information on the FIHS is available at http://www.dot.state.fl.us/planning/systems/fihs/

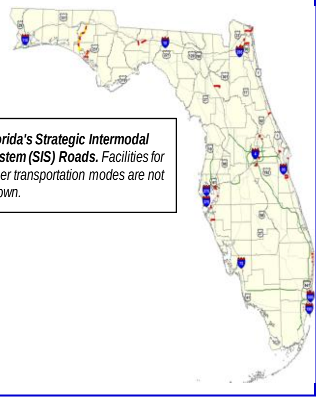


Florida Intrastate Highway System (FIHS) Roads

Strategic Intermodal System (SIS): Made up of statewide and regionally significant facilities and services (*strategic*). Contains all forms of transportation for moving both people and goods (*intermodal*). Integrates individual facilities, services, modes of transportation and linkages into a single, integrated transportation network (system).

The highway component of the SIS is similar to the FIHS. It includes highways that are both currently designated (SIS Routes) and expected to be eligible for designation relatively soon (Emberging SIS Routes), as well as connectors (SIS Connectors) to designated intermodal facilities, and roads that are expected to be so designated in the future (Emerging SIS Connectors). Some unbuilt routes and connectors are also designated as Planned SIS Routes or Connectors. More SIS information at

http://www.dot.state.fl.us/planning/sis



Florida's Strategic Intermodal System (SIS) Roads. *Facilities for other transportation modes are not shown.*

Mileage and Vehicle Miles Traveled
On Florida's Public Roads

As reported by the Federal Highway Administration in annual issues of *Highway Statistics*

NOTE: Data before 1984 may not be reported consistently, and should be used with caution.

Year	Centerline Miles	AVMT (millions)	DVMT (thousands)
1967 [1]	82,898	31,820	87,178
1968	85,889	34,838	95,447
1969	87,654	37,595	103,000
1970	89,499	41,781	114,468
1971	93,310	47,493	130,118
1972	96,774	54,589	149,559
1973	98,129	59,265	162,370
1974	98,091	62,021	169,921
1975 [2]	101,538	-	-
1976	98,094	64,492	176,690
1977	97,021	67,007	183,581
1978	97,120	71,437	195,718
1979	96,281	74,651	204,523
1980	97,153	79,002	216,444
1981	97,186	76,145	208,616
1982	93,797	79,498	217,803
1983	93,074	81,776	224,044
1984	98,984	85,475	234,178
1985	99,071	88,056	241,249
1986	99,074	87,273	239,104
1987	100,423	93,639	256,545
1988	104,589	105,319	288,545
1989	107,955	108,877	298,293
1990 [1]	108,085	109,997	301,362
1991 [1]	109,374	113,319	310,463
1992 [1]	110,640	119,868	328,405
1993 [1]	112,808	120,467	330,047
1994 [1]	113,478	121,989	334,216
1995 [1]	113,778	127,809	350,162
1996	114,422	130,004	356,175
1997	114,572	133,268	365,118
1998	115,416	136,681	374,468
1999	115,956	141,903	388,775
2000	116,442	149,857	410,568
2001	117,301	171,030	468,574
2002	119,785	178,367	489,536
2003	120,376	185,511	508,249
2004	119,525	196,444	536,732
2005	120,557	201,531	552,140
2006	121,996	203,741	558,195
2007	121,526	206,121	564,715
2008 [3]	121,387	197,952	542,334
2009 [3]	121,446	196,402	538,089
2010 [3]	121,702	195,755	536,315
Increase since 1984	23%	132%	132%

Notes:

[1] VMT data for this year revised and printed in following year's report.

[2] VMT data not available.

[3] From FDOT's Public Road Mileage & Miles Traveled Report

Sources:

- Centerline Miles from Table HM-10 in FHWA's Highway Statistics, except as noted.
- AVMT is from Table VM-2 in Highway Statistics, except as noted.
- DVMT is from FDOT's Public Road Mileage & Miles Traveled Report

Mileage and DVMT on Florida's State Highway System

As of Dec. 31, except as noted

Year [1]	Centerline Miles			Lane Miles			Daily Vehicle Miles Traveled (DVMT)			DVMT per Lane Mile		
	Number	Annual % Increase	Total % Increase	Number	Annual % Increase	Total % Increase	Thousands	Annual % Increase	Total % Increase	Number	Annual % Increase	Total % Increase
1984	11,490.0		0.0%	34,658		0.0%	156,519		0.0%	4,516		0.0%
1985	11,469.0	-0.2%	-0.2%	34,915	0.7%	0.7%	170,769	9.1%	9.1%	4,891	8.3%	8.3%
1986	11,492.0	0.2%	0.0%	35,176	0.7%	1.5%	178,602	4.6%	14.1%	5,077	3.8%	12.4%
1987	11,527.0	0.3%	0.3%	35,588	1.2%	2.7%	179,310	0.4%	14.6%	5,039	-0.8%	11.6%
1988	11,763.4	2.1%	2.4%	36,220	1.8%	4.5%	191,342	6.7%	22.2%	5,283	4.8%	17.0%
1989 [4]	11,752.9	-0.1%	2.3%	36,404	0.5%	5.0%	186,943	-2.3%	19.4%	5,135	-2.8%	13.7%
1990	11,854.3	0.9%	3.2%	37,085	1.9%	7.0%	191,215	2.3%	22.2%	5,156	0.4%	14.2%
1991	11,862.5	0.1%	3.2%	37,312	0.6%	7.7%	198,205	3.7%	26.6%	5,312	3.0%	17.6%
1992	11,898.4	0.3%	3.6%	37,578	0.7%	8.4%	198,300	0.0%	26.7%	5,277	-0.7%	16.8%
1993	11,905.0	0.1%	3.6%	37,752	0.5%	8.9%	212,590	7.2%	35.8%	5,631	6.7%	24.7%
1994	11,897.5	-0.1%	3.5%	38,013	0.7%	9.7%	221,240	4.1%	41.4%	5,820	3.4%	28.9%
1995	11,921.1	0.2%	3.8%	38,328	0.8%	10.6%	226,747	2.5%	44.9%	5,916	1.6%	31.0%
1996	11,927.3	0.1%	3.8%	38,654	0.8%	11.5%	231,215	2.0%	47.7%	5,982	1.1%	32.5%
1997	11,926.8	0.0%	3.8%	39,003	0.9%	12.5%	239,518	3.6%	53.0%	6,141	2.7%	36.0%
1998	11,943.5	0.1%	3.9%	39,256	0.6%	13.3%	245,757	2.6%	57.0%	6,260	1.9%	38.6%
1999	11,952.3	0.1%	4.0%	39,529	0.7%	14.1%	254,114	3.4%	62.4%	6,429	2.7%	42.3%
2000	11,989.9	0.3%	4.4%	39,840	0.8%	15.0%	258,528	1.7%	65.2%	6,489	0.9%	43.7%
2001	12,050.5	0.5%	4.9%	40,204	0.9%	16.0%	267,229	3.4%	70.7%	6,647	2.4%	47.2%
2002	12,058.2	0.1%	4.9%	40,554	0.9%	17.0%	273,744	2.4%	74.9%	6,750	1.6%	49.5%
2003	12,051.3	-0.1%	4.9%	40,829	0.7%	17.8%	280,754	2.6%	79.4%	6,876	1.9%	52.3%
2004	12,045.8	0.0%	4.8%	41,138	0.8%	18.7%	292,398	4.1%	86.8%	7,108	3.4%	57.4%
2005	12,040.1	0.0%	4.8%	41,474	0.8%	19.7%	300,010	2.6%	91.7%	7,234	1.8%	60.2%
2006 [2]	12,068.6	0.2%	5.0%	41,916	1.1%	20.9%	303,603	1.2%	94.0%	7,243	0.1%	60.4%
2007 [2]	12,061.8	-0.1%	5.0%	42,082	0.4%	21.4%	305,128	0.5%	94.9%	7,251	0.1%	60.6%
2008 [2]	12,084.3	0.1%	5.2%	42,432	1.2%	22.4%	293,858	-3.2%	87.7%	6,925	-4.4%	53.4%
2009 [2]	12,088.0	0.2%	5.2%	42,634	1.3%	23.0%	286,888	-6.0%	83.3%	6,729	-7.2%	49.0%
2010 [2]	12,085.1	0.0%	5.2%	42,829	0.9%	23.6%	288,185	-1.9%	84.1%	6,729	-2.8%	49.0%
Average since 1984:		0.2%			0.9%			2.2%			1.3%	

Notes

[1] Except as noted, CLM and LM are from December 31 SHS Mileage Report and DVMT are from SHS Mileage Report for the following June

[2] Data as shown in the annual report for this year

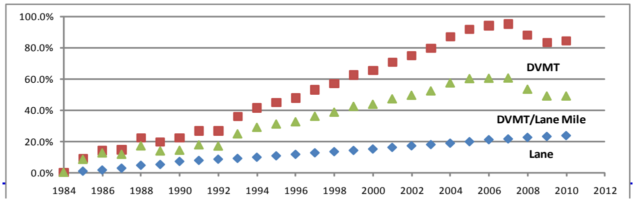
[3] Florida Turnpike data not included in 1983

[4] CLM and LM as of June 30

Causes of Changes

Changes in the State Highway System may result from road jurisdiction transfers as well as from the construction or reconstruction of State Highway System roads. Construction increases both centerline and lane miles. Reconstruction increases only lane miles. Jurisdiction transfers may cause centerline miles, lane miles, and vehicle miles traveled to increase or decrease; the net result (other than in 1984) has had little effect on the overall trends.

Increases since 1984



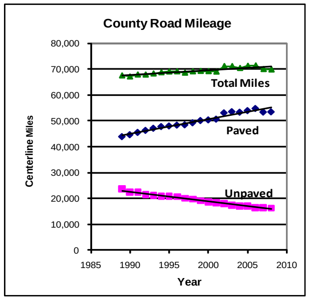
Centerline Mileage on Florida's City and County Roads

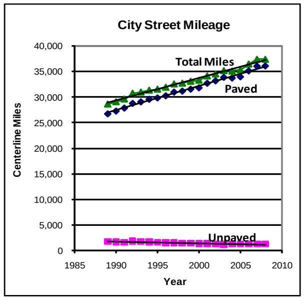
Data as of Sep. 30 of the Year Listed

All data are supplied by the counties and cities.

County Roads				City Streets			
Year	Paved	Unpaved	Total	Year	Paved	Unpaved	Total
1987	41,528	23,282	64,810	1987	25,587	2,031	27,618
1988	43,067	23,703	66,770	1988	26,237	1,945	28,182
1989	43,940	23,634	67,574	1989	26,798	1,789	28,588
1990	44,678	22,503	67,180	1990	27,343	1,707	29,050
1991	45,578	22,346	67,924	1991	27,936	1,651	29,586
1992	46,358	21,545	67,903	1992	28,849	1,885	30,734
1993	47,185	21,119	68,304	1993	29,149	1,815	30,964
1994	47,850	20,922	68,772	1994	29,647	1,694	31,340
1995	48,088	20,958	69,046	1995	29,907	1,625	31,532
1996	48,413	20,691	69,103	1996	30,328	1,584	31,913
1997	48,519	20,085	68,603	1997	31,051	1,523	32,573
1998	49,318	19,789	69,106	1998	31,252	1,469	32,721
1999	50,183	19,097	69,280	1999	31,622	1,469	33,091
2000	50,440	18,744	69,184	2000	31,888	1,410	33,298
2001	50,721	18,297	69,018	2001	32,770	1,383	34,153
2002	53,175	17,920	71,095	2002	33,249	1,297	34,546
2003	53,630	17,451	71,081	2003	33,925	1,266	35,191
2004	53,424	16,956	70,380	2004	33,802	1,311	35,113
2005	54,048	17,147	71,195	2005	34,035	1,309	35,344
2006	54,866	16,461	71,327	2006	35,198	1,308	36,505
2007	53,467	16,508	69,976	2007	36,112	1,333	37,445
2008	53,554	16,250	69,804	2008	36,156	1,288	37,443
2009	54,036	15,817	69,853	2009	36,218	1,208	37,426
2010	54,210	15,655	69,865	2009	36,348	1,201	37,548
Change since 1987…							
Miles	12,026	-7,032	4,994		10,569	-744	9,825
Percentage	29.0%	-30.2%	7.7%		41.3%	-36.6%	35.6%

NOTE: Changes in road jurisdiction may result from road jurisdiction transfers as well as from the construction or reconstruction of City or County roads. These changes have not had a major effect on trends since 1987.





