

Revenue Recovery Assessment Framework & Tool

Version 1 | January 2025



BUILD AMERICA CENTER

**INNOVATIVE FINANCING AND DELIVERY
OF TRANSPORTATION INFRASTRUCTURE**



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OF TRANSPORTATION INFRASTRUCTURE



User Manual

REVENUE RECOVERY ASSESSMENT
FRAMEWORK & TOOL

RRAFT v1.2024

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1. Introduction

This guide provides step-by-step instructions for using the Revenue Recovery Assessment Tool (RRAFT) v1.2024 developed by Build America Center and Purdue University.

1.1. About the Tool

RRAFT is an excel-based tool developed to assist state transportation agencies in estimating and planning for the future impacts of Electric Vehicle (EV) and Hybrid Electric Vehicle (HEV) adoption on highway revenues. RRAFT was designed as part of the research initiative carried out by Purdue University and the Build America Center, sponsored by the Federal Highway Administration (FHWA). RRAFT, developed using Microsoft Excel with embedded interactive functionality, offers the following key features:

- **Forecasting revenue losses due to EV and HEV adoption**
Evaluates the decline in traditional fuel tax revenues driven by the transition to EVs and HEVs.
- **Engages alternative mechanisms for recouping lost revenue**
Utilizes strategies such as annual registration fees, vehicle miles traveled (VMT) fees, and electricity excise taxes to recover revenue lost due to EV and HEV adoption.
- **Modeling growth scenarios**
Analyzes the impacts of different growth rates for EVs and HEVs on state revenue systems.
- **Customizable state-specific analysis**
Incorporates data models for all 50 states and D.C., enabling state-specific insights based on unique vehicle and revenue characteristics.
- **Revenue allocation and fee impact analysis**
Calculates recovery fees and assesses their potential to close funding gaps.

RRAFT is designed to be user-friendly, allowing state agencies to quickly and interactively analyze the financial implications of shifting vehicle technologies and develop robust recovery strategies.

1.2. System Requirements

RRAFT works on Microsoft Excel for Office 365, version 2024. The tool also works on older versions of Excel; however, the interface could be different for certain commands.

1.3. How to use the tool

To begin using the RRAFT tool, simply download the Excel document to your local device. Once downloaded, you can navigate through the various sheets within the workbook to access specific functionalities, such as inputting data, viewing revenue projections, and analyzing recovery strategies. Each sheet is clearly labeled to guide users in selecting the appropriate section for their analysis. When finished, the document can be saved locally to preserve any modifications or insights. The tool consists of these seven sheets:

- Cover Page
- Introduction
- Input
- Revenue Output
- Fee Output
- Model
- All Data

2. Cover Page

The first interface that comes up when the user opens the excel sheet is the cover page presented in Figure 2.1. This page serves as the introductory interface for the tool, providing an overview of its purpose and functionality.



Figure 2.1: Cover Page

3. Introduction Sheet

It is recommended that first-time users begin by reviewing the **Introduction** sheet to familiarize themselves with the terminology and concepts used in the tool. The key details from this sheet are also outlined in the following section.

The Revenue Recovery Assessment Tool (RRAFT) is designed to evaluate the financial implications of Electric Vehicle (EV) and Hybrid Electric Vehicle (HEV) adoption across the United States, including all 50 states and the District of Columbia. The tool incorporates models that utilize historical data, such as average growth rates, and provides analysis across various vehicle classes, including Motorcycles (MC), Light Duty Vehicles (LDVs), Buses, and Trucks. By offering detailed insights, RRAFT supports state agencies in planning and developing effective strategies for future revenue recovery efforts.

User Inputs Required: (Select Sheet: INPUT)

- Select the desired State of interest to model.
- Select if the user wishes to change the default values of tax rates
- Select the desired vehicle class (MC, Buses, and Trucks) for EV & HEV growth.
- LDVs are enabled by default.
- Provide input for projected annual growth rates for EVs and HEVs for selected types.
- Provide input for Sunrise years for classes of vehicles for selected types.

Tool Outputs:

- SHEET - REVENUE MODEL: Revenue losses due to EVs and HEVs.
- SHEET - FEE MODEL: Projected recovery fees as these categories:
 - Annual Registration Fees
 - Mileage-Based User Fees (MBUF or VMT fees).
 - EV Charging electricity excise taxes.

Table 3.1 defines key terms used in the tool, including metrics like historical average growth rate, VMT split, and expected growth rate. It explains vehicle classifications (EVs, HEVs, and ICEVs) and revenue-related terms such as all-ICEV revenue, revenue loss due to EVs/HEVs, and realizable revenue. Additionally, it outlines recovery mechanisms like per-vehicle fees, VMT fees (cents/mile), and electricity excise fees (cents/kWh), which are used to recoup lost fuel tax revenues.

