

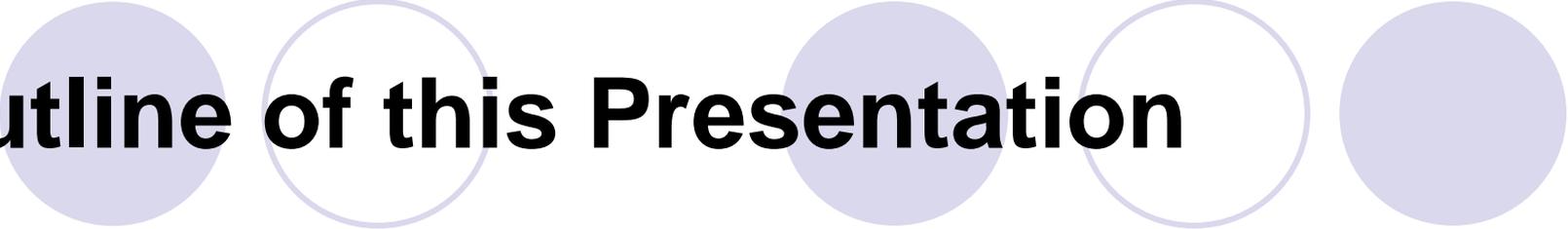
Bureau of Transportation Statistics Economic Analysis Modeling System (BTEAMS)

Brian W. Sloboda

U.S. Department of Transportation/BTS

David Chien

U.S. Department of Transportation/BTS

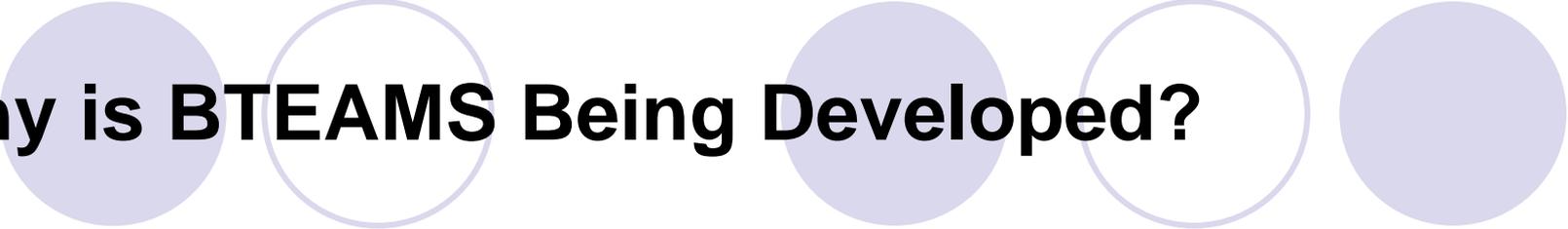


Outline of this Presentation

- What is the BTEAMS model and its origins?
- Why is BTEAMS being developed?
- Who are the customers of BTEAMS?
- What is the planned development of BTEAMS?
 - a. Data Inputs (including BTS data and how they are used in the model?)
 - b. BTS Economic Inputs

What is BTEAMS and its Origins?

- The main component of the BTEAMS is the Energy Information Administration's Transportation Module National Energy Modeling System (NEMS).
- NEMS forecasts future demand and supply of energy through various policy and scenario analyses.



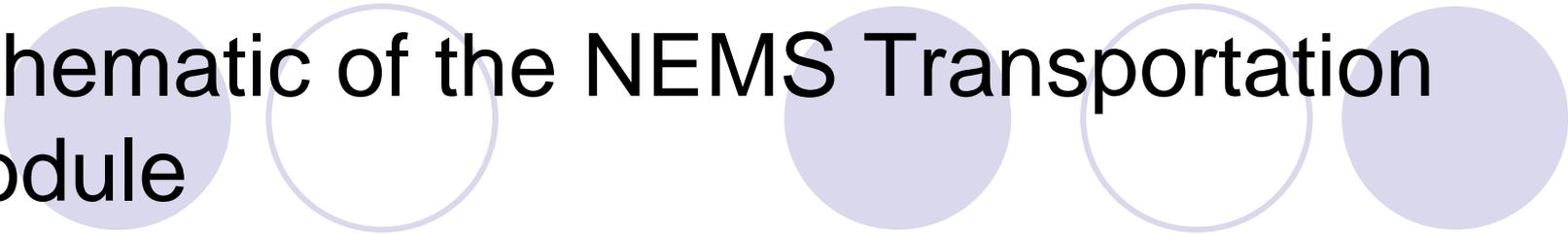
Why is BTEAMS Being Developed?

- **Measure Effects of Economy on Transportation System**
- **Measure National and Regional Effects of Transportation on Economy**
- **Development of Forecasts**

Potential Customers of the BTEAMS Model

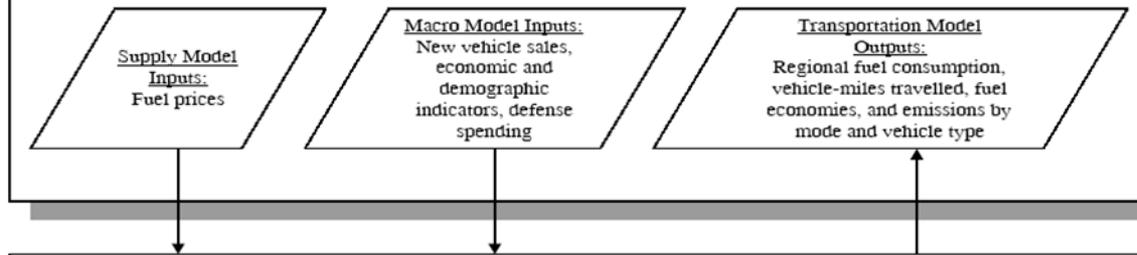
- **U.S. Department of Transportation modal administrations**
- **Other agencies within the Federal government, e.g., EPA, U.S. Department of Energy**
- **Various Congressional committees**
- **State Departments of Transportation**
- **State Revenue and Tax Authorities**
- **Specialized groups, e.g., American Association of State Highway and Transportation Officials (ASHTO) and others related groups**