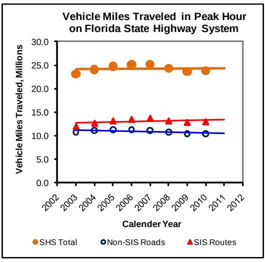
VMT: Vehicle Miles Traveled, Millions

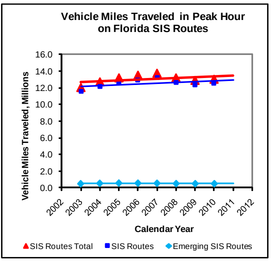
		Peak Hour				Daily			
Year	Facility	Statewide	7 Largest Counties	Oth. Urbz. Areas	Non-Urbz.	Statewide	7 Largest Counties	Oth. Urbz. Areas	Non-Urbz.
2003	SHS Total	23.1	11.6	6.7	4.9	293.9	142.2	85.4	66.2
	SIS Routes	11.5	6.5	2.0	3.0	147.4	78.1	26.7	42.6
	Emerging SIS Routes	0.5	0.0	0.2	0.3	6.3	0.1	1.9	4.3
	SIS Connectors	0.2	0.1	0.0	0.0	2.0	1.5	0.4	0.0
	Emerging SIS Connectors	0.2	0.0	0.2	0.0	2.2	0.0	2.1	0.1
	SIS Routes Total	12.0	6.5	2.2	3.4	153.7	78.3	28.6	46.9
	Other SHS	10.8	4.9	4.3	1.5	136.0	62.4	54.4	19.2
2004	SHS Total	24.1	12.0	7.7	4.4	305.9	146.7	99.1	60.0
	SIS Routes	12.2	6.8	2.6	2.7	155.3	81.7	35.0	38.6
	Emerging SIS Routes	0.5	0.0	0.2	0.3	6.9	0.1	2.5	4.2
	SIS Connectors	0.1	0.1	0.0	0.0	1.5	1.2	0.3	0.0
	Emerging SIS Connectors	0.2	0.0	0.2	0.0	2.0	0.0	1.9	0.0
	SIS Routes Total	12.7	6.8	2.8	3.1	162.1	81.8	37.5	42.8
	Other SHS	11.1	5.1	4.7	1.3	140.3	63.7	59.4	17.2
2005	SHS Total	24.7	12.2	8.0	4.5	313.9	149.1	103.2	61.6
	SIS Routes	12.6	7.0	2.8	2.8	160.8	84.0	37.4	39.4
	Emerging SIS Routes	0.6	0.0	0.2	0.3	7.2	0.1	2.6	4.5
	SIS Connectors	0.1	0.1	0.0	0.0	1.6	1.3	0.3	0.0
	Emerging SIS Connectors	0.2	0.0	0.2	0.0	2.1	0.0	2.1	0.0
	SIS Routes Total	13.2	7.0	3.0	3.1	168.0	84.1	40.1	43.9
	Other SHS	11.2	5.1	4.8	1.4	142.2	63.7	60.7	17.7
2006	SHS Total	25.1	12.4	8.1	4.6	318.0	151.3	104.5	62.2
	SIS Routes	13.0	7.2	2.9	2.8	165.0	86.6	38.2	40.1
	Emerging SIS Routes	0.6	0.0	0.2	0.3	7.1	0.1	2.6	4.4
	SIS Connectors	0.1	0.1	0.0	0.0	1.6	1.3	0.3	0.0
	Emerging SIS Connectors	0.2	0.0	0.2	0.0	2.2	0.0	2.2	0.0
	SIS Routes Total	13.5	7.2	3.1	3.2	172.1	86.7	40.8	44.6
	Other SHS	11.2	5.0	4.8	1.4	142.1	63.4	61.1	17.6
2007	SHS Total	25.2	12.5	8.1	4.6	319.5	152.8	104.4	62.3
	SIS Routes	13.2	7.4	2.9	2.9	168.0	88.9	38.6	40.5
	Emerging SIS Routes	0.5	0.0	0.2	0.3	7.0	0.1	2.5	4.3
	SIS Connectors	0.1	0.1	0.0	0.0	1.7	1.2	0.5	0.0
	Emerging SIS Connectors	0.2	0.0	0.2	0.0	2.3	0.0	2.2	0.0
	SIS Routes Total	13.8	7.4	3.1	3.2	174.9	89.0	41.2	44.8
	Other SHS	11.1	5.0	4.8	1.4	140.6	62.6	60.5	17.4
2008	SHS Total	24.3	12.3	7.7	4.3	307.7	149.9	99.1	58.7
	SIS Routes	12.7	7.2	2.8	2.7	161.2	86.2	36.8	38.1
	Emerging SIS Routes	0.5	0.0	0.2	0.3	6.5	0.1	2.4	4.0
	SIS Connectors	0.1	0.1	0.1	0.0	1.7	1.1	0.7	0.0
	Emerging SIS Connectors	0.2	0.0	0.2	0.0	2.0	0.0	1.9	0.0
	SIS Routes Total	13.2	7.2	3.0	3.0	167.7	86.3	39.2	42.1
	Other SHS	10.8	5.0	4.5	1.3	136.3	62.5	57.3	16.5
2009	SHS Total	23.7	11.9	7.5	4.2	299.9	145.5	96.6	57.8
	SIS Routes	12.4	7.0	2.7	2.7	157.4	84.1	35.9	37.4
	Emerging SIS Routes	0.5	0.0	0.2	0.3	6.4	0.1	2.3	3.9
	SIS Connectors	0.3	0.1	0.2	0.0	3.7	1.1	2.5	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.2
	SIS Routes Total	12.9	7.0	2.9	3.0	163.8	84.3	38.2	41.4
	Other SHS	10.5	4.8	4.4	1.3	132.1	60.0	55.9	16.2
2010	SHS Total	23.7	12.0	7.5	4.2	301.0	146.8	96.6	57.6
	SIS Routes	12.5	7.1	2.7	2.7	159.2	85.5	36.2	37.4
	Emerging SIS Routes	0.5	0.0	0.2	0.3	6.4	0.1	2.3	3.9
	SIS Connectors	0.3	0.1	0.2	0.0	3.9	1.1	2.5	0.2
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	SIS Routes Total	13.0	7.2	2.9	3.0	165.6	85.7	38.6	41.4
	Other SHS	10.4	4.8	4.4	1.3	131.5	59.9	55.5	16.0
2011	SHS Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SIS Routes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Emerging SIS Routes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SIS Connectors	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SIS Routes Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other SHS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

VMT, Millions — Peak Hour

Statewide, by Facility Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
SIS Conn.	0.2	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.0	10.1%
Emerging SIS Conn.	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	-33.3%
SIS Rt.	11.5	12.2	12.6	13.0	13.2	12.7	12.4	12.5	0.0	1.2%
Emerging SIS Rt.	0.5	0.5	0.6	0.6	0.5	0.5	0.5	0.5	0.0	0.1%
SIS Rt Total	12.0	12.7	13.2	13.5	13.8	13.2	12.9	13.0	0.0	1.1%
Non-SIS	10.8	11.1	11.2	11.2	11.1	10.8	10.5	10.4	0.0	-0.5%
SHS Total	**23.1**	**24.1**	**24.7**	**25.1**	**25.2**	**24.3**	**23.7**	**23.7**	0.0	**0.4%**

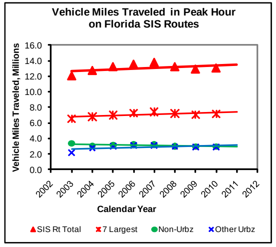

Vehicle Miles Traveled in Peak Hour on Florida State Highway System

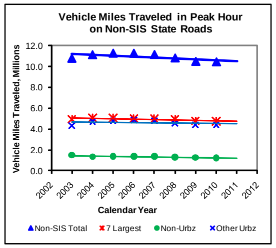

Vehicle Miles Traveled in Peak Hour on Florida SIS Routes

VMT, Millions — Peak Hour

Statewide, by Area Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
7 Largest Counties	6.5	6.8	7.0	7.2	7.4	7.2	7.0	7.2	0.0	1.4%
Other Urbz. Counties	2.2	2.8	3.0	3.1	3.1	3.0	2.9	2.9	0.0	4.4%
Non-Urbanized	3.4	3.1	3.1	3.2	3.2	3.0	3.0	3.0	0.0	-1.8%
All SIS Routes	12.0	12.7	13.2	13.5	13.8	13.2	12.9	13.0	0.0	1.1%
7 Largest Counties	4.9	5.1	5.1	5.0	5.0	5.0	4.8	4.8	0.0	-0.6%
Other Urbz. Counties	4.3	4.7	4.8	4.8	4.8	4.5	4.4	4.4	0.0	0.3%
Non-Urbanized	1.5	1.3	1.4	1.4	1.4	1.3	1.3	1.3	0.0	-2.6%
All Non-SIS	10.8	11.1	11.2	11.2	11.1	10.8	10.5	10.4	0.0	-0.5%
SHS Total	**23.1**	**24.1**	**24.7**	**25.1**	**25.2**	**24.3**	**23.7**	**23.7**	0.0	0.4%

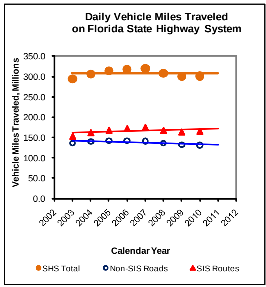

Vehicle Miles Traveled in Peak Hour on Florida SIS Routes

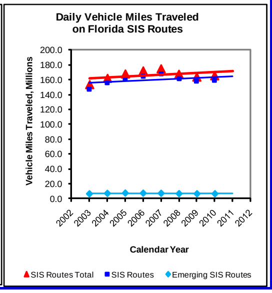

Vehicle Miles Traveled in Peak Hour on Non-SIS State Roads

VMT, Millions — Daily

Statewide, by Facility Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
SIS Conn.	2.0	1.5	1.6	1.6	1.7	1.7	3.7	3.9	0.0	10.2%
Emerging SIS Conn.	2.2	2.0	2.1	2.2	2.3	2.0	0.3	0.1	0.0	-33.3%
SIS Rt.	147.4	155.3	160.8	165.0	168.0	161.2	157.4	159.2	0.0	1.1%
Emerging SIS Rt.	6.3	6.9	7.2	7.1	7.0	6.5	6.4	6.4	0.0	0.1%
SIS Rt Total	153.7	162.1	168.0	172.1	174.9	167.7	163.8	165.6	0.0	1.1%
Non-SIS	136.0	140.3	142.2	142.1	140.6	136.3	132.1	131.5	0.0	-0.5%
SHS Total	**293.9**	**305.9**	**313.9**	**318.0**	**319.5**	**307.7**	**299.9**	**301.0**	0.0	**0.3%**

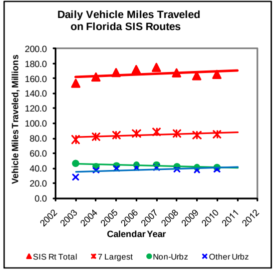

Daily Vehicle Miles Traveled on Florida State Highway System

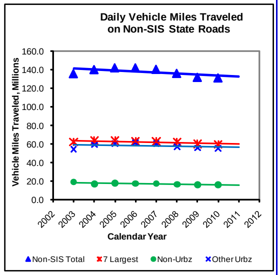

Daily Vehicle Miles Traveled on Florida SIS Routes

VMT, Millions — Daily

Statewide, by Area Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
7 Largest Counties	78.3	81.8	84.1	86.7	89.0	86.3	84.3	85.7	0.0	1.3%
Other Urbz. Counties	28.6	37.5	40.1	40.8	41.2	39.2	38.2	38.6	0.0	4.4%
Non-Urbanized	46.9	42.8	43.9	44.6	44.8	42.1	41.4	41.4	0.0	-1.8%
All SIS Routes	153.7	162.1	168.0	172.1	174.9	167.7	163.8	165.6	0.0	1.1%
7 Largest Counties	62.4	63.7	63.7	63.4	62.6	62.5	60.0	59.9	0.0	-0.6%
Other Urbz. Counties	54.4	59.4	60.7	61.1	60.5	57.3	55.9	55.5	0.0	0.3%
Non-Urbanized	19.2	17.2	17.7	17.6	17.4	16.5	16.2	16.0	0.0	-2.6%
All Non-SIS	136.0	140.3	142.2	142.1	140.6	136.3	132.1	131.5	0.0	-0.5%
SHS Total	**293.9**	**305.9**	**313.9**	**318.0**	**319.5**	**307.7**	**299.9**	**301.0**	0.0	0.3%


Daily Vehicle Miles Traveled on Florida SIS Routes


Daily Vehicle Miles Traveled on Non-SIS State Roads

TMT: Truck Miles Traveled, Millions

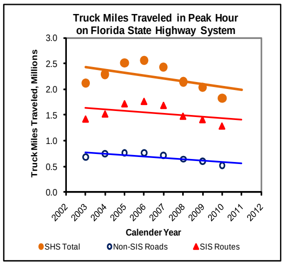
		Peak Hour				Daily			
Year	Facility	Statewide	7 Largest Counties	Oth. Urbz. Areas	Non-Urbz.	Statewide	7 Largest Counties	Oth. Urbz. Areas	Non-Urbz.
2003	SHS Total	2.1	0.8	0.5	0.8	27.6	10.0	7.0	10.6
	SIS Routes	1.4	0.5	0.3	0.6	17.9	6.6	3.5	7.8
	Emerging SIS Routes	0.1	0.0	0.0	0.0	0.8	0.0	0.1	0.6
	SIS Connectors	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
	SIS Routes Total	1.4	0.5	0.3	0.6	18.7	6.6	3.7	8.4
	Other SHS	0.7	0.3	0.3	0.2	8.6	3.2	3.2	2.2
2004	SHS Total	2.3	0.9	0.7	0.7	29.6	11.0	8.6	10.0
	SIS Routes	1.5	0.6	0.3	0.5	19.0	7.2	4.6	7.2
	Emerging SIS Routes	0.1	0.0	0.0	0.1	0.9	0.0	0.2	0.6
	SIS Connectors	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
	SIS Routes Total	1.5	0.6	0.4	0.6	19.9	7.2	4.8	7.9
	Other SHS	0.7	0.3	0.3	0.2	9.5	3.7	3.6	2.1
2005	SHS Total	2.5	1.0	0.7	0.8	32.4	12.0	9.6	10.8
	SIS Routes	1.6	0.7	0.4	0.6	21.4	8.3	5.3	7.8
	Emerging SIS Routes	0.1	0.0	0.0	0.1	1.0	0.0	0.2	0.7
	SIS Connectors	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0
	SIS Routes Total	1.7	0.7	0.4	0.6	22.4	8.3	5.6	8.5
	Other SHS	0.8	0.3	0.3	0.2	9.7	3.5	3.9	2.3
2006	SHS Total	2.6	1.0	0.8	0.8	33.1	12.3	9.8	11.0
	SIS Routes	1.7	0.7	0.4	0.6	22.1	8.6	5.5	8.0
	Emerging SIS Routes	0.1	0.0	0.0	0.1	1.0	0.0	0.2	0.7
	SIS Connectors	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0
	SIS Routes Total	1.8	0.7	0.4	0.6	23.0	8.6	5.7	8.7
	Other SHS	0.8	0.3	0.3	0.2	9.7	3.5	3.9	2.3
2007	SHS Total	2.4	0.9	0.7	0.8	31.4	11.2	9.6	10.6
	SIS Routes	1.6	0.7	0.4	0.6	21.2	7.9	5.5	7.8
	Emerging SIS Routes	0.1	0.0	0.0	0.1	0.9	0.0	0.2	0.7
	SIS Connectors	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0
	SIS Routes Total	1.7	0.7	0.4	0.6	22.1	7.9	5.7	8.4
	Other SHS	0.7	0.2	0.3	0.2	9.1	3.1	3.7	2.2
2008	SHS Total	2.1	0.8	0.6	0.7	27.7	10.0	8.3	9.4
	SIS Routes	1.4	0.6	0.4	0.5	18.5	6.9	4.7	6.9
	Emerging SIS Routes	0.1	0.0	0.0	0.0	0.8	0.0	0.2	0.6
	SIS Connectors	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
	SIS Routes Total	1.5	0.6	0.4	0.5	19.3	6.9	4.9	7.5
	Other SHS	0.6	0.2	0.3	0.2	8.2	3.0	3.2	1.9
2009	SHS Total	2.0	0.8	0.6	0.7	26.4	9.4	7.8	9.2
	SIS Routes	1.4	0.5	0.3	0.5	17.8	6.5	4.4	6.8
	Emerging SIS Routes	0.1	0.0	0.0	0.0	0.7	0.0	0.2	0.5
	SIS Connectors	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SIS Routes Total	1.4	0.5	0.3	0.5	18.5	6.5	4.6	7.3
	Other SHS	0.6	0.2	0.2	0.1	7.6	2.8	3.0	1.8
2010	SHS Total	1.8	0.7	0.5	0.6	23.7	8.6	6.8	8.2
	SIS Routes	1.2	0.5	0.3	0.4	16.2	6.1	4.0	6.1
	Emerging SIS Routes	0.1	0.0	0.0	0.0	0.7	0.0	0.2	0.5
	SIS Connectors	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SIS Routes Total	1.3	0.5	0.3	0.5	16.8	6.1	4.1	6.6
	Other SHS	0.5	0.2	0.2	0.1	6.6	2.4	2.6	1.6
2011	SHS Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SIS Routes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Emerging SIS Routes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SIS Connectors	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SIS Routes Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other SHS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

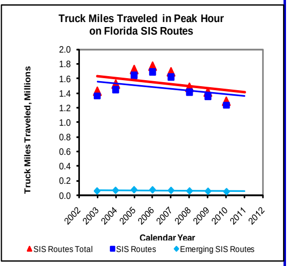
TMT, Millions

Peak Hour

Statewide, by Facility Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
SIS Conn.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.2%
Emerging SIS Conn.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-36.7%
SIS Rt.	1.4	1.5	1.6	1.7	1.6	1.4	1.4	1.2	0.0	-1.4%
Emerging SIS Rt.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-2.3%
SIS Rt Total	1.4	1.5	1.7	1.8	1.7	1.5	1.4	1.3	0.0	-1.4%
Non-SIS	0.7	0.7	0.8	0.8	0.7	0.6	0.6	0.5	0.0	-3.7%
SHS Total	**2.1**	**2.3**	**2.5**	**2.6**	**2.4**	**2.1**	**2.0**	**1.8**	0.0	**-2.1%**


Truck Miles Traveled in Peak Hour on Florida State Highway System

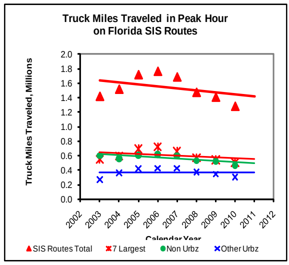

Truck Miles Traveled in Peak Hour on Florida SIS Routes

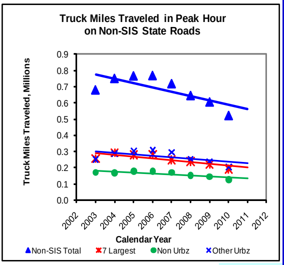
TMT, Millions

Peak Hour

Statewide, by Area Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
7 Largest Counties	0.5	0.6	0.7	0.7	0.7	0.6	0.5	0.5	0.0	-1.1%
Other Urbz. Counties	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.0	1.7%
Non-Urbanized	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.0	-3.5%
All SIS Routes	1.4	1.5	1.7	1.8	1.7	1.5	1.4	1.3	0.0	-1.4%
7 Largest Counties	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.0	-4.0%
Other Urbz. Counties	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.0	-3.0%
Non-Urbanized	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0	-4.3%
All Non-SIS	0.7	0.7	0.8	0.8	0.7	0.6	0.6	0.5	0.0	-3.7%
SHS Total	**2.1**	**2.3**	**2.5**	**2.6**	**2.4**	**2.1**	**2.0**	**1.8**	0.0	**-2.1%**


Truck Miles Traveled in Peak Hour on Florida SIS Routes

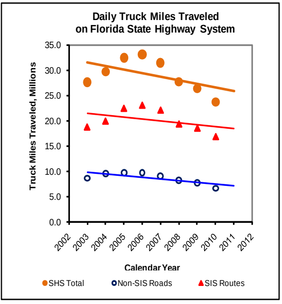

Truck Miles Traveled in Peak Hour on Non-SIS State Roads

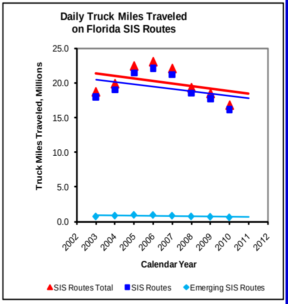
TMT, Millions

Daily

Statewide, by Facility Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
SIS Conn.	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.0	7.2%
Emerging SIS Conn.	0.1	0.1	0.2	0.2	0.2	0.1	0.0	0.0	0.0	-36.7%
SIS Rt.	17.9	19.0	21.4	22.1	21.2	18.5	17.8	16.2	0.0	-1.5%
Emerging SIS Rt.	0.8	0.9	1.0	1.0	0.9	0.8	0.7	0.7	0.0	-2.3%
SIS Rt Total	18.7	19.9	22.4	23.0	22.1	19.3	18.5	16.8	0.0	-1.5%
Non-SIS	8.6	9.5	9.7	9.7	9.1	8.2	7.6	6.6	0.0	-3.7%
SHS Total	**27.6**	**29.6**	**32.4**	**33.1**	**31.4**	**27.7**	**26.4**	**23.7**	0.0	**-2.2%**


Daily Truck Miles Traveled on Florida State Highway System

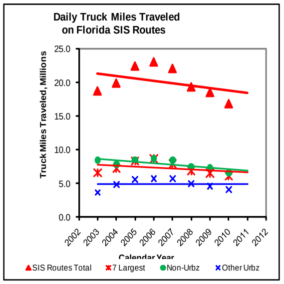

Daily Truck Miles Traveled on Florida SIS Routes

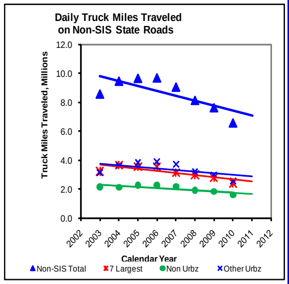
TMT, Millions

Daily

Statewide, by Area Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
7 Largest Counties	6.6	7.2	8.3	8.6	7.9	6.9	6.5	6.1	0.0	-1.2%
Other Urbz. Counties	3.7	4.8	5.6	5.7	5.7	4.9	4.6	4.1	0.0	1.7%
Non-Urbanized	8.4	7.9	8.5	8.7	8.4	7.5	7.3	6.6	0.0	-3.4%
All SIS Routes	18.7	19.9	22.4	23.0	22.1	19.3	18.5	16.8	0.0	-1.5%
7 Largest Counties	3.2	3.7	3.5	3.5	3.1	3.0	2.8	2.4	0.0	-4.0%
Other Urbz. Counties	3.2	3.6	3.9	3.9	3.7	3.2	3.0	2.6	0.0	-3.0%
Non-Urbanized	2.2	2.1	2.3	2.3	2.2	1.9	1.8	1.6	0.0	-4.3%
All Non-SIS	8.6	9.5	9.7	9.7	9.1	8.2	7.6	6.6	0.0	-3.7%
SHS Total	**27.6**	**29.6**	**32.4**	**33.1**	**31.4**	**27.7**	**26.4**	**23.7**	0.0	-2.2%


Daily Truck Miles Traveled on Florida SIS Routes


Daily Truck Miles Traveled on Non-SIS State Roads

Highways Congested: % Centerline Miles Congested

Year	Facility	Peak Hour Statewide	 7 Largest Counties	 Oth. Urbz. Areas	 Non-Urbz.
2003	SHS Total	10.0%	24.5%	14.7%	0.4%
	SIS Routes	9.4%	26.4%	8.6%	0.0%
	Emerging SIS Routes	1.6%	0.7%	10.5%	0.3%
	SIS Connectors	10.7%	14.0%	0.9%	0.0%
	Emerging SIS Connectors	12.4%	36.1%	12.1%	0.0%
	SIS Routes Total	8.0%	26.0%	8.9%	0.1%
	Other SHS	11.2%	23.6%	17.1%	0.7%
2004	SHS Total	11.7%	27.8%	16.3%	0.2%
	SIS Routes	11.4%	31.3%	9.1%	0.0%
	Emerging SIS Routes	2.2%	0.7%	12.7%	0.2%
	SIS Connectors	15.6%	23.0%	0.8%	0.0%
	Emerging SIS Connectors	20.9%	100.0%	21.4%	0.0%
	SIS Routes Total	9.8%	30.7%	9.6%	0.0%
	Other SHS	12.6%	25.7%	19.3%	0.4%
2005	SHS Total	12.2%	27.5%	17.3%	0.8%
	SIS Routes	11.8%	29.6%	11.6%	0.3%
	Emerging SIS Routes	3.1%	0.7%	13.3%	1.1%
	SIS Connectors	14.0%	19.8%	0.8%	0.0%
	Emerging SIS Connectors	23.4%	100.0%	23.9%	0.0%
	SIS Routes Total	10.2%	29.2%	11.8%	0.5%
	Other SHS	13.2%	26.2%	19.8%	1.1%
2006	SHS Total	13.4%	30.3%	18.7%	0.7%
	SIS Routes	14.6%	38.1%	12.8%	0.3%
	Emerging SIS Routes	2.6%	0.7%	11.2%	1.0%
	SIS Connectors	15.7%	21.5%	2.3%	0.0%
	Emerging SIS Connectors	33.9%	100.0%	34.8%	0.0%
	SIS Routes Total	12.5%	37.4%	12.6%	0.5%
	Other SHS	13.3%	25.3%	21.2%	1.0%
2007	SHS Total	12.8%	30.7%	16.5%	0.5%
	SIS Routes	14.5%	40.1%	9.8%	0.0%
	Emerging SIS Routes	2.2%	0.6%	7.9%	1.1%
	SIS Connectors	14.4%	17.5%	8.2%	0.0%
	Emerging SIS Connectors	22.9%	21.5%	23.4%	0.0%
	SIS Routes Total	12.3%	39.4%	9.6%	0.3%
	Other SHS	12.6%	24.6%	19.7%	0.8%
2008	SHS Total	10.7%	25.8%	13.6%	0.4%
	SIS Routes	11.4%	30.4%	9.2%	0.0%
	Emerging SIS Routes	1.8%	0.5%	6.5%	1.0%
	SIS Connectors	15.7%	15.3%	16.2%	0.0%
	Emerging SIS Connectors	21.6%	23.1%	22.2%	0.0%
	SIS Routes Total	9.7%	29.9%	8.8%	0.3%
	Other SHS	10.8%	22.9%	15.6%	0.6%
2009	SHS Total	9.4%	23.8%	10.8%	0.4%
	SIS Routes	10.8%	30.12%	6.99%	0.00%
	Emerging SIS Routes	1.7%	0.52%	5.56%	0.99%
	SIS Connectors	16.1%	15.52%	16.71%	0.00%
	Emerging SIS Connectors	3.5%	73.22%	0.00%	0.00%
	SIS Routes Total	9.2%	29.6%	6.8%	0.3%
	Other SHS	9.1%	19.64%	12.56%	0.60%
2010	SHS Total	8.9%	22.5%	10.6%	0.3%
	SIS Routes	10.1%	28.50%	5.97%	0.05%
	Emerging SIS Routes	1.1%	0.52%	3.99%	0.60%
	SIS Connectors	12.9%	15.95%	17.33%	0.00%
	Emerging SIS Connectors	47.8%	67.29%	0.00%	0.00%
	SIS Routes Total	8.5%	28.0%	5.7%	0.2%
	Other SHS	8.8%	18.41%	12.68%	0.44%
2011	SHS Total				
	SIS Routes		0.0%	0.0%	0.0%
	Emerging SIS Routes		0.0%	0.0%	0.0%
	SIS Connectors		0.0%	0.0%	0.0%
	Emerging SIS Connectors		0.0%	0.0%	0.0%
	SIS Routes Total				
	Other SHS		0.0%	0.0%	0.0%

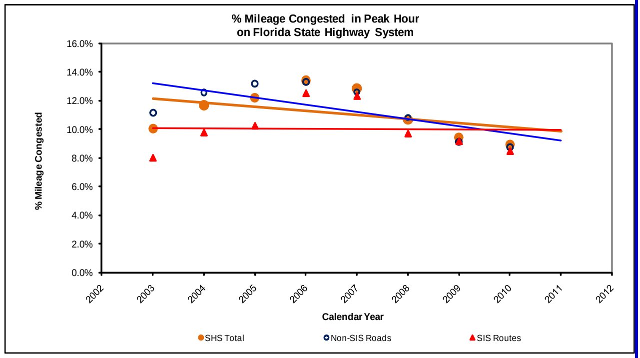
Highways Congested: % Centerline Miles Congested