Schematic of the NEMS Transportation Module

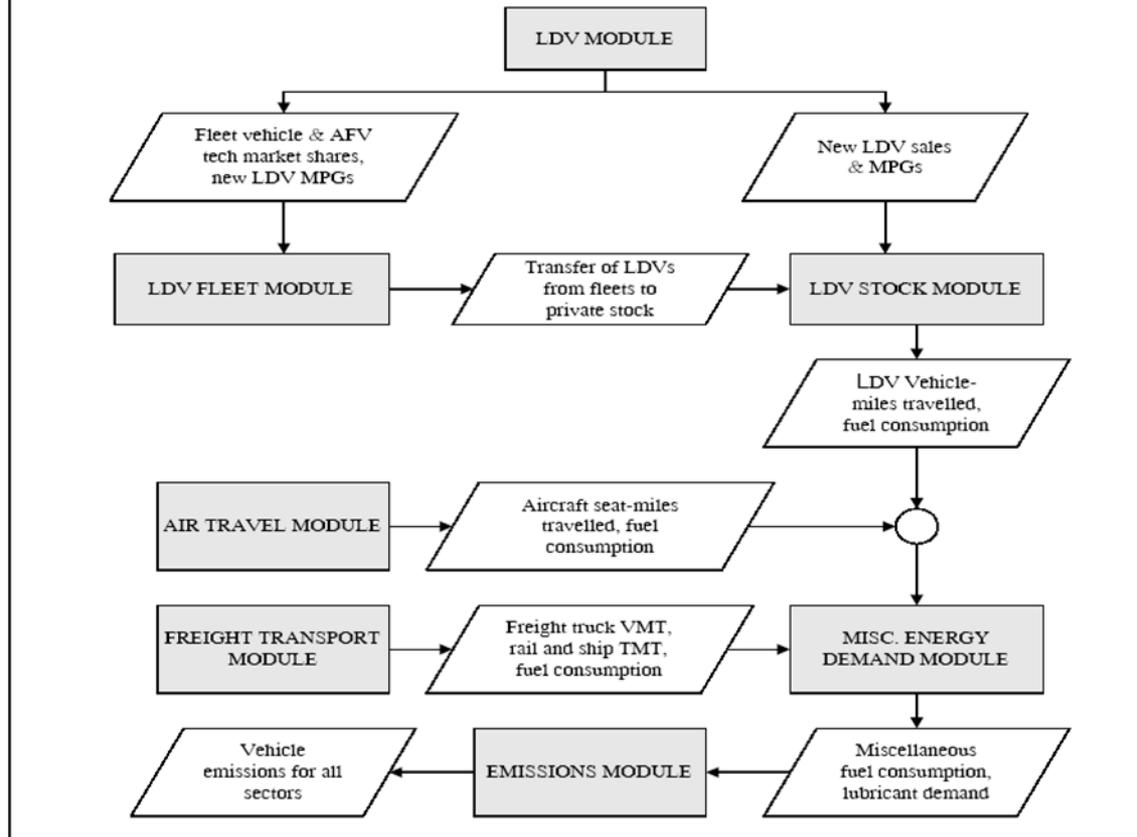


See the next slide for the schematic of the NEMS Transportation Module.

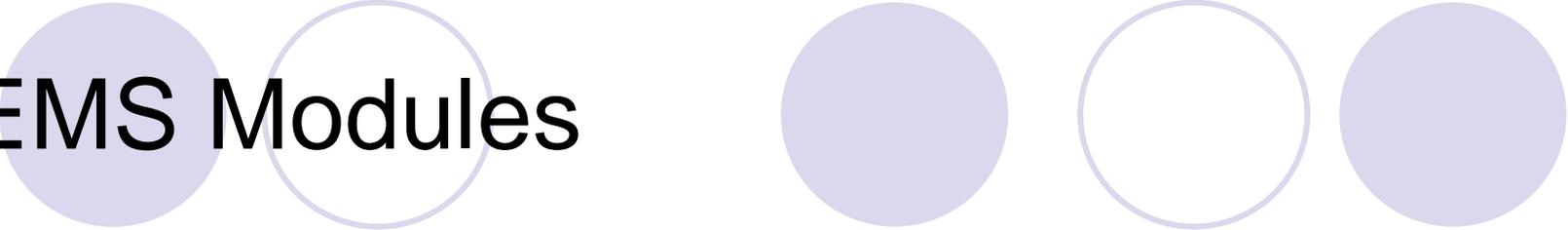
NATIONAL ENERGY MODELING SYSTEM



NEMS TRANSPORTATION MODEL



NEMS Modules



NEMS Supply Modules

- **Crude Oil Supply (R&D, exploration and drilling)**
- **Oil Refinery Module**
- **Oil Distribution Module**
- **Natural Gas Module (exploration, distribution)**
- **Electricity Model (Nuclear, Coal, Natural Gas, Residual Fuel, Small Generators like Wind and Solar)**
- **Coal Module**
- **Alternative-Fuels**

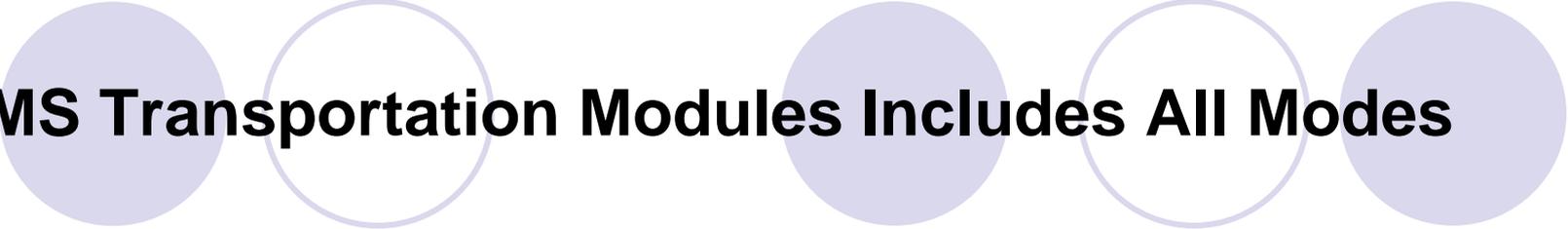
NEMS Demand and Other Modules

NEMS Demand Modules

- Residential
- Commercial
- Industrial
- Transportation

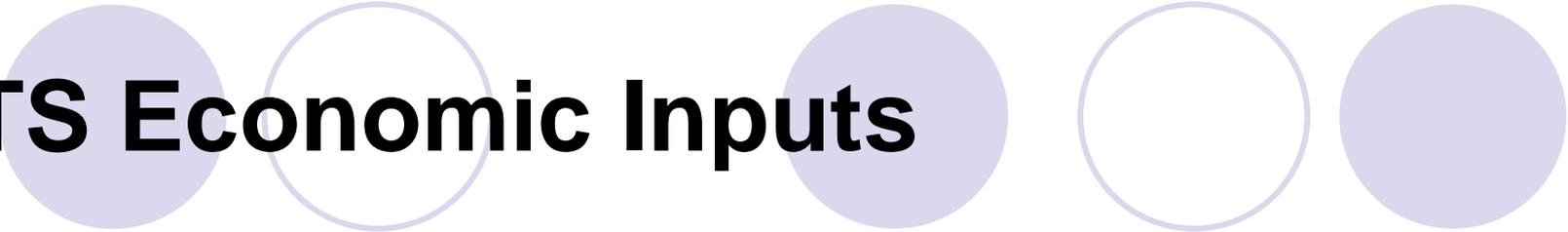
Macro-Economic Module (the Global Insight Model)