Peak Hour

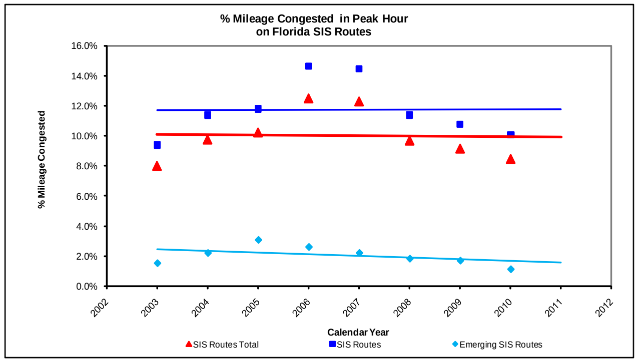
Statewide, by Facility Type

	2003	2004	2005	2006	2007	2008	2009	2010	Annual Growth
SIS Conn.	10.7%	15.6%	14.0%	15.7%	14.4%	15.7%	16.1%	12.9%	2.7%
Emerging SIS Conn.	12.4%	20.9%	23.4%	33.9%	22.9%	21.6%	3.5%	47.8%	21.3%
SIS Rt.	9.4%	11.4%	11.8%	14.6%	14.5%	11.4%	10.8%	10.1%	1.0%
Emerging SIS Rt.	1.6%	2.2%	3.1%	2.6%	2.2%	1.8%	1.7%	1.1%	-4.2%
SIS Rt Total	8.0%	9.8%	10.2%	12.5%	12.3%	9.7%	9.2%	8.5%	0.8%
Non-SIS	11.2%	12.6%	13.2%	13.3%	12.6%	10.8%	9.1%	8.8%	-3.4%
SHS Total	**10.0%**	**11.7%**	**12.2%**	**13.4%**	**12.8%**	**10.7%**	**9.4%**	**8.9%**	**-1.7%**

% Mileage Congested in Peak Hour on Florida State Highway System



% Mileage Congested in Peak Hour on Florida SIS Routes



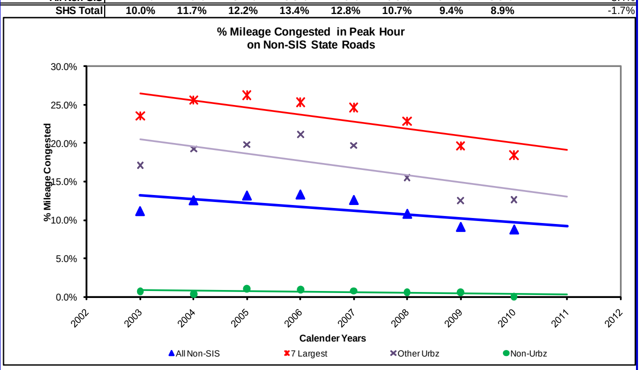
Highways Congested: % Centerline Miles Congested

Peak Hour

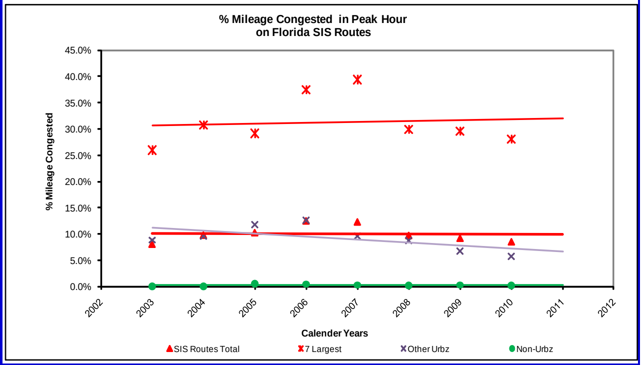
Statewide, by Area Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
7 Largest Counties	26.0%	30.7%	29.2%	37.4%	39.4%	29.9%	29.6%	28.0%		1.1%
Other Urbz. Counties	8.9%	9.6%	11.8%	12.6%	9.6%	8.8%	6.8%	5.7%		-6.1%
Non-Urbanized	0.1%	0.0%	0.5%	0.5%	0.3%	0.3%	0.3%	0.2%		15.5%
All SIS Routes	8.0%	9.8%	10.2%	12.5%	12.3%	9.7%	9.2%	8.5%	0.0%	0.8%
7 Largest Counties	23.6%	25.7%	26.2%	25.3%	24.6%	22.9%	19.6%	18.4%	0.0%	-3.4%
Other Urbz. Counties	17.1%	19.3%	19.8%	21.2%	19.7%	15.6%	12.6%	12.7%	0.0%	-4.2%
Non-Urbanized	0.7%	0.4%	1.1%	1.0%	0.8%	0.6%	0.6%	0.44%	0.0%	-7.2%
All Non-SIS	11.2%	12.6%	13.2%	13.3%	12.6%	10.8%	9.1%	8.8%		-3.4%
SHS Total	**10.0%**	**11.7%**	**12.2%**	**13.4%**	**12.8%**	**10.7%**	**9.4%**	**8.9%**		-1.7%

% Mileage Congested in Peak Hour on Non-SIS State Roads



% Mileage Congested in Peak Hour on Florida SIS Routes



Duration of Congestion: Hours per Day

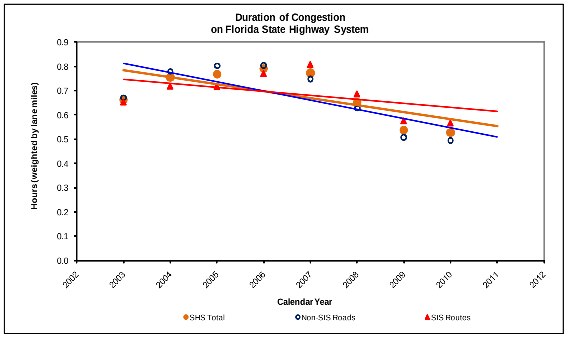
Year	Facility	Daily Statewide	 7 Largest Counties	 Oth. Urbz. Areas	 Non-Urbz.
2003	SHS Total	0.66	1.49	0.60	0.02
	SIS Routes	0.73	1.88	0.32	0.00
	Emerging SIS Routes	0.11	0.14	0.59	0.02
	SIS Connectors	0.83	1.11	0.04	0.00
	Emerging SIS Connectors	0.36	1.25	0.36	0.00
	SIS Routes Total	0.65	1.87	0.35	0.00
	Other SHS	0.67	1.24	0.71	0.04
2004	SHS Total	0.75	1.62	0.73	0.00
	SIS Routes	0.80	2.00	0.38	0.00
	Emerging SIS Routes	0.15	0.16	0.76	0.00
	SIS Connectors	1.10	1.58	0.03	0.00
	Emerging SIS Connectors	0.60	4.14	0.61	0.00
	SIS Routes Total	0.72	1.99	0.42	0.00
	Other SHS	0.78	1.37	0.88	0.01
2005	SHS Total	0.77	1.60	0.77	0.02
	SIS Routes	0.80	1.96	0.41	0.00
	Emerging SIS Routes	0.17	0.21	0.79	0.02
	SIS Connectors	0.95	1.33	0.03	0.00
	Emerging SIS Connectors	0.67	5.38	0.68	0.00
	SIS Routes Total	0.72	1.95	0.45	0.00
	Other SHS	0.80	1.36	0.93	0.04
2006	SHS Total	0.79	1.62	0.79	0.04
	SIS Routes	0.85	2.10	0.42	0.00
	Emerging SIS Routes	0.19	0.07	0.71	0.06
	SIS Connectors	0.92	1.24	0.13	0.00
	Emerging SIS Connectors	0.91	4.45	0.93	0.00
	SIS Routes Total	0.77	2.09	0.45	0.01
	Other SHS	0.80	1.31	0.96	0.06
2007	SHS Total	0.77	1.68	0.69	0.02
	SIS Routes	0.90	2.27	0.38	0.00
	Emerging SIS Routes	0.13	0.06	0.50	0.04
	SIS Connectors	0.88	1.21	0.24	0.00
	Emerging SIS Connectors	0.50	2.09	0.50	0.00
	SIS Routes Total	0.81	2.25	0.39	0.01
	Other SHS	0.75	1.28	0.85	0.04
2008	SHS Total	0.65	1.49	0.51	0.01
	SIS Routes	0.77	1.96	0.28	0.00
	Emerging SIS Routes	0.08	0.05	0.33	0.02
	SIS Connectors	0.67	0.97	0.26	0.00
	Emerging SIS Connectors	0.67	0.97	0.69	0.00
	SIS Routes Total	0.69	1.95	0.29	0.00
	Other SHS	0.63	1.18	0.62	0.02
2009	SHS Total	0.54	1.24	0.40	0.01
	SIS Routes	0.64	1.67	0.19	0.00
	Emerging SIS Routes	0.08	0.05	0.29	0.03
	SIS Connectors	0.51	0.74	0.42	0.00
	Emerging SIS Connectors	0.71	9.75	0.00	0.00
	SIS Routes Total	0.58	1.66	0.20	0.01
	Other SHS	0.51	0.95	0.50	0.02
2010	SHS Total	0.53	1.22	0.39	0.01
	SIS Routes	0.64	1.65	0.18	0.00
	Emerging SIS Routes	0.05	0.04	0.18	0.02
	SIS Connectors	0.50	1.10	0.38	0.00
	Emerging SIS Connectors	5.66	7.90	0.00	0.00
	SIS Routes Total	0.57	1.64	0.18	0.00
	Other SHS	0.50	0.92	0.49	0.02
2011	SHS Total				
	SIS Routes		0.00	0.00	0.00
	Emerging SIS Routes		0.00	0.00	0.00
	SIS Connectors		0.00	0.00	0.00
	Emerging SIS Connectors		0.00	0.00	0.00
	SIS Routes Total				
	Other SHS		0.00	0.00	0.00

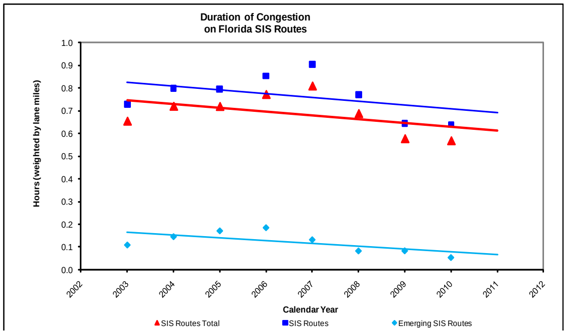
Duration of Congestion: Hours per Day

Daily

Statewide, by Facility Type

	2003	2004	2005	2006	2007	2008	2009	2010	Annual Growth
SIS Conn.	0.8	1.1	0.9	0.9	0.9	0.7	0.5	0.5	-7.1%
Emerging SIS Conn.	0.4	0.6	0.7	0.9	0.5	0.7	0.7	5.7	48.2%
SIS Rt.	0.7	0.8	0.8	0.9	0.9	0.8	0.6	0.6	-1.9%
Emerging SIS Rt.	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	-9.9%
SIS Rt Total	0.7	0.7	0.7	0.8	0.8	0.7	0.6	0.6	-2.0%
Non-SIS	0.7	0.8	0.8	0.8	0.7	0.6	0.5	0.5	-4.2%
SHS Total	**0.7**	**0.8**	**0.8**	**0.8**	**0.8**	**0.7**	**0.5**	**0.5**	**-3.2%**



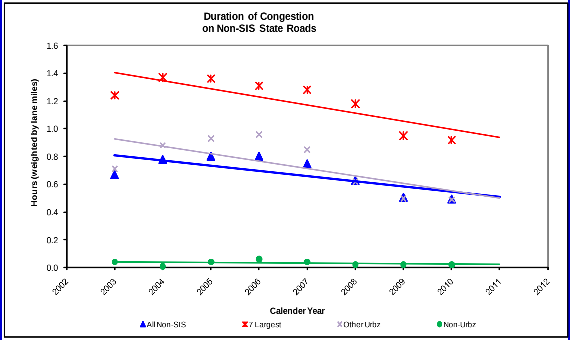


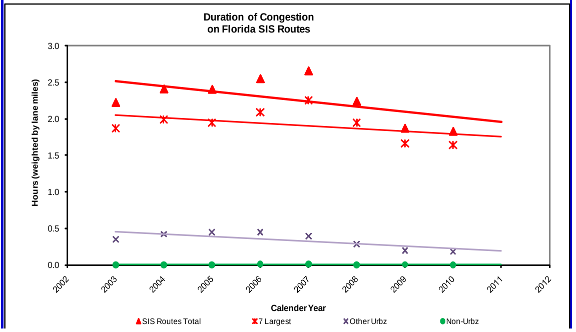
Duration of Congestion: Hours per Day

Daily

Statewide, by Area Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
7 Largest Counties	1.9	2.0	1.9	2.1	2.3	1.9	1.7	1.6		-1.8%
Other Urbz. Counties	0.3	0.4	0.4	0.5	0.4	0.3	0.2	0.2		-9.0%
Non-Urbanized	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1.0%
All SIS Routes	2.2	2.4	2.4	2.5	2.7	2.2	1.9	1.8	0.0	-2.8%
7 Largest Counties	1.2	1.4	1.4	1.3	1.3	1.2	1.0	0.9	0.0	-4.2%
Other Urbz. Counties	0.7	0.9	0.9	1.0	0.9	0.6	0.5	0.5	0.0	-5.2%
Non-Urbanized	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-9.4%
All Non-SIS	0.7	0.8	0.8	0.8	0.7	0.6	0.5	0.5		-4.2%
SHS Total	**0.7**	**0.8**	**0.8**	**0.8**	**0.8**	**0.7**	**0.5**	**0.5**		-3.2%