Integration Module



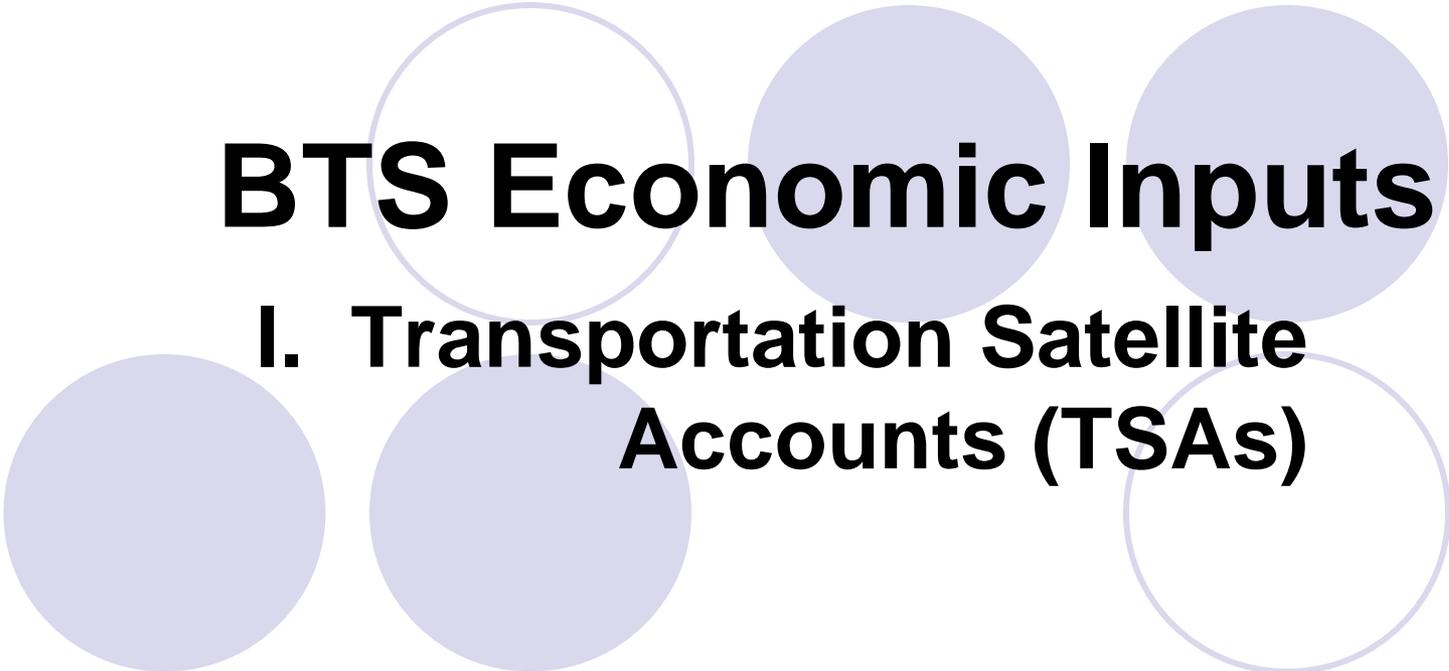
NEMS Transportation Modules Includes All Modes

- **Light-Duty Vehicle (LDV) Module (Cars, Light-trucks)**
- **Aviation Module (Wide and Narrow-Body, and General Aviation for passengers and freight)**
- **Freight Truck Module (medium and heavy-duty trucks for freight)**
- **Rail Module (passenger and freight)**
- **Waterborne module (passenger and freight)**
- **Miscellaneous module (Military, Mass Transit, Recreational Boats)**
- **Emissions Module**



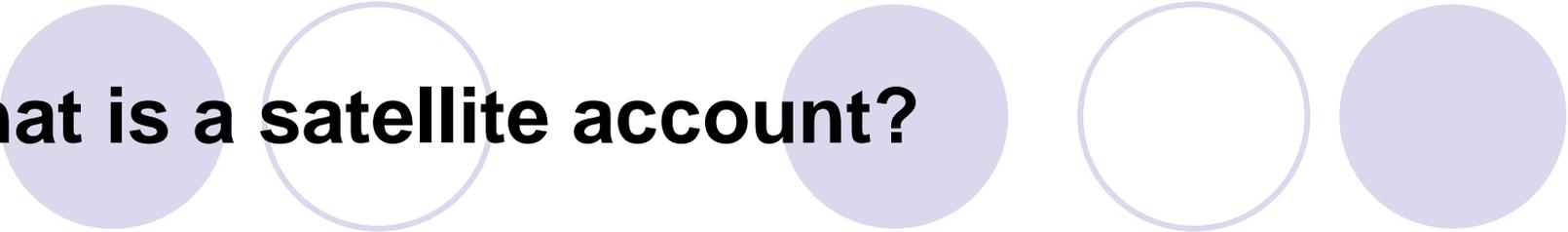
BTS Economic Inputs

- **Transportation Satellite Accounts (TSAs)**
- **Multifactor Productivity (MFP) Analysis**
- **Transportation Infrastructure Capital Stocks Accounts (TICSAs)**



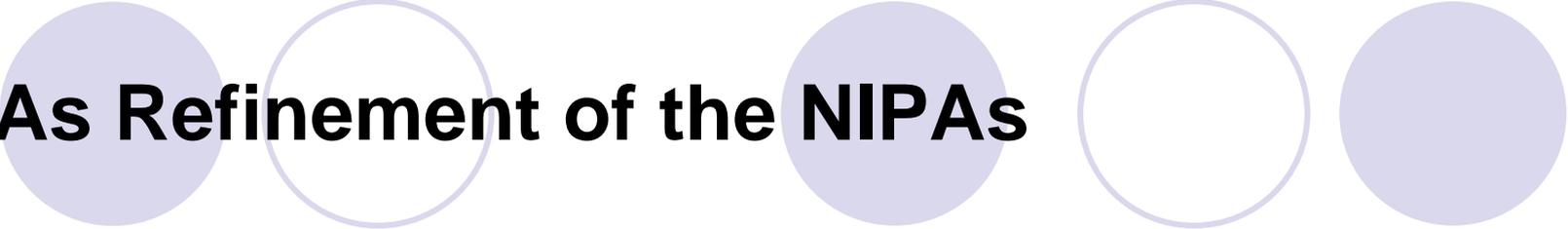
BTS Economic Inputs

I. Transportation Satellite Accounts (TSAs)



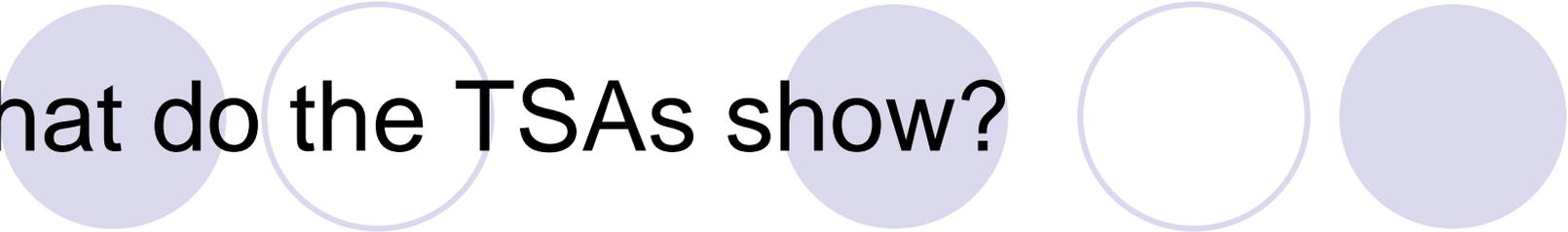
What is a satellite account?

- A framework designed to expand the analytical capacity of the national accounts
- Focuses on a particular area of inquiry such as transportation, education, tourism, health, and others
- Maintains the ties with the national accounts but there is reclassification and expanded production boundary.



TSA's Refinement of the NIPAs

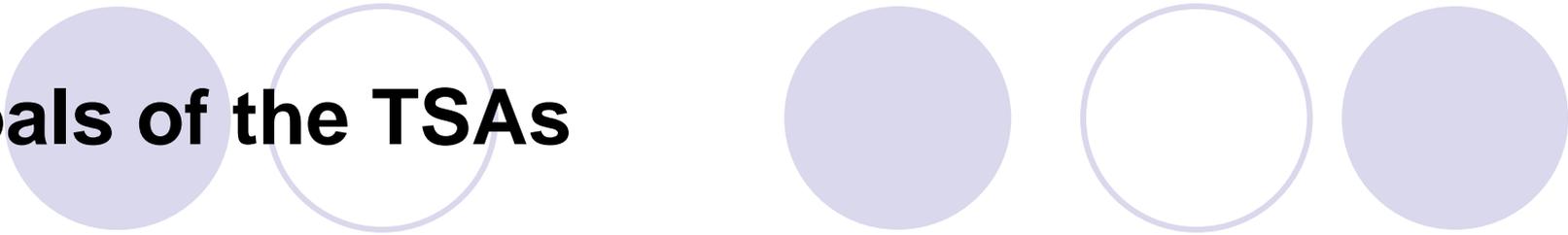
- **Underrepresentation: transportation services on a for-hire basis are identified in the national accounts. Own-hire transportation services are not revealed in the national accounts, e.g. Safeway trucks shipping products from their warehouses to their Safeway stores**
- **Lack of details: the general purpose of the national accounts, e.g., cannot analyze specific inquiries using the national accounts**



What do the TSAs show?

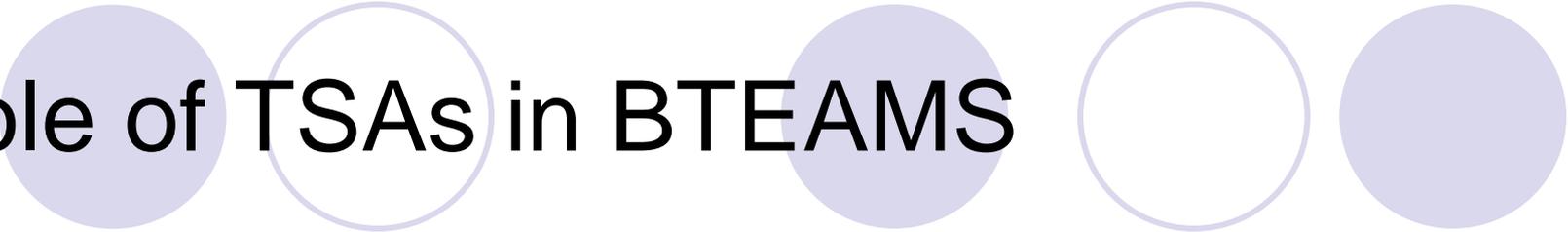
- Present estimates of for hire and in-house transportation on an industry-by-industry basis;
- Provides output measures of transportation
- Provides input structures to transportation.

Goals of the TSAs



- A more detailed representation of transportation in relation to the economy
- A unified data source for measuring transportation in relation to Gross Domestic Product (GDP)
- A data source that can be applied for analysis of various transportation issues.

Role of TSAs in BTEAMS



- The TSAs will be integrated into the BTEAMS to show the effects of various scenarios on the economy in more detail since TSAs provides information on industries, output levels, and final demand.



BTS Economic Inputs

II. Transportation Infrastructure Capital Stocks Accounts (TICSAs)

Purpose of the TICSAs:

- 1. TICSAs provide estimates of the stock value for all types of transportation infrastructure at a point in time.**
- 2. TICSAs data serve as input for estimating transportation infrastructure capital services.**
- 3. TICSAs can also show the condition of the infrastructure**