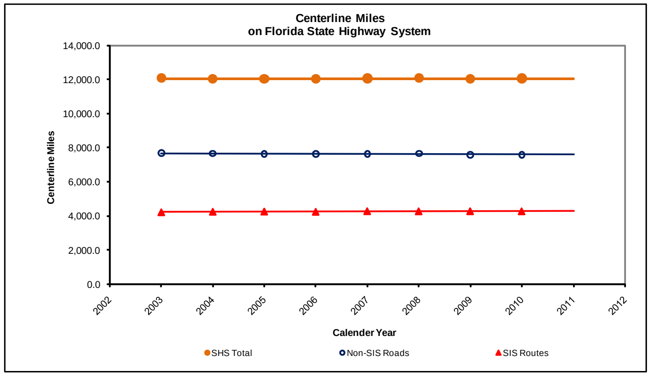
Centerline Miles

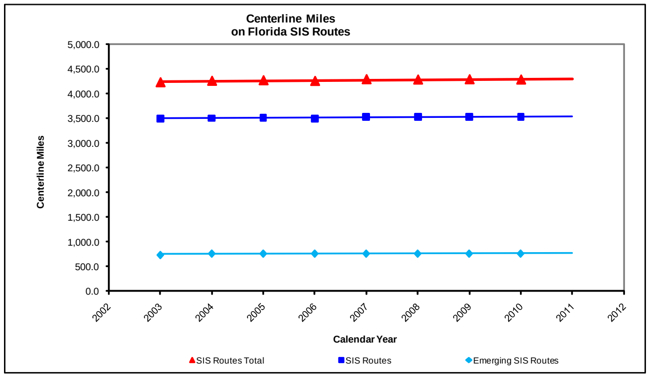
Year	Facility	Statewide	7 Largest Counties	Oth. Urbz. Areas	Non-Urbz.
2003	SHS Total	12082.5	3045.3	3003.6	6033.6
	SIS Routes	3498.8	1045.2	600.6	1853.0
	Emerging SIS Routes	735.9	18.5	90.5	626.9
	SIS Connectors	75.7	56.6	18.5	0.6
	Emerging SIS Connectors	87.1	2.9	80.4	3.8
	SIS Routes Total	4234.7	1063.7	691.1	2479.9
	Other SHS	7685.0	1922.1	2213.6	3549.3
2004	SHS Total	12039.5	3018.7	3364.2	5656.6
	SIS Routes	3502.5	1048.7	783.1	1670.7
	Emerging SIS Routes	761.3	18.5	123.9	618.9
	SIS Connectors	46.1	30.8	15.3	0.0
	Emerging SIS Connectors	70.6	0.1	68.5	2.0
	SIS Routes Total	4263.8	1067.2	907.0	2289.6
	Other SHS	7659.0	1920.6	2373.4	3365.0
2005	SHS Total	12041.3	3020.9	3401.2	5619.2
	SIS Routes	3513.7	1059.9	814.9	1638.9
	Emerging SIS Routes	761.0	18.2	123.2	619.6
	SIS Connectors	51.9	36.2	15.7	0.0
	Emerging SIS Connectors	75.1	0.1	73.0	2.0
	SIS Routes Total	4274.7	1078.1	938.1	2258.5
	Other SHS	7639.6	1906.5	2374.4	3358.7
2006	SHS Total	12027.1	3024.9	3397.5	5604.7
	SIS Routes	3500.0	1059.4	814.6	1626.0
	Emerging SIS Routes	761.0	18.2	123.2	619.6
	SIS Connectors	52.3	36.6	15.7	0.0
	Emerging SIS Connectors	75.0	0.1	72.9	2.0
	SIS Routes Total	4261.0	1077.6	937.8	2245.6
	Other SHS	7638.8	1910.6	2371.1	3357.1
2007	SHS Total	12060.4	3031.3	3408.9	5620.2
	SIS Routes	3534.0	1075.9	817.3	1640.8
	Emerging SIS Routes	761.0	18.2	123.2	619.6
	SIS Connectors	54.8	36.6	18.2	0.0
	Emerging SIS Connectors	78.4	0.3	76.2	1.9
	SIS Routes Total	4295.0	1094.1	940.5	2260.4
	Other SHS	7632.2	1900.3	2374.0	3357.9
2008	SHS Total	12074.3	3044.4	3412.5	5617.4
	SIS Routes	3527.7	1072.0	820.9	1634.8
	Emerging SIS Routes	760.9	18.2	123.1	619.6
	SIS Connectors	60.4	34.6	25.8	0.0
	Emerging SIS Connectors	69.1	0.3	66.9	1.9
	SIS Routes Total	4288.6	1090.2	944.0	2254.4
	Other SHS	7656.2	1919.3	2375.8	3361.1
2009	SHS Total	12054.3	3032.7	3405.8	5615.8
	SIS Routes	3532.7	1072.4	820.8	1639.5
	Emerging SIS Routes	761.2	18.2	123.3	619.7
	SIS Connectors	131.5	36.7	92.9	1.9
	Emerging SIS Connectors	41.4	2.0	0.9	38.5
	SIS Routes Total	4293.9	1090.6	944.1	2259.2
	Other SHS	7587.5	1903.4	2367.9	3316.2
2010	SHS Total	12057.2	3037.3	3403.1	5616.8
	SIS Routes	3527.3	1070.5	817.5	1639.3
	Emerging SIS Routes	761.3	18.4	123.3	619.6
	SIS Connectors	169.7	36.2	93.0	40.5
	Emerging SIS Connectors	3.1	2.2	0.9	0.0
	SIS Routes Total	4288.6	1088.9	940.8	2258.9
	Other SHS	7595.8	1910.0	2368.4	3317.4
2011	SHS Total	0.0	0.0	0.0	0.0
	SIS Routes	0.0	0.0	0.0	0.0
	Emerging SIS Routes	0.0	0.0	0.0	0.0
	SIS Connectors	0.0	0.0	0.0	0.0
	Emerging SIS Connectors	0.0	0.0	0.0	0.0
	SIS Routes Total	0.0	0.0	0.0	0.0
	Other SHS	0.0	0.0	0.0	0.0

Centerline Miles

Statewide, by Facility Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
SIS Conn.	75.7	46.1	51.9	52.3	54.8	60.4	131.5	169.7	0.0	12.2%
Emerging SIS Conn.	87.1	70.6	75.1	75.0	78.4	69.1	41.4	3.1	0.0	-37.9%
SIS Rt.	3,498.8	3,502.5	3,513.7	3,500.0	3,534.0	3,527.7	3,532.7	3,527.3	0.0	0.1%
Emerging SIS Rt.	735.9	761.3	761.0	761.0	761.0	760.9	761.2	761.3	0.0	0.5%
SIS Total	4,234.7	4,263.8	4,274.7	4,261.0	4,295.0	4,288.6	4,293.9	4,288.6	0.0	0.2%
Non-SIS	7,685.0	7,659.0	7,639.6	7,638.8	7,632.2	7,656.2	7,587.5	7,595.8	0.0	-0.2%
SHS Total	**12,082.5**	**12,039.5**	**12,041.3**	**12,027.1**	**12,060.4**	**12,074.3**	**12,054.3**	**12,057.2**	0.0	**0.0%**

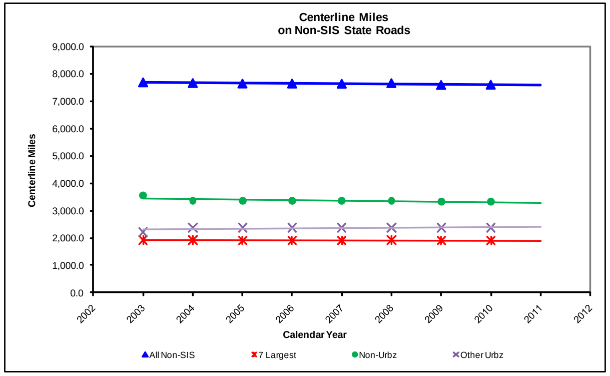

Centerline Miles
on Florida State Highway System

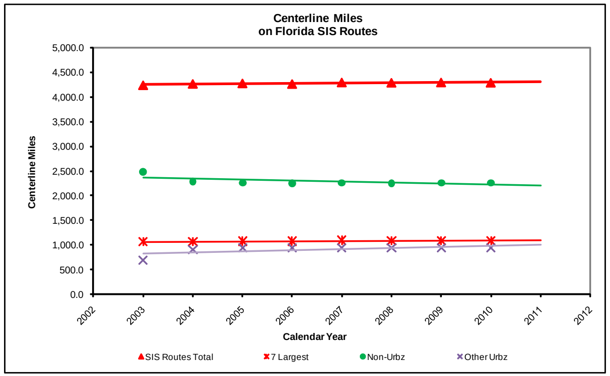

Centerline Miles
on Florida SIS Routes

Centerline Miles

Statewide, by Area Type

	2003	2004	2005	2006	2007	2008	2009	2010		Annual Growth
7 Largest Counties	1,063.7	1,067.2	1,078.1	1,077.6	1,094.1	1,090.2	1,090.6	1,088.9	0.0	0.3%
Other Urbz. Counties	691.1	907.0	938.1	937.8	940.5	944.0	944.1	940.8	0.0	4.5%
Non-Urbanized	2,479.9	2,289.6	2,258.5	2,245.6	2,260.4	2,254.4	2,259.2	2,258.9	0.0	-1.3%
All SIS Routes	4,234.7	4,263.8	4,274.7	4,261.0	4,295.0	4,288.6	4,293.9	4,288.6	0.0	0.2%
7 Largest Counties	1,922.1	1,920.6	1,906.5	1,910.6	1,900.3	1,919.3	1,903.4	1,910.0	0.0	-0.1%
Other Urbz. Counties	2,213.6	2,373.4	2,374.4	2,371.1	2,374.0	2,375.8	2,367.9	2,368.4	0.0	1.0%
Non-Urbanized	3,549.3	3,365.0	3,358.7	3,357.1	3,357.9	3,361.1	3,316.2	3,317.4	0.0	-1.0%
All Non-SIS	7,685.0	7,659.0	7,639.6	7,638.8	7,632.2	7,656.2	7,587.5	7,595.8	0.0	-0.2%
SHS Total	12,082.5	12,039.5	12,041.3	12,027.1	12,060.4	12,074.3	######	######	0.0	0.0%


Centerline Miles
on Non-SIS State Roads


Centerline Miles
on Florida SIS Routes

APPENDIX C: FINANCIAL MODEL WORKSHEETS

Model Input	VMT	Fuel Taxes (dollars per gallon)						Collection		
		Auto & LT			Truck					
	Truck %	(Federal)	(State)	(Local)	(Federal)	(State)	(Local)	Cost	Discount Rate	Present Year
	6.40%	$0.184	$0.177	$0.190	$0.244	$0.177	$0.190	1.00%	4.00%	2015

Yearly Analysis

Reflecting Café Standards

	VMT			Fuel Efficiency		Taxes						Gross Revenues			Cost of	Net Revenue	Discount Rate	Present Value
	All Vehicles	Auto & LT	Trucks	Auto & LT	Trucks	Auto & LT			Trucks			Auto & LT	Trucks	All Vehicles	Collection			
Year	(1,000,000)	(1,000,000)	(1,000,000)	(mpg)	(mpg)	(Federal)	(State)	(Local)	(Federal)	(State)	(Local)	($1,000,000)	($1,000,000)	($1,000,000)	%	($1,000,000)	(%)	($1,000,000)
2015	209,400	195,999	13,402	26.0	5.6	$0.184	$0.177	$0.190	$0.244	$0.177	$0.190	$4,154	$1,462	$5,616	1.00%	$5,560	4.00%	$5,782
2016	213,097	199,459	13,638	27.1	5.7	$0.184	$0.181	$0.190	$0.244	$0.181	$0.190	$4,088	$1,473	$5,560	1.00%	$5,505	4.00%	$5,505
2017	216,829	202,952	13,877	28.2	5.9	$0.184	$0.186	$0.190	$0.244	$0.186	$0.190	$4,030	$1,458	$5,488	1.00%	$5,433	4.00%	$5,224
2018	220,576	206,459	14,117	29.3	6.1	$0.184	$0.191	$0.190	$0.244	$0.191	$0.190	$3,978	$1,445	$5,424	1.00%	$5,370	4.00%	$4,965
2019	224,329	209,971	14,357	30.9	6.3	$0.184	$0.195	$0.190	$0.244	$0.195	$0.190	$3,869	$1,434	$5,303	1.00%	$5,250	4.00%	$4,667
2020	228,084	213,487	14,597	32.2	6.4	$0.184	$0.200	$0.190	$0.244	$0.200	$0.190	$3,807	$1,447	$5,254	1.00%	$5,201	4.00%	$4,446
2021	231,840	217,003	14,838	33.9	6.4	$0.184	$0.205	$0.190	$0.244	$0.205	$0.190	$3,708	$1,482	$5,190	1.00%	$5,138	4.00%	$4,223
2022	235,597	220,519	15,078	35.7	6.5	$0.184	$0.210	$0.190	$0.244	$0.210	$0.190	$3,610	$1,495	$5,105	1.00%	$5,054	4.00%	$3,994
2023	239,355	224,036	15,319	37.4	6.5	$0.184	$0.216	$0.190	$0.244	$0.216	$0.190	$3,532	$1,531	$5,063	1.00%	$5,013	4.00%	$3,809
2024	243,112	227,553	15,559	38.8	6.6	$0.184	$0.221	$0.190	$0.244	$0.221	$0.190	$3,490	$1,544	$5,034	1.00%	$4,984	4.00%	$3,642
2025	246,869	231,069	15,800	40.2	6.6	$0.184	$0.227	$0.190	$0.244	$0.227	$0.190	$3,452	$1,581	$5,033	1.00%	$4,983	4.00%	$3,501
2026	250,626	234,586	16,040	40.3	6.6	$0.184	$0.232	$0.190	$0.244	$0.232	$0.190	$3,529	$1,619	$5,148	1.00%	$5,097	4.00%	$3,443
2027	254,384	238,103	16,281	40.6	6.7	$0.184	$0.238	$0.190	$0.244	$0.238	$0.190	$3,589	$1,633	$5,222	1.00%	$5,170	4.00%	$3,358
2028	258,141	241,620	16,521	41.0	6.7	$0.184	$0.244	$0.190	$0.244	$0.244	$0.190	$3,642	$1,672	$5,314	1.00%	$5,261	4.00%	$3,286
2029	261,898	245,137	16,761	41.4	6.7	$0.184	$0.250	$0.190	$0.244	$0.250	$0.190	$3,695	$1,711	$5,407	1.00%	$5,353	4.00%	$3,215
2030	265,656	248,654	17,002	41.7	6.8	$0.184	$0.256	$0.190	$0.244	$0.256	$0.190	$3,759	$1,726	$5,485	1.00%	$5,430	4.00%	$3,136
2031	269,413	252,170	17,242	41.9	6.8	$0.184	$0.263	$0.190	$0.244	$0.263	$0.190	$3,832	$1,767	$5,599	1.00%	$5,543	4.00%	$3,078
2032	273,170	255,687	17,483	42.3	6.8	$0.184	$0.269	$0.190	$0.244	$0.269	$0.190	$3,889	$1,808	$5,697	1.00%	$5,640	4.00%	$3,011
2033	276,927	259,204	17,723	42.7	6.9	$0.184	$0.276	$0.190	$0.244	$0.276	$0.190	$3,946	$1,824	$5,770	1.00%	$5,712	4.00%	$2,933
2034	280,685	262,721	17,964	43.1	6.9	$0.184	$0.283	$0.190	$0.244	$0.283	$0.190	$4,005	$1,867	$5,871	1.00%	$5,812	4.00%	$2,869
2035	284,442	266,238	18,204	43.6	7	$0.184	$0.290	$0.190	$0.244	$0.290	$0.190	$4,055	$1,883	$5,938	1.00%	$5,878	4.00%	$2,790
													Total Value	$113,522		$112,387		$80,877