Methodology of the TICSAs

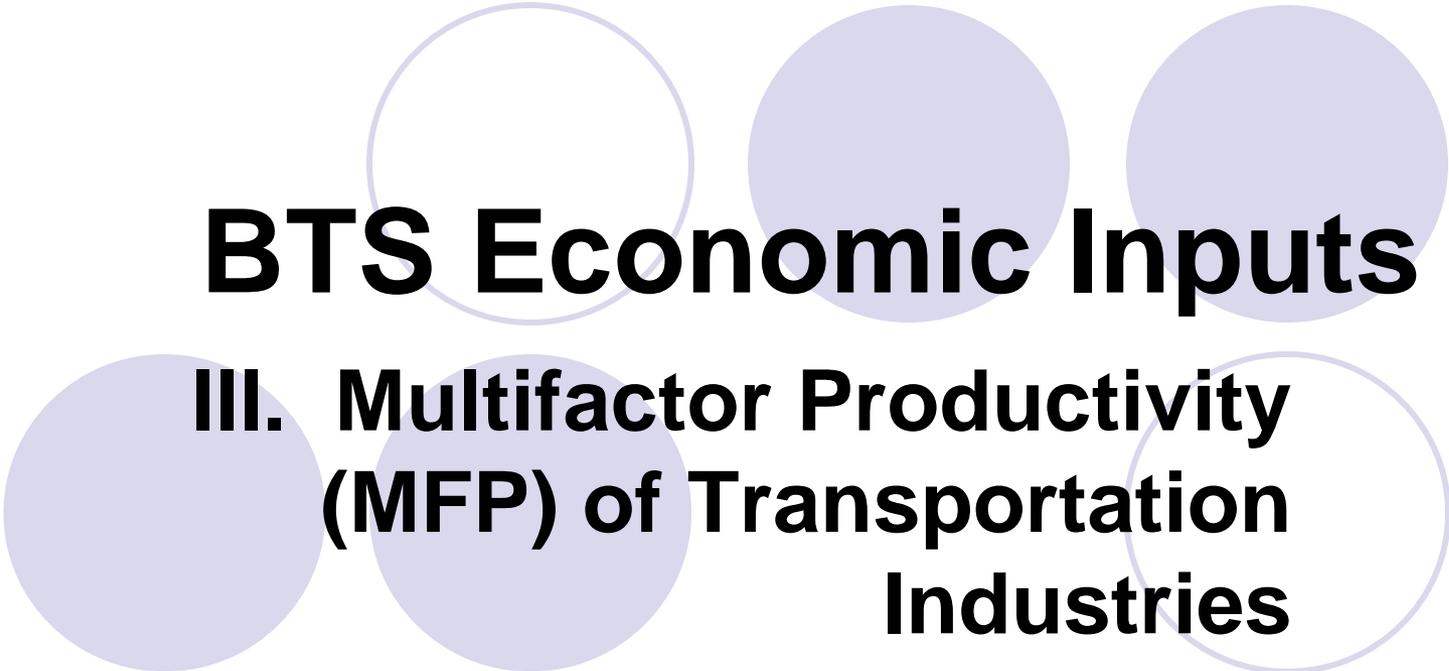
- 1. Long investment series with appropriate price deflator**
- 2. Asset's service life (how long an asset is in use?)**
- 3. Asset's depreciation pattern (what type of depreciation pattern is used?)
The geometric pattern is the distribution often used in capital stocks analyses.**

TICSAs being prepared for the following modes of transportation on a national level

- 1. Highways and streets***
- 2. Airports and airways***
- 3. Ports and waterways**
- 4. Public transit facilities**

Role of the TICSAs in BTEAMS

- TICSAs allow for the stock modeling of transportation infrastructure which measures the effects of infrastructure investments on the economy and the transportation system.
- Currently in the NEMS Module there are no infrastructure measures since direct data are not readily available.

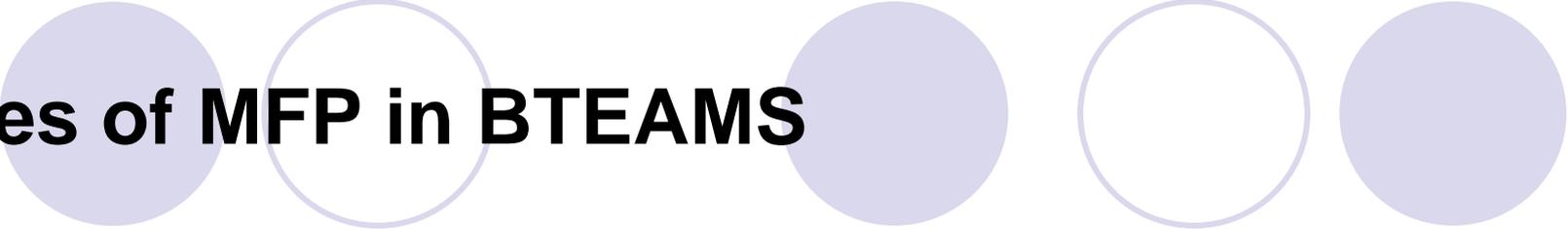


BTS Economic Inputs

III. Multifactor Productivity (MFP) of Transportation Industries

Multifactor Productivity Analysis

- MFP measures the changes in output per unit of combined inputs.
- The purpose is to estimate productivity in specific transportation modes
- Estimates will provide the changes in the value of labor, capital, and other inputs



Uses of MFP in BTEAMS

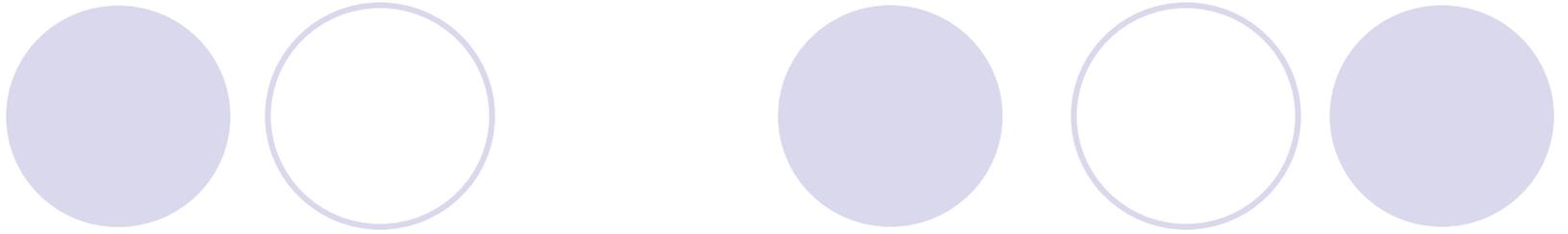
There are two possible roles of the MFP in the BTEAMS model:

Scenario 1: Forecasted MFP

ECON → TSAs → TICSAs → MFP'

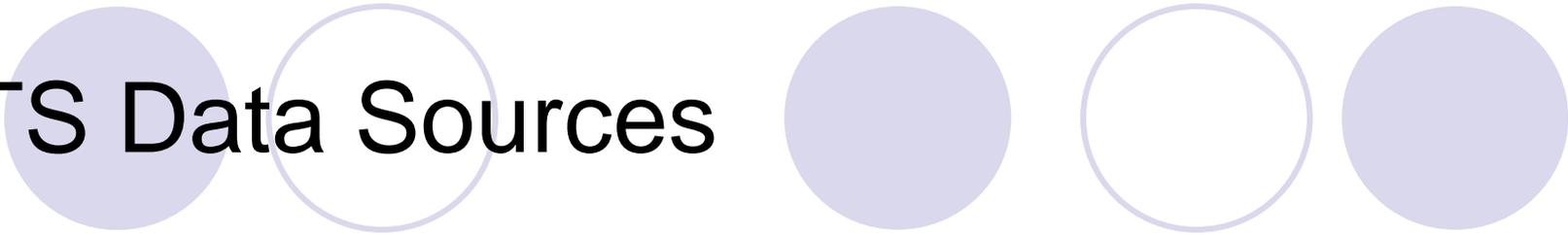
Scenario 2: Assumed MFP

ECON ← TSAs ← TICSAs ← MFP

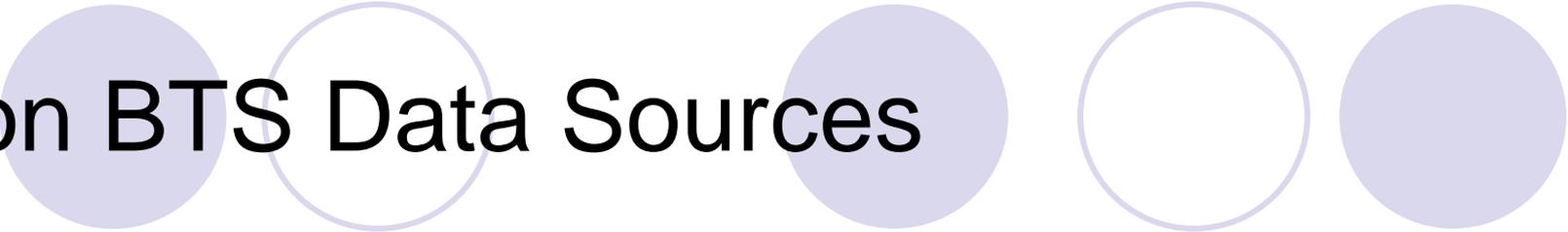


Other Data Inputs to the BTEAMS Model

BTS Data Sources



- Office of Airline Information (OAI) data
- Commodity Flow Survey (CFS)
- National Household Travel Survey (NHTS)
- National Transportation Statistics (NTS)

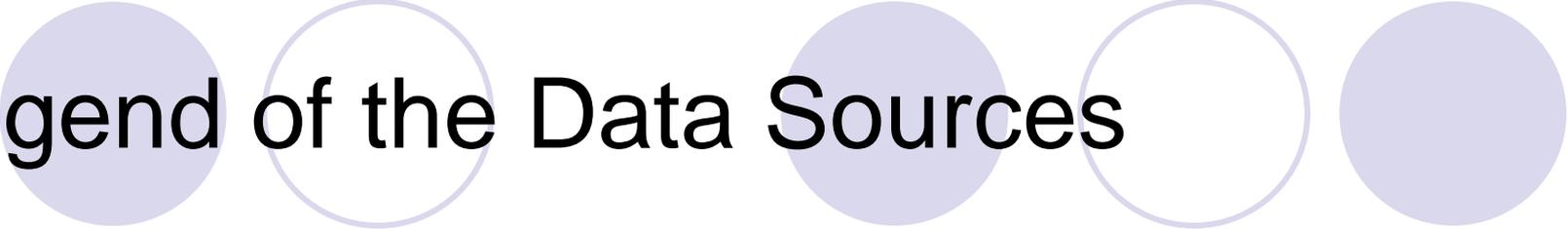


Non BTS Data Sources

- Vehicles Miles Traveled (VMT)- FHWA/Highway Statistics
- Vehicle Inventory and Use Survey- Census
- Transportation Energy Data Book- EIA
- Federal Railroad Administration
- Army Corps of Engineers
- Aviation Forecasts- FAA

Data Sources

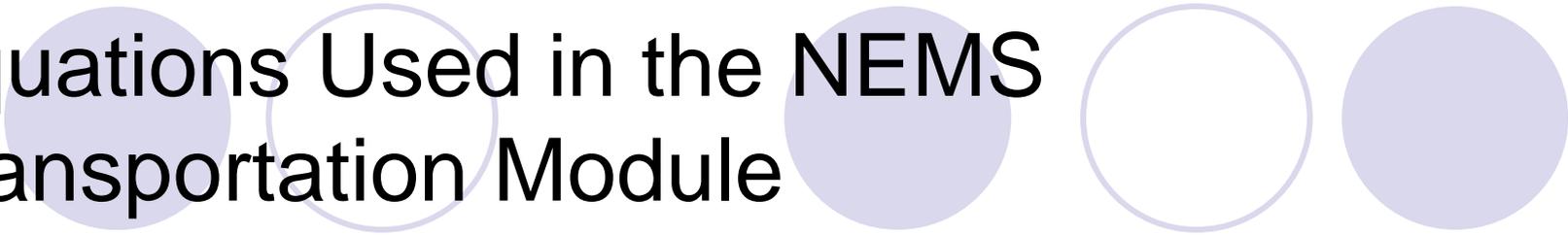
Mode	Stock	Travel	Efficiency	Size /Mix of Vehicle	Adv Tech	Passenger	Freight
LDV	HS/Polk	HS/NTSA	NHSTA/HS	NHTSA	Automotive News	NTS/TED	TED
Truck	VIUS/HS	HS	HS	HS	VIUS	----	VIUS/ CFS
Rail	----	AAR /TED/NTS	----	----	-----	NTS/TED	Waybill /BTS
Water	----	NTS/TED	NTS/ TED	----	-----	NTS/TED	Army Corps
Air	FAA/AF	BTS/OAI	BTS	BTS/ OAI/FAA	FAA	BTS/OAI	BTS/ OAI
Miscellaneous Modes of Transportation							
Transit	---	APTA/ TED	APTA/ TED	----	----	APTA/ TED	-----
RR	---			----	----		-----
Bus	---			-----	-----		-----



Legend of the Data Sources

- AAR= Association of American Railroads
- APTA=American Public Transit Association
- AF= Aviation Forecasts
- BTS/OAI= BTS Office of Airline Information data
- CFS=Commodity Flow Survey
- FAA= Federal Aviation Administration
- HS= Highway Statistics
- NTS= National Transportation Statistics
- TED= Transportation Energy Data

Equations Used in the NEMS Transportation Module



- A matrix showing the equations will be presented in the next slide.