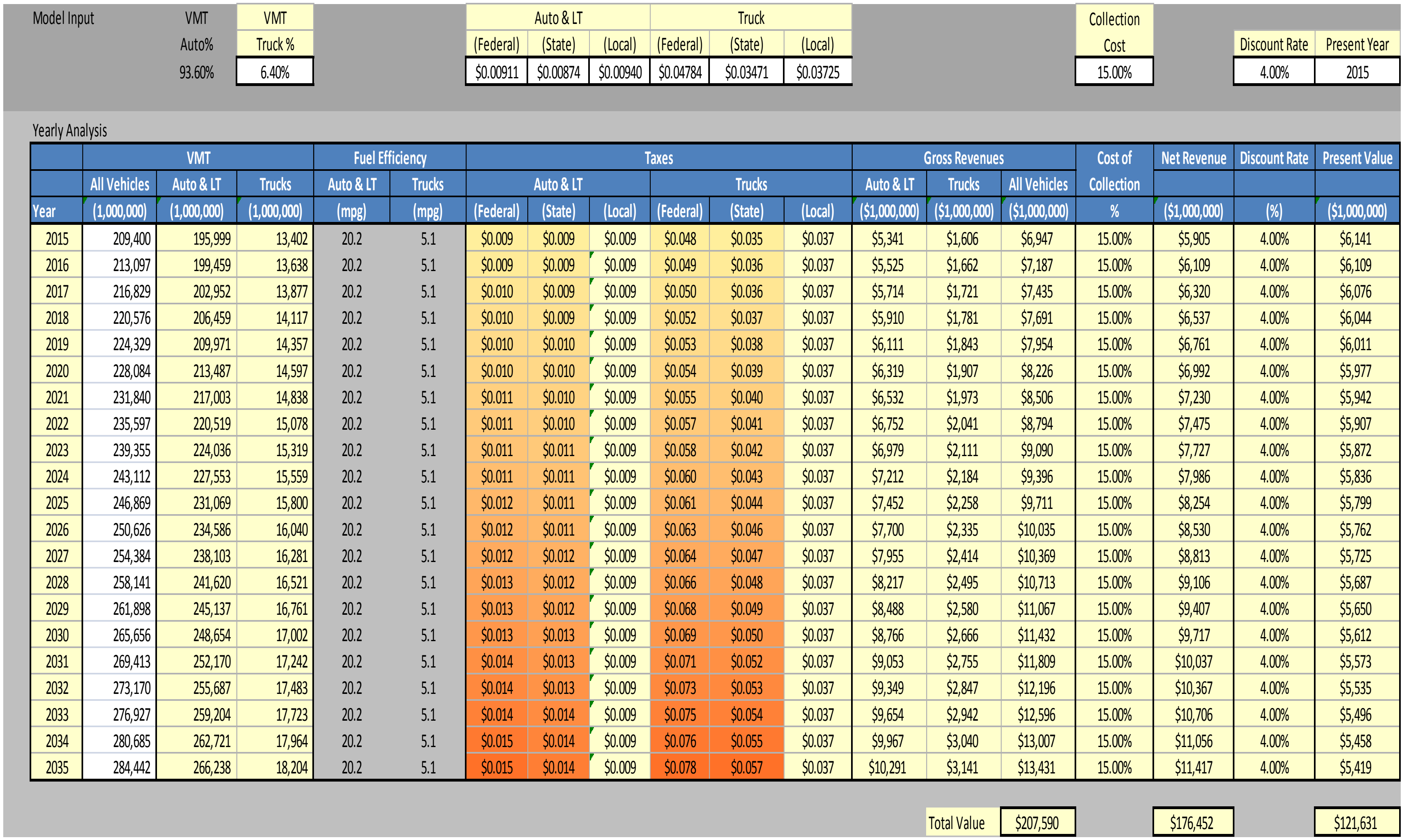
Model Input

VMT	Fuel Taxes (dollars per gallon)						Collection		
	Auto & LT			Truck					
Truck %	(Federal)	(State)	(Local)	(Federal)	(State)	(Local)	Cost	Discount Rate	Present Year
6.40%	$0.184	$0.177	$0.190	$0.244	$0.177	$0.190	1.00%	4.00%	2015

Yearly Analysis

Reflecting Café Standards

	VMT			Fuel Efficiency		Taxes						Gross Revenues			Cost of	Net Revenue	Discount Rate	Present Value
	All Vehicles	Auto & LT	Trucks	Auto & LT	Trucks	Auto & LT			Trucks			Auto & LT	Trucks	All Vehicles	Collection			
Year	(1,000,000)	(1,000,000)	(1,000,000)	(mpg)	(mpg)	(Federal)	(State)	(Local)	(Federal)	(State)	(Local)	($1,000,000)	($1,000,000)	($1,000,000)	%	($1,000,000)	(%)	($1,000,000)
2015	209,400	195,999	13,402	20.2	5.1	$0.184	$0.177	$0.190	$0.244	$0.177	$0.190	$5,346	$1,606	$6,952	1.00%	$6,882	4.00%	$7,158
2016	213,097	199,459	13,638	20.2	5.1	$0.184	$0.181	$0.190	$0.244	$0.181	$0.190	$5,484	$1,646	$7,130	1.00%	$7,059	4.00%	$7,059
2017	216,829	202,952	13,877	20.2	5.1	$0.184	$0.186	$0.190	$0.244	$0.186	$0.190	$5,626	$1,687	$7,313	1.00%	$7,240	4.00%	$6,961
2018	220,576	206,459	14,117	20.2	5.1	$0.184	$0.191	$0.190	$0.244	$0.191	$0.190	$5,771	$1,729	$7,500	1.00%	$7,425	4.00%	$6,865
2019	224,329	209,971	14,357	20.2	5.1	$0.184	$0.195	$0.190	$0.244	$0.195	$0.190	$5,918	$1,772	$7,690	1.00%	$7,613	4.00%	$6,768
2020	228,084	213,487	14,597	20.2	5.1	$0.184	$0.200	$0.190	$0.244	$0.200	$0.190	$6,069	$1,815	$7,885	1.00%	$7,806	4.00%	$6,672
2021	231,840	217,003	14,838	20.2	5.1	$0.184	$0.205	$0.190	$0.244	$0.205	$0.190	$6,223	$1,860	$8,083	1.00%	$8,002	4.00%	$6,577
2022	235,597	220,519	15,078	20.2	5.1	$0.184	$0.210	$0.190	$0.244	$0.210	$0.190	$6,380	$1,905	$8,285	1.00%	$8,202	4.00%	$6,482
2023	239,355	224,036	15,319	20.2	5.1	$0.184	$0.216	$0.190	$0.244	$0.216	$0.190	$6,540	$1,951	$8,491	1.00%	$8,406	4.00%	$6,388
2024	243,112	227,553	15,559	20.2	5.1	$0.184	$0.221	$0.190	$0.244	$0.221	$0.190	$6,703	$1,998	$8,702	1.00%	$8,615	4.00%	$6,295
2025	246,869	231,069	15,800	20.2	5.1	$0.184	$0.227	$0.190	$0.244	$0.227	$0.190	$6,870	$2,046	$8,916	1.00%	$8,827	4.00%	$6,202
2026	250,626	234,586	16,040	20.2	5.1	$0.184	$0.232	$0.190	$0.244	$0.232	$0.190	$7,040	$2,095	$9,136	1.00%	$9,044	4.00%	$6,110
2027	254,384	238,103	16,281	20.2	5.1	$0.184	$0.238	$0.190	$0.244	$0.238	$0.190	$7,214	$2,145	$9,360	1.00%	$9,266	4.00%	$6,019
2028	258,141	241,620	16,521	20.2	5.1	$0.184	$0.244	$0.190	$0.244	$0.244	$0.190	$7,392	$2,196	$9,588	1.00%	$9,493	4.00%	$5,929
2029	261,898	245,137	16,761	20.2	5.1	$0.184	$0.250	$0.190	$0.244	$0.250	$0.190	$7,574	$2,248	$9,822	1.00%	$9,724	4.00%	$5,840
2030	265,656	248,654	17,002	20.2	5.1	$0.184	$0.256	$0.190	$0.244	$0.256	$0.190	$7,759	$2,301	$10,061	1.00%	$9,960	4.00%	$5,752
2031	269,413	252,170	17,242	20.2	5.1	$0.184	$0.263	$0.190	$0.244	$0.263	$0.190	$7,949	$2,356	$10,305	1.00%	$10,202	4.00%	$5,665
2032	273,170	255,687	17,483	20.2	5.1	$0.184	$0.269	$0.190	$0.244	$0.269	$0.190	$8,143	$2,411	$10,554	1.00%	$10,449	4.00%	$5,579
2033	276,927	259,204	17,723	20.2	5.1	$0.184	$0.276	$0.190	$0.244	$0.276	$0.190	$8,341	$2,468	$10,809	1.00%	$10,701	4.00%	$5,494
2034	280,685	262,721	17,964	20.2	5.1	$0.184	$0.283	$0.190	$0.244	$0.283	$0.190	$8,544	$2,525	$11,070	1.00%	$10,959	4.00%	$5,410
2035	284,442	266,238	18,204	20.2	5.1	$0.184	$0.290	$0.190	$0.244	$0.290	$0.190	$8,752	$2,584	$11,336	1.00%	$11,223	4.00%	$5,327
													Total Value	$188,987		$187,097		$130,550



Model Input

VMT	VMT	Auto & LT			Truck			Collection	Discount Rate	Present Year
Auto%	Truck %	(Federal)	(State)	(Local)	(Federal)	(State)	(Local)	Cost		
93.60%	6.40%	$0.00911	$0.00874	$0.00940	$0.04784	$0.03471	$0.03725	15.00%	4.00%	2015

Yearly Analysis

	VMT			Fuel Efficiency		Taxes						Gross Revenues			Cost of	Net Revenue	Discount Rate	Present Value
	All Vehicles	Auto & LT	Trucks	Auto & LT	Trucks	Auto & LT			Trucks			Auto & LT	Trucks	All Vehicles	Collection			
Year	(1,000,000)	(1,000,000)	(1,000,000)	(mpg)	(mpg)	(Federal)	(State)	(Local)	(Federal)	(State)	(Local)	($1,000,000)	($1,000,000)	($1,000,000)	%	($1,000,000)	(%)	($1,000,000)
2015	209,400	195,999	13,402	20.2	5.1	$0.009	$0.009	$0.009	$0.048	$0.035	$0.037	$5,341	$1,606	$6,947	15.00%	$5,905	4.00%	$6,141
2016	213,097	199,459	13,638	20.2	5.1	$0.009	$0.009	$0.009	$0.049	$0.036	$0.037	$5,525	$1,662	$7,187	15.00%	$6,109	4.00%	$6,109
2017	216,829	202,952	13,877	20.2	5.1	$0.010	$0.009	$0.009	$0.050	$0.036	$0.037	$5,714	$1,721	$7,435	15.00%	$6,320	4.00%	$6,076
2018	220,576	206,459	14,117	20.2	5.1	$0.010	$0.009	$0.009	$0.052	$0.037	$0.037	$5,910	$1,781	$7,691	15.00%	$6,537	4.00%	$6,044
2019	224,329	209,971	14,357	20.2	5.1	$0.010	$0.010	$0.009	$0.053	$0.038	$0.037	$6,111	$1,843	$7,954	15.00%	$6,761	4.00%	$6,011
2020	228,084	213,487	14,597	20.2	5.1	$0.010	$0.010	$0.009	$0.054	$0.039	$0.037	$6,319	$1,907	$8,226	15.00%	$6,992	4.00%	$5,977
2021	231,840	217,003	14,838	20.2	5.1	$0.011	$0.010	$0.009	$0.055	$0.040	$0.037	$6,532	$1,973	$8,506	15.00%	$7,230	4.00%	$5,942
2022	235,597	220,519	15,078	20.2	5.1	$0.011	$0.010	$0.009	$0.057	$0.041	$0.037	$6,752	$2,041	$8,794	15.00%	$7,475	4.00%	$5,907
2023	239,355	224,036	15,319	20.2	5.1	$0.011	$0.011	$0.009	$0.058	$0.042	$0.037	$6,979	$2,111	$9,090	15.00%	$7,727	4.00%	$5,872
2024	243,112	227,553	15,559	20.2	5.1	$0.011	$0.011	$0.009	$0.060	$0.043	$0.037	$7,212	$2,184	$9,396	15.00%	$7,986	4.00%	$5,836
2025	246,869	231,069	15,800	20.2	5.1	$0.012	$0.011	$0.009	$0.061	$0.044	$0.037	$7,452	$2,258	$9,711	15.00%	$8,254	4.00%	$5,799
2026	250,626	234,586	16,040	20.2	5.1	$0.012	$0.011	$0.009	$0.063	$0.046	$0.037	$7,700	$2,335	$10,035	15.00%	$8,530	4.00%	$5,762
2027	254,384	238,103	16,281	20.2	5.1	$0.012	$0.012	$0.009	$0.064	$0.047	$0.037	$7,955	$2,414	$10,369	15.00%	$8,813	4.00%	$5,725
2028	258,141	241,620	16,521	20.2	5.1	$0.013	$0.012	$0.009	$0.066	$0.048	$0.037	$8,217	$2,495	$10,713	15.00%	$9,106	4.00%	$5,687
2029	261,898	245,137	16,761	20.2	5.1	$0.013	$0.012	$0.009	$0.068	$0.049	$0.037	$8,488	$2,580	$11,067	15.00%	$9,407	4.00%	$5,650
2030	265,656	248,654	17,002	20.2	5.1	$0.013	$0.013	$0.009	$0.069	$0.050	$0.037	$8,766	$2,666	$11,432	15.00%	$9,717	4.00%	$5,612
2031	269,413	252,170	17,242	20.2	5.1	$0.014	$0.013	$0.009	$0.071	$0.052	$0.037	$9,053	$2,755	$11,809	15.00%	$10,037	4.00%	$5,573
2032	273,170	255,687	17,483	20.2	5.1	$0.014	$0.013	$0.009	$0.073	$0.053	$0.037	$9,349	$2,847	$12,196	15.00%	$10,367	4.00%	$5,535
2033	276,927	259,204	17,723	20.2	5.1	$0.014	$0.014	$0.009	$0.075	$0.054	$0.037	$9,654	$2,942	$12,596	15.00%	$10,706	4.00%	$5,496
2034	280,685	262,721	17,964	20.2	5.1	$0.015	$0.014	$0.009	$0.076	$0.055	$0.037	$9,967	$3,040	$13,007	15.00%	$11,056	4.00%	$5,458
2035	284,442	266,238	18,204	20.2	5.1	$0.015	$0.014	$0.009	$0.078	$0.057	$0.037	$10,291	$3,141	$13,431	15.00%	$11,417	4.00%	$5,419
													Total Value	$207,590		$176,452		$121,631