Module Characteristics							
Mode	Stock	Travel	Efficiency	Size /Mix of Vehicle	Adv Tech	Passenger	Freight
LDV	X	X	X	X	X	X	X
Truck	X	X	X	X	X	X	X
Rail (Freight)		X	X			X	X
Water		X	X			X	X
Air	X	X	X	X	X	X	X
Miscellaneous Modes							
Transit		X	X			X	
Rail			X				
Bus		X	X			X	

Travel Equation for LDV

Travel Equation:

$$VMT = f\left(\frac{P_g}{MPG}, \frac{Y}{C}, POP16, DAF, \frac{Male}{Female}\right)$$

Size Mix Equation for LDV

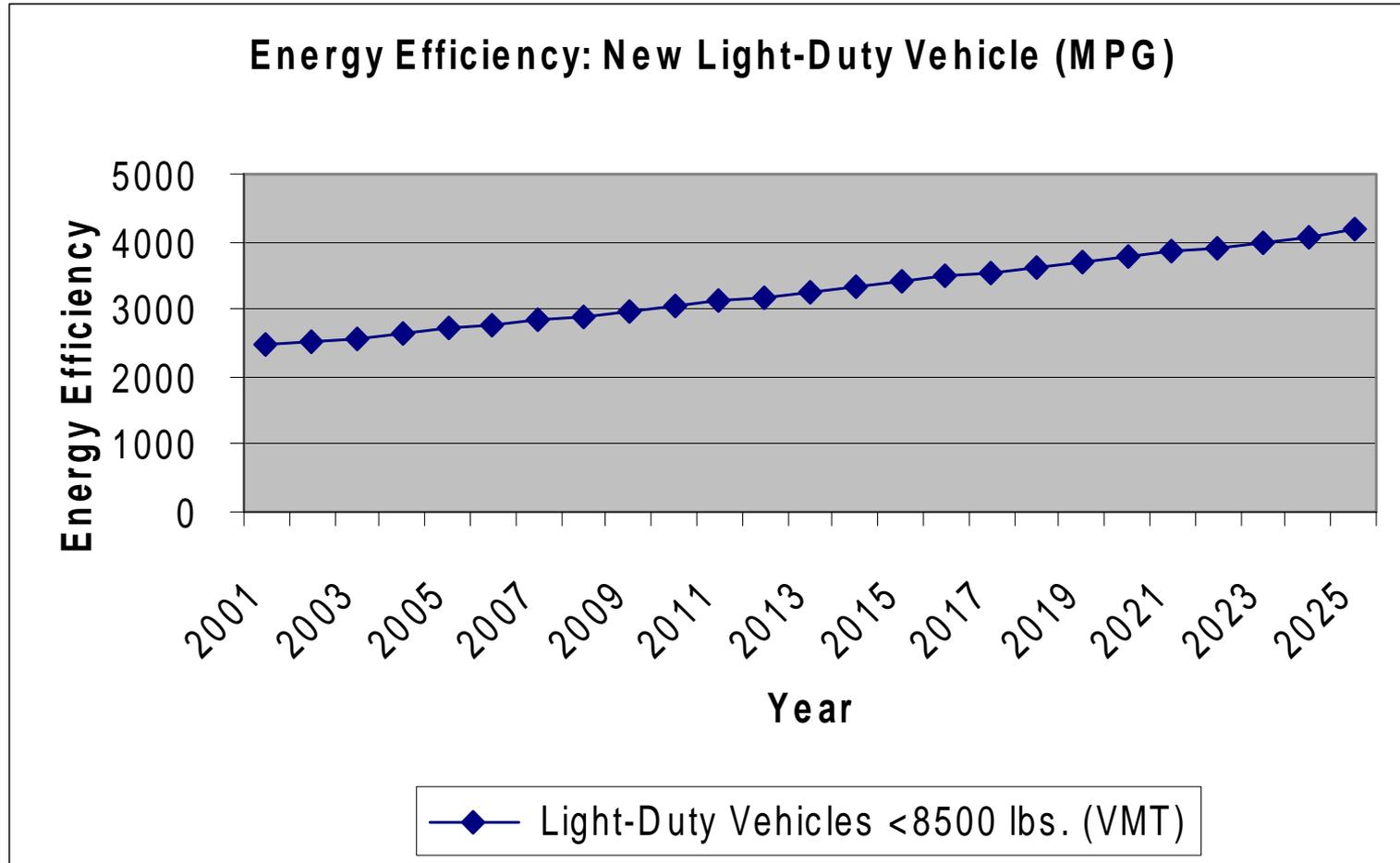
Size Mix Equation

$$Size / Mix = f\left(P_g, \frac{Y}{C}, VP\right)$$

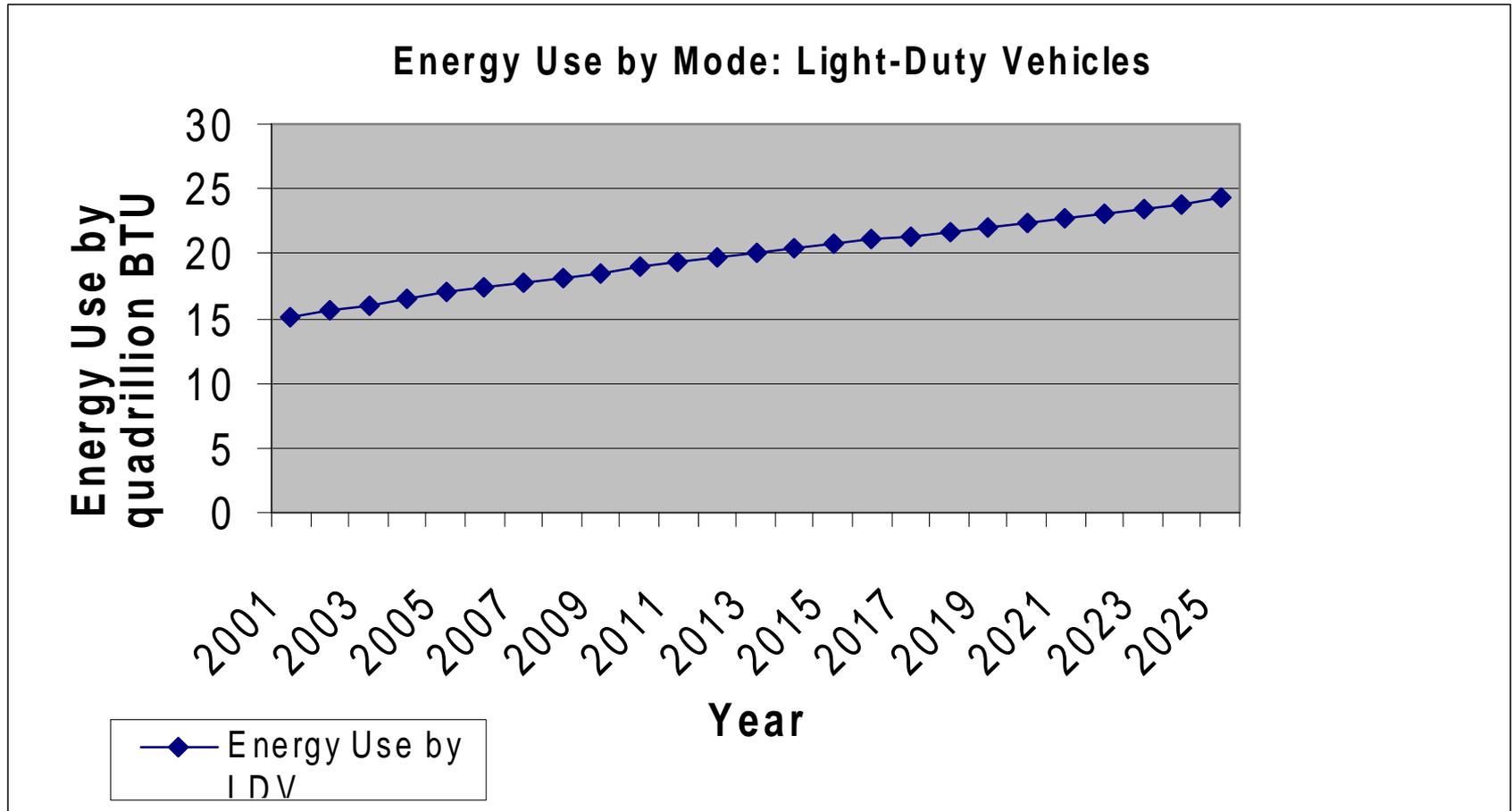
Sales of Alternative Fuel Vehicles for LDV

$$Sales = f\left(\frac{HP}{WT}, VP, MPG, R, Fuel\right)$$

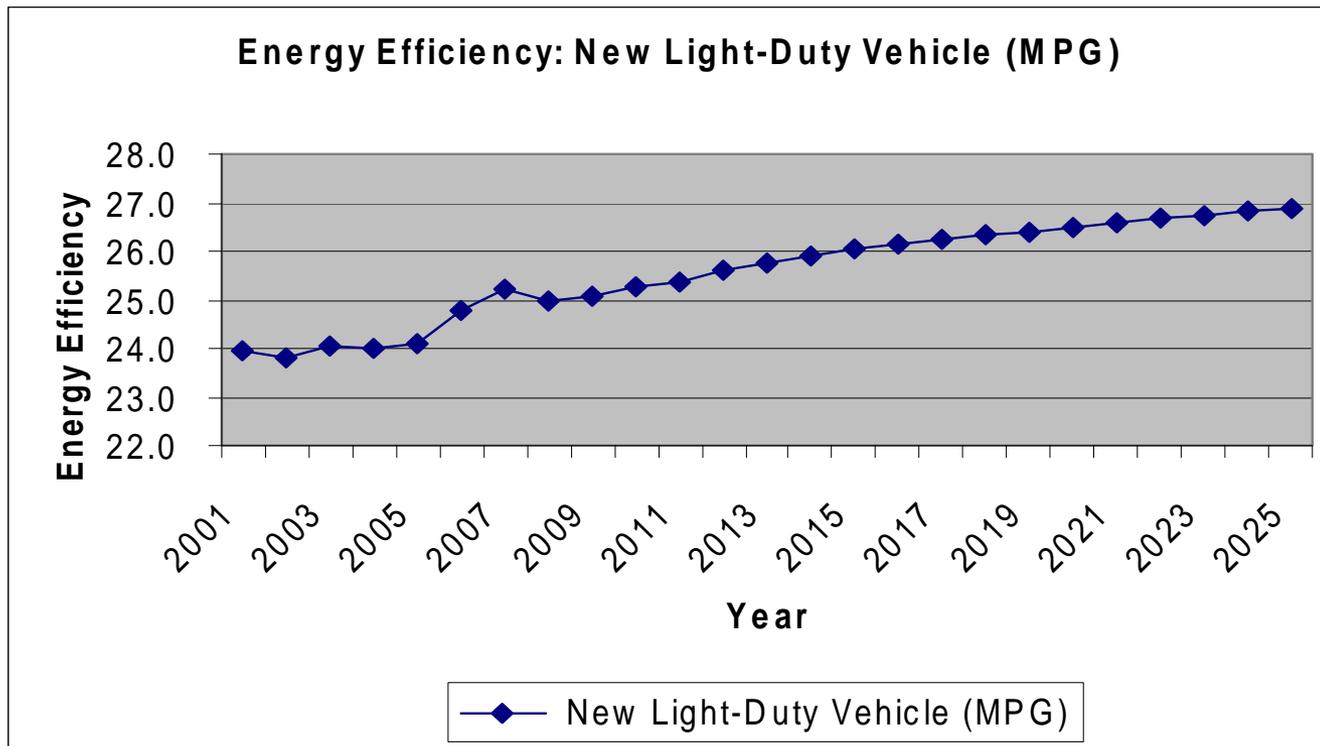
VMT for Light Duty Vehicles

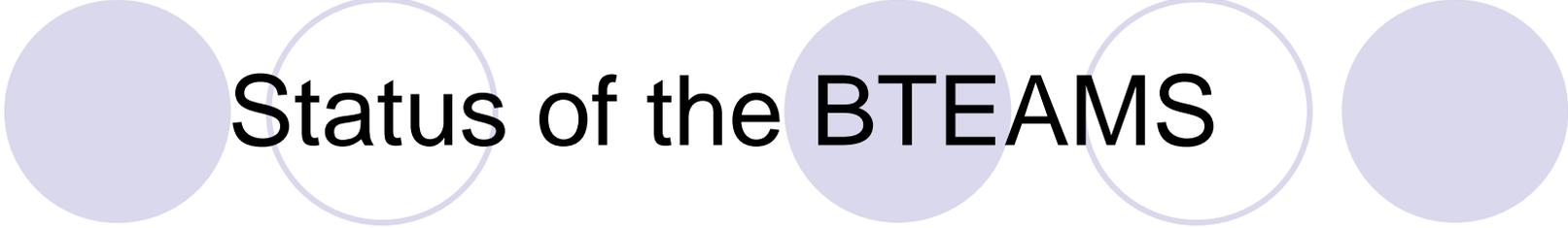


Energy Use: LDV



Energy Efficiency: New Light Duty Vehicles (MPG)





Status of the BTEAMS

- The previous version of NEMS is already in operation and BTS just acquired the latest version of NEMS.
- Preliminary estimates for the 1997 TSAs has been completed and the migration of the current TSA system to a new one is being developed
- Preliminary TICSA estimates for highway estimates and airport/airways. Other modes of transportation are in the process of being prepared.