County/City Traffic Split	
Auto & LT	Trucks
46.30%	46.30%

SHS Traffic Split	
Auto & LT	Trucks
53.70%	53.70%

Area Veh Type Percentages

Auto		Truck
93.60%	100%	6.40%

Urban		Rural	Urban		Rural
66.50%	100%	33.50%	66.50%	100%	33.50%

Peak		Off Peak	Peak		Off Peak		Peak		Off Peak	Peak		Off Peak
20.9300%	100.0%	79.0700%	23.2500%	100.0%	76.7500%	<-- % -->	18.6000%	100.0%	81.4000%	23.2500%	100.0%	76.7500%
50.00%		25.00%	25.00%		0.00%	<--Ad. Tax-->	50.00%		25.00%	25.00%		0.00%
-1.60%		-0.80%	-0.80%		0.00%	<deflection>	-1.70%		-0.90%	-0.90%		0.00%

Fuel Taxes (dollars per mile)

Auto & LT							Truck						
(Federal)	(State)	(Local)	(Urban)		(Rural)		(Federal)	(State)	(Local)	(Urban)		(Rural)	
			(Peak)	(OffPeak)	(Peak)	(OffPeak)				(Peak)	(OffPeak)	(Peak)	(OffPeak)
$0.00911	$0.00874	$0.00940	50.000%	25.000%	25.000%	0.000%	$0.04784	$0.03471	$0.03725	50.000%	25.000%	25.000%	0.000%

Collection Cost
20.00%

Discount Rat	Present Year
4.00%	2015

Yearly Analysis

	VMT			Roadway Type Split				S.H.S. 'Auto & LT' Breakdown With Diversion				S.H.S. 'Trucks' Breakdown with Diversion				Fuel Efficiency	
	All Vehicles	Auto & LT	Trucks	County/City		S.H.S. No. Diversion		Urban		Rural		Urban		Rural		Auto & LT	Trucks
				Auto & LT	Trucks	Auto & LT	Trucks	Peak	OffPeak	Peak	OffPeak	Peak	OffPeak	Peak	OffPeak		
Year	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(mpg)	(mpg)
2015	209,400	195,999	13,402	90,747	6,205	105,251	7,197	14,415	54,900	8,132	27,061	875	3,861	555	1,850	20.2	5.1
2016	213,097	199,459	13,638	92,349	6,314	107,109	7,324	14,669	55,869	8,276	27,539	890	3,929	565	1,883	20.2	5.1
2017	216,829	202,952	13,877	93,967	6,425	108,985	7,452	14,926	56,848	8,421	28,021	906	3,998	575	1,916	20.2	5.1
2018	220,576	206,459	14,117	95,590	6,536	110,868	7,581	15,184	57,830	8,566	28,506	922	4,067	585	1,949	20.2	5.1
2019	224,329	209,971	14,357	97,217	6,647	112,755	7,710	15,443	58,814	8,712	28,991	937	4,136	595	1,982	20.2	5.1
2020	228,084	213,487	14,597	98,844	6,759	114,642	7,839	15,701	59,798	8,858	29,476	953	4,205	605	2,015	20.2	5.1
2021	231,840	217,003	14,838	100,472	6,870	116,530	7,968	15,960	60,783	9,004	29,961	969	4,274	615	2,049	20.2	5.1
2022	235,597	220,519	15,078	102,100	6,981	118,419	8,097	16,218	61,768	9,150	30,447	984	4,344	625	2,082	20.2	5.1
2023	239,355	224,036	15,319	103,729	7,093	120,307	8,226	16,477	62,753	9,295	30,933	1,000	4,413	635	2,115	20.2	5.1
2024	243,112	227,553	15,559	105,357	7,204	122,196	8,355	16,736	63,738	9,441	31,418	1,016	4,482	645	2,148	20.2	5.1
2025	246,869	231,069	15,800	106,985	7,315	124,084	8,484	16,994	64,723	9,587	31,904	1,032	4,551	655	2,181	20.2	5.1
2026	250,626	234,586	16,040	108,613	7,427	125,973	8,614	17,253	65,709	9,733	32,389	1,047	4,621	665	2,215	20.2	5.1
2027	254,384	238,103	16,281	110,242	7,538	127,861	8,743	17,512	66,694	9,879	32,875	1,063	4,690	675	2,248	20.2	5.1
2028	258,141	241,620	16,521	111,870	7,649	129,750	8,872	17,770	67,679	10,025	33,360	1,079	4,759	685	2,281	20.2	5.1
2029	261,898	245,137	16,761	113,498	7,761	131,638	9,001	18,029	68,664	10,171	33,846	1,094	4,828	695	2,314	20.2	5.1
2030	265,656	248,654	17,002	115,127	7,872	133,527	9,130	18,288	69,649	10,317	34,331	1,110	4,898	705	2,347	20.2	5.1
2031	269,413	252,170	17,242	116,755	7,983	135,415	9,259	18,546	70,634	10,463	34,817	1,126	4,967	715	2,381	20.2	5.1
2032	273,170	255,687	17,483	118,383	8,095	137,304	9,388	18,805	71,619	10,609	35,303	1,141	5,036	725	2,414	20.2	5.1
2033	276,927	259,204	17,723	120,011	8,206	139,193	9,517	19,063	72,604	10,755	35,788	1,157	5,106	735	2,447	20.2	5.1
2034	280,685	262,721	17,964	121,640	8,317	141,081	9,647	19,322	73,589	10,901	36,274	1,173	5,175	745	2,480	20.2	5.1
2035	284,442	266,238	18,204	123,268	8,429	142,970	9,776	19,581	74,574	11,046	36,759	1,189	5,244	755	2,513	20.2	5.1

	Taxes														Gross Revenues				Net Revenue	scount Ra	Present Value
	Auto & LT							Trucks							Auto & LT	Trucks	All Vehicles	Cost of Collection			
				Urban		Rural					Urban		Rural								
Year	(Federal)	(State)	(Local)	Peak	OffPeak	Peak	OffPeak	(Federal)	(State)	(Local)	Peak	OffPeak	Peak	OffPeak	($1,000,000)	($1,000,000)	($1,000,000)	%	($1,000,000)	(%)	($1,000,000)
2015	$0.009	$0.009	$0.009	$0.01363	$0.00681	$0.00681	$0.00000	$0.048	$0.035	$0.037	$0.05990	$0.02995	$0.02995	$0.00000	$5,947	$1,784	$7,731	20.00%	$6,184	4.00%	$6,432
2016	$0.009	$0.009	$0.009	$0.01374	$0.00687	$0.00687	$0.00000	$0.048	$0.036	$0.037	$0.06034	$0.03017	$0.03017	$0.00000	$6,100	$1,828	$7,929	20.00%	$6,343	4.00%	$6,343
2017	$0.009	$0.009	$0.009	$0.01385	$0.00692	$0.00692	$0.00000	$0.048	$0.036	$0.037	$0.06078	$0.03039	$0.03039	$0.00000	$6,258	$1,874	$8,132	20.00%	$6,506	4.00%	$6,255
2018	$0.009	$0.009	$0.009	$0.01396	$0.00698	$0.00698	$0.00000	$0.048	$0.037	$0.037	$0.06124	$0.03062	$0.03062	$0.00000	$6,419	$1,921	$8,340	20.00%	$6,672	4.00%	$6,168
2019	$0.009	$0.010	$0.009	$0.01408	$0.00704	$0.00704	$0.00000	$0.048	$0.038	$0.037	$0.06170	$0.03085	$0.03085	$0.00000	$6,583	$1,968	$8,551	20.00%	$6,841	4.00%	$6,082
2020	$0.009	$0.010	$0.009	$0.01420	$0.00710	$0.00710	$0.00000	$0.048	$0.039	$0.037	$0.06218	$0.03109	$0.03109	$0.00000	$6,751	$2,017	$8,767	20.00%	$7,014	4.00%	$5,996
2021	$0.009	$0.010	$0.009	$0.01432	$0.00716	$0.00716	$0.00000	$0.048	$0.040	$0.037	$0.06267	$0.03134	$0.03134	$0.00000	$6,922	$2,066	$8,988	20.00%	$7,190	4.00%	$5,910
2022	$0.009	$0.010	$0.009	$0.01445	$0.00723	$0.00723	$0.00000	$0.048	$0.041	$0.037	$0.06318	$0.03159	$0.03159	$0.00000	$7,096	$2,116	$9,212	20.00%	$7,370	4.00%	$5,825
2023	$0.009	$0.011	$0.009	$0.01458	$0.00729	$0.00729	$0.00000	$0.048	$0.042	$0.037	$0.06369	$0.03185	$0.03185	$0.00000	$7,274	$2,168	$9,442	20.00%	$7,553	4.00%	$5,740
2024	$0.009	$0.011	$0.009	$0.01471	$0.00736	$0.00736	$0.00000	$0.048	$0.043	$0.037	$0.06422	$0.03211	$0.03211	$0.00000	$7,456	$2,220	$9,676	20.00%	$7,741	4.00%	$5,656
2025	$0.009	$0.011	$0.009	$0.01485	$0.00743	$0.00743	$0.00000	$0.048	$0.044	$0.037	$0.06476	$0.03238	$0.03238	$0.00000	$7,641	$2,273	$9,914	20.00%	$7,932	4.00%	$5,573
2026	$0.009	$0.011	$0.009	$0.01499	$0.00750	$0.00750	$0.00000	$0.048	$0.046	$0.037	$0.06532	$0.03266	$0.03266	$0.00000	$7,830	$2,328	$10,158	20.00%	$8,127	4.00%	$5,490
2027	$0.009	$0.012	$0.009	$0.01513	$0.00757	$0.00757	$0.00000	$0.048	$0.047	$0.037	$0.06589	$0.03294	$0.03294	$0.00000	$8,024	$2,383	$10,407	20.00%	$8,326	4.00%	$5,408
2028	$0.009	$0.012	$0.009	$0.01528	$0.00764	$0.00764	$0.00000	$0.048	$0.048	$0.037	$0.06647	$0.03324	$0.03324	$0.00000	$8,221	$2,440	$10,661	20.00%	$8,529	4.00%	$5,327
2029	$0.009	$0.012	$0.009	$0.01543	$0.00772	$0.00772	$0.00000	$0.048	$0.049	$0.037	$0.06707	$0.03353	$0.03353	$0.00000	$8,423	$2,498	$10,921	20.00%	$8,737	4.00%	$5,247
2030	$0.009	$0.013	$0.009	$0.01559	$0.00779	$0.00779	$0.00000	$0.048	$0.050	$0.037	$0.06768	$0.03384	$0.03384	$0.00000	$8,630	$2,557	$11,186	20.00%	$8,949	4.00%	$5,168
2031	$0.009	$0.013	$0.009	$0.01574	$0.00787	$0.00787	$0.00000	$0.048	$0.052	$0.037	$0.06831	$0.03415	$0.03415	$0.00000	$8,841	$2,617	$11,458	20.00%	$9,166	4.00%	$5,090
2032	$0.009	$0.013	$0.009	$0.01591	$0.00795	$0.00795	$0.00000	$0.048	$0.053	$0.037	$0.06895	$0.03448	$0.03448	$0.00000	$9,056	$2,678	$11,735	20.00%	$9,388	4.00%	$5,012
2033	$0.009	$0.014	$0.009	$0.01607	$0.00804	$0.00804	$0.00000	$0.048	$0.054	$0.037	$0.06961	$0.03481	$0.03481	$0.00000	$9,277	$2,741	$12,018	20.00%	$9,614	4.00%	$4,936
2034	$0.009	$0.014	$0.009	$0.01624	$0.00812	$0.00812	$0.00000	$0.048	$0.055	$0.037	$0.07029	$0.03515	$0.03515	$0.00000	$9,502	$2,805	$12,308	20.00%	$9,846	4.00%	$4,860
2035	$0.009	$0.014	$0.009	$0.01642	$0.00821	$0.00821	$0.00000	$0.048	$0.057	$0.037	$0.07098	$0.03549	$0.03549	$0.00000	$9,733	$2,871	$12,604	20.00%	$10,083	4.00%	$4,786
																Total Value	$210,138		$168,110		$117,303

Model Input	VMT	VMT	County/City Split		SHS Split		Auto & LT		Truck	
	Auto%	Truck %	Auto & LT	Trucks	Auto & LT	Trucks	Urban	Rural	Urban	Rural
	93.60%	6.40%	46.30%	46.30%	53.70%	53.70%	66.50%	33.50%	66.50%	33.50%
						diversion factor--->	-0.08%	0%	-0.09%	0%

Fuel Taxes (dollars per mile)									
Auto & LT					Truck				
(Federal)	(State)	(Local)	(Urban)	(Rural)	(Federal)	(State)	(Local)	(Urban)	(Rural)
$0.00911	$0.00874	$0.00940	25.00%	0.00%	$0.04784	$0.03471	$0.03725	25.00%	0.00%
			% of Tax	% of Tax				% of Tax	% of Tax

Collection Cost	Discount Rate	Present Year
20.00%	4.00%	2015

Yearly Analysis

Area Percentages

	VMT			County/City		S.H.S. Volumes no diversion		S.H.S Auto & LT w/ diversion		S.H.S Trucks w/ diversion		Fuel Efficiency	
	All Vehicles	Auto & LT	Trucks	Auto & LT	Trucks	Auto & LT	Trucks	Urban w/ diversion	Rural	Urban w/ diversion	Rural	Auto & LT	Trucks
Year	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(mpg)	(mpg)
2015	209,400	195,999	13,402	90,747	6,205	105,251	7,197	69,936	35,259	4,781	2,411	20.2	5.1
2016	213,097	199,459	13,638	92,349	6,314	107,109	7,324	71,171	35,882	4,866	2,453	20.2	5.1
2017	216,829	202,952	13,877	93,967	6,425	108,985	7,452	72,417	36,510	4,951	2,496	20.2	5.1
2018	220,576	206,459	14,117	95,590	6,536	110,868	7,581	73,668	37,141	5,037	2,540	20.2	5.1
2019	224,329	209,971	14,357	97,217	6,647	112,755	7,710	74,922	37,773	5,122	2,583	20.2	5.1
2020	228,084	213,487	14,597	98,844	6,759	114,642	7,839	76,176	38,405	5,208	2,626	20.2	5.1
2021	231,840	217,003	14,838	100,472	6,870	116,530	7,968	77,431	39,038	5,294	2,669	20.2	5.1
2022	235,597	220,519	15,078	102,100	6,981	118,419	8,097	78,685	39,670	5,380	2,712	20.2	5.1
2023	239,355	224,036	15,319	103,729	7,093	120,307	8,226	79,940	40,303	5,465	2,756	20.2	5.1
2024	243,112	227,553	15,559	105,357	7,204	122,196	8,355	81,195	40,936	5,551	2,799	20.2	5.1
2025	246,869	231,069	15,800	106,985	7,315	124,084	8,484	82,450	41,568	5,637	2,842	20.2	5.1
2026	250,626	234,586	16,040	108,613	7,427	125,973	8,614	83,705	42,201	5,723	2,886	20.2	5.1
2027	254,384	238,103	16,281	110,242	7,538	127,861	8,743	84,960	42,834	5,809	2,929	20.2	5.1
2028	258,141	241,620	16,521	111,870	7,649	129,750	8,872	86,215	43,466	5,894	2,972	20.2	5.1
2029	261,898	245,137	16,761	113,498	7,761	131,638	9,001	87,470	44,099	5,980	3,015	20.2	5.1
2030	265,656	248,654	17,002	115,127	7,872	133,527	9,130	88,724	44,732	6,066	3,059	20.2	5.1
2031	269,413	252,170	17,242	116,755	7,983	135,415	9,259	89,979	45,364	6,152	3,102	20.2	5.1
2032	273,170	255,687	17,483	118,383	8,095	137,304	9,388	91,234	45,997	6,238	3,145	20.2	5.1
2033	276,927	259,204	17,723	120,011	8,206	139,193	9,517	92,489	46,630	6,323	3,188	20.2	5.1
2034	280,685	262,721	17,964	121,640	8,317	141,081	9,647	93,744	47,262	6,409	3,232	20.2	5.1
2035	284,442	266,238	18,204	123,268	8,429	142,970	9,776	94,999	47,895	6,495	3,275	20.2	5.1

	Taxes										Gross Revenues			Cost of Collection	Net Revenue	Discount Rate	Present Value
	Auto & LT					Trucks					Auto & LT	Trucks	All Vehicles				
Year	(Federal)	(State) Indexed	(Local)	(Urban)	(Rural)	(Federal)	(State) Indexed	(Local)	(Urban)	(Rural)	($1,000,000)	($1,000,000)	($1,000,000)	%	($1,000,000)	(%)	($1,000,000)
2015	$0.009	$0.009	$0.009	$0.0068	$0.00	$0.048	$0.035	$0.037	$0.0300	$0.00	$5,816	$1,748	$7,565	20.00%	$6,052	4.00%	$6,294
2016	$0.009	$0.009	$0.009	$0.0069	$0.00	$0.048	$0.036	$0.037	$0.0302	$0.00	$5,966	$1,792	$7,758	20.00%	$6,207	4.00%	$6,207
2017	$0.009	$0.009	$0.009	$0.0069	$0.00	$0.048	$0.036	$0.037	$0.0304	$0.00	$6,120	$1,837	$7,957	20.00%	$6,366	4.00%	$6,121
2018	$0.009	$0.009	$0.009	$0.0070	$0.00	$0.048	$0.037	$0.037	$0.0306	$0.00	$6,278	$1,883	$8,160	20.00%	$6,528	4.00%	$6,036
2019	$0.009	$0.010	$0.009	$0.0070	$0.00	$0.048	$0.038	$0.037	$0.0309	$0.00	$6,438	$1,929	$8,368	20.00%	$6,694	4.00%	$5,951
2020	$0.009	$0.010	$0.009	$0.0071	$0.00	$0.048	$0.039	$0.037	$0.0311	$0.00	$6,602	$1,977	$8,579	20.00%	$6,863	4.00%	$5,867
2021	$0.009	$0.010	$0.009	$0.0072	$0.00	$0.048	$0.040	$0.037	$0.0313	$0.00	$6,769	$2,025	$8,795	20.00%	$7,036	4.00%	$5,783
2022	$0.009	$0.010	$0.009	$0.0072	$0.00	$0.048	$0.041	$0.037	$0.0316	$0.00	$6,940	$2,074	$9,015	20.00%	$7,212	4.00%	$5,699
2023	$0.009	$0.011	$0.009	$0.0073	$0.00	$0.048	$0.042	$0.037	$0.0318	$0.00	$7,114	$2,125	$9,239	20.00%	$7,391	4.00%	$5,617
2024	$0.009	$0.011	$0.009	$0.0074	$0.00	$0.048	$0.043	$0.037	$0.0321	$0.00	$7,292	$2,176	$9,468	20.00%	$7,574	4.00%	$5,534
2025	$0.009	$0.011	$0.009	$0.0074	$0.00	$0.048	$0.044	$0.037	$0.0324	$0.00	$7,473	$2,228	$9,701	20.00%	$7,761	4.00%	$5,453
2026	$0.009	$0.011	$0.009	$0.0075	$0.00	$0.048	$0.046	$0.037	$0.0327	$0.00	$7,658	$2,282	$9,940	20.00%	$7,952	4.00%	$5,372
2027	$0.009	$0.012	$0.009	$0.0076	$0.00	$0.048	$0.047	$0.037	$0.0329	$0.00	$7,848	$2,336	$10,184	20.00%	$8,147	4.00%	$5,292
2028	$0.009	$0.012	$0.009	$0.0076	$0.00	$0.048	$0.048	$0.037	$0.0332	$0.00	$8,041	$2,392	$10,432	20.00%	$8,346	4.00%	$5,213
2029	$0.009	$0.012	$0.009	$0.0077	$0.00	$0.048	$0.049	$0.037	$0.0335	$0.00	$8,238	$2,448	$10,686	20.00%	$8,549	4.00%	$5,134
2030	$0.009	$0.013	$0.009	$0.0078	$0.00	$0.048	$0.050	$0.037	$0.0338	$0.00	$8,440	$2,506	$10,946	20.00%	$8,757	4.00%	$5,057
2031	$0.009	$0.013	$0.009	$0.0079	$0.00	$0.048	$0.052	$0.037	$0.0342	$0.00	$8,646	$2,565	$11,211	20.00%	$8,969	4.00%	$4,980
2032	$0.009	$0.013	$0.009	$0.0080	$0.00	$0.048	$0.053	$0.037	$0.0345	$0.00	$8,857	$2,625	$11,483	20.00%	$9,186	4.00%	$4,905
2033	$0.009	$0.014	$0.009	$0.0080	$0.00	$0.048	$0.054	$0.037	$0.0348	$0.00	$9,073	$2,687	$11,760	20.00%	$9,408	4.00%	$4,830
2034	$0.009	$0.014	$0.009	$0.0081	$0.00	$0.048	$0.055	$0.037	$0.0351	$0.00	$9,294	$2,750	$12,043	20.00%	$9,635	4.00%	$4,756
2035	$0.009	$0.014	$0.009	$0.0082	$0.00	$0.048	$0.057	$0.037	$0.0355	$0.00	$9,519	$2,814	$12,333	20.00%	$9,867	4.00%	$4,683
												Total Value	$205,624		$164,499		$114,783

Model Input

VMT Auto%	VMT Truck %
93.60%	6.40%

Fuel Taxes (dollars per mile)					
Auto & LT			Truck		
(Federal)	(State)	(Local)	(Federal)	(State)	(Local)
$0.00911	$0.00874	$0.00940	$0.04784	$0.03471	$0.03725

Collection Cost	Discount Rate	Present Year
15.00%	4.00%	2015

Yearly Analysis

	VMT			Fuel Efficiency		Taxes						Gross Revenues			Cost of	Net Revenue	Discount Rate	Present Value
	All Vehicles	Auto & LT	Trucks	Auto & LT	Trucks	Auto & LT			Trucks			Auto & LT	Trucks	All Vehicles	Collection			
Year	(1,000,000)	(1,000,000)	(1,000,000)	(mpg)	(mpg)	(Federal)	(State)	(Local)	(Federal)	(State)	(Local)	($1,000,000)	($1,000,000)	($1,000,000)	%	($1,000,000)	(%)	($1,000,000)
2015	209,400	195,999	13,402	20.2	5.1	$0.009	$0.009	$0.009	$0.048	$0.035	$0.037	$5,341	$1,606	$6,947	15.00%	$5,905	4.00%	$6,141
2016	213,097	199,459	13,638	20.2	5.1	$0.009	$0.009	$0.009	$0.048	$0.036	$0.037	$5,479	$1,646	$7,125	15.00%	$6,056	4.00%	$6,056
2017	216,829	202,952	13,877	20.2	5.1	$0.009	$0.009	$0.009	$0.048	$0.036	$0.037	$5,621	$1,687	$7,308	15.00%	$6,211	4.00%	$5,973
2018	220,576	206,459	14,117	20.2	5.1	$0.009	$0.009	$0.009	$0.048	$0.037	$0.037	$5,765	$1,729	$7,494	15.00%	$6,370	4.00%	$5,889
2019	224,329	209,971	14,357	20.2	5.1	$0.009	$0.010	$0.009	$0.048	$0.038	$0.037	$5,913	$1,772	$7,684	15.00%	$6,532	4.00%	$5,807
2020	228,084	213,487	14,597	20.2	5.1	$0.009	$0.010	$0.009	$0.048	$0.039	$0.037	$6,063	$1,815	$7,879	15.00%	$6,697	4.00%	$5,724
2021	231,840	217,003	14,838	20.2	5.1	$0.009	$0.010	$0.009	$0.048	$0.040	$0.037	$6,217	$1,860	$8,077	15.00%	$6,865	4.00%	$5,643
2022	235,597	220,519	15,078	20.2	5.1	$0.009	$0.010	$0.009	$0.048	$0.041	$0.037	$6,373	$1,905	$8,279	15.00%	$7,037	4.00%	$5,561
2023	239,355	224,036	15,319	20.2	5.1	$0.009	$0.011	$0.009	$0.048	$0.042	$0.037	$6,533	$1,951	$8,485	15.00%	$7,212	4.00%	$5,480
2024	243,112	227,553	15,559	20.2	5.1	$0.009	$0.011	$0.009	$0.048	$0.043	$0.037	$6,696	$1,998	$8,695	15.00%	$7,391	4.00%	$5,400
2025	246,869	231,069	15,800	20.2	5.1	$0.009	$0.011	$0.009	$0.048	$0.044	$0.037	$6,863	$2,046	$8,909	15.00%	$7,573	4.00%	$5,321
2026	250,626	234,586	16,040	20.2	5.1	$0.009	$0.011	$0.009	$0.048	$0.046	$0.037	$7,033	$2,095	$9,128	15.00%	$7,759	4.00%	$5,242
2027	254,384	238,103	16,281	20.2	5.1	$0.009	$0.012	$0.009	$0.048	$0.047	$0.037	$7,207	$2,145	$9,352	15.00%	$7,949	4.00%	$5,164
2028	258,141	241,620	16,521	20.2	5.1	$0.009	$0.012	$0.009	$0.048	$0.048	$0.037	$7,384	$2,196	$9,581	15.00%	$8,143	4.00%	$5,086
2029	261,898	245,137	16,761	20.2	5.1	$0.009	$0.012	$0.009	$0.048	$0.049	$0.037	$7,566	$2,248	$9,814	15.00%	$8,342	4.00%	$5,010
2030	265,656	248,654	17,002	20.2	5.1	$0.009	$0.013	$0.009	$0.048	$0.050	$0.037	$7,751	$2,301	$10,052	15.00%	$8,544	4.00%	$4,934
2031	269,413	252,170	17,242	20.2	5.1	$0.009	$0.013	$0.009	$0.048	$0.052	$0.037	$7,940	$2,356	$10,296	15.00%	$8,752	4.00%	$4,859
2032	273,170	255,687	17,483	20.2	5.1	$0.009	$0.013	$0.009	$0.048	$0.053	$0.037	$8,134	$2,411	$10,545	15.00%	$8,963	4.00%	$4,786
2033	276,927	259,204	17,723	20.2	5.1	$0.009	$0.014	$0.009	$0.048	$0.054	$0.037	$8,332	$2,468	$10,800	15.00%	$9,180	4.00%	$4,713
2034	280,685	262,721	17,964	20.2	5.1	$0.009	$0.014	$0.009	$0.048	$0.055	$0.037	$8,535	$2,525	$11,060	15.00%	$9,401	4.00%	$4,641
2035	284,442	266,238	18,204	20.2	5.1	$0.009	$0.014	$0.009	$0.048	$0.057	$0.037	$8,742	$2,584	$11,326	15.00%	$9,627	4.00%	$4,570
													Total Value	$188,835		$160,510		$111,999

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