Table 3.1 Key Definitions

Light Duty Vehicle (LDV)	Category of vehicles that includes passenger cars, light trucks, vans, and sport utility vehicles as per FHWA classification.
Trucks	Heavy-duty vehicles used for transporting goods, including single-unit, 2-axle 6-tire, and combination trucks with one or more trailers.
Historical Average growth rate	The average annual increase in a specific metric over past years (2015-2022), measured as geometric mean.
VMT Split	The proportion of total Vehicle Miles Traveled (VMT) divided across different vehicle classes (LDVs, MCs, Buses & Trucks).
Sunrise Year	The year in which the market adoption of EVs or HEVs begins or is expected to begin significantly.
Expected growth rate	The projected annual percentage increase in the number of EVs or HEVs.
Vehicle class	A category of vehicles based on size, function, or weight, such as motorcycles, cars, buses, or trucks.
Electric Vehicle (EV)	A vehicle powered entirely by electricity, using batteries and electric motors instead of an internal combustion engine.
Hybrid Electric Vehicle (HEV)	A vehicle that combines an internal combustion engine with an electric motor, allowing for both fuel and electric propulsion.
Internal Combustion Engine Vehicle (ICEV)	A vehicle powered solely by an internal combustion engine, typically using gasoline or diesel fuel for propulsion.
All-ICEV Revenue	A revenue scenario that assumes all vehicles on the road are ICEVs, with no EVs & HEVs in use.
Revenue Loss due to EVs	The reduction in fuel tax revenues caused by the increased use of electric vehicles, which do not rely on gasoline.
Revenue Loss due to HEVs	The decrease in fuel tax revenues from the adoption of HEVs, which consume less fuel than traditional vehicles.
Realizable Revenue	The actual revenue that can be collected from EV fees or other mechanisms, after accounting for losses.
Recovery Fee (\$/veh)	The fee charged per vehicle to compensate for lost fuel tax revenues.
VMT Fee (cents/mile)	A charge based on the number of miles traveled by a vehicle, typically measured in cents per mile.
Electricity Excise Fee (cents/kwh)	A tax imposed on the electricity consumed by EVs for charging, typically measured in cents per kilowatt-hour.

4. Input Sheet

The **Input Sheet** is the only sheet in the tool where users are required to provide input data. It is divided into various sections, each catering to specific parameters necessary for generating accurate projections and analyses. These sections include:

1. **State Selection:** Allows users to select the state or region of interest.
2. **Tax Rates:** Enables users to modify default gasoline and special fuel tax rates.
3. **Vehicle Class Selection:** Provides options to choose the vehicle classes (e.g., LDVs, Motorcycles, Buses, Trucks) to include in the analysis.
4. **Growth Parameters:** Users input projected annual growth rates and sunrise years for EVs and HEVs for each vehicle class.

This sheet is essential for customizing the tool based on specific user scenarios and ensures that all relevant parameters are included in the analysis.

4.1. Legend Color Code

The Legend Color Code provides guidance on how to interact with the tool. Red cells indicate areas for user input, blue cells contain informational content that is not editable, and yellow cells represent default projections used in the tool. The Legend Color code is shown in Figure 4.1 below.

LEGEND COLOR CODE	
Input	This indicates cells for user input
	Information / not editable
	Default Projections

Figure 4.1 Legend Color Code

4.2. Input the State of Interest

To begin using the tool, select your State of Interest from the dropdown menu. Simply click the dropdown box, as shown in Figure 4.2 below, and choose the desired state or the District of Columbia. The selected state will be used to generate revenue projections and analyses specific to its data.

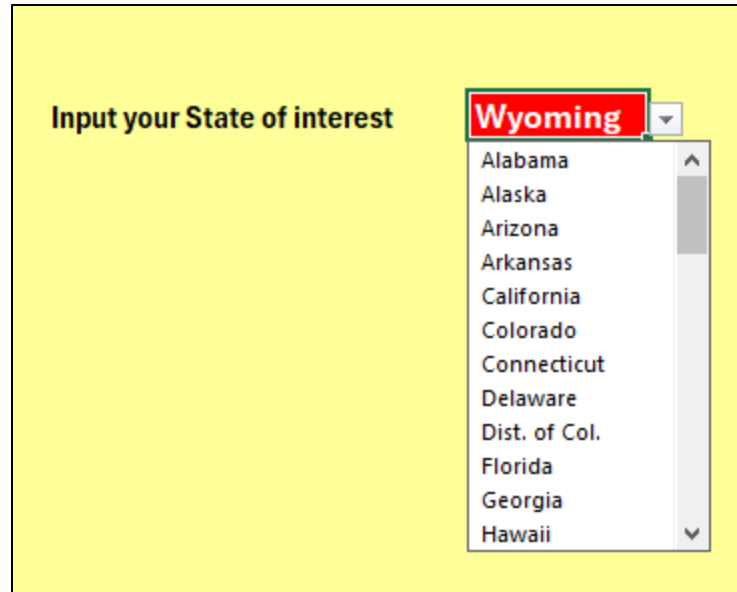


Figure 4.2 Dropdown Menu for Selecting the State of Interest

4.3. State Parameters

Once the state is selected, the state parameters section provides historical information about the selected state. It includes the Historical Average Growth Rates for Electric Vehicle (EV) Light Duty Vehicles (LDVs) and Hybrid Electric Vehicle (HEV) Light Duty Vehicles (LDVs) over the period of 2016-2022. These values are for informational purposes and help users understand past trends as a reference for future projections. A particular example is provided in Figure 4.3 below.

<u>State parameters (For info)</u>		Historical Avg. growth rate
EV LDVs		41.4%
HEV LDVs		11.5%

Figure 4.3 Summary of State Parameters

4.4. Modification of tax rates

Considering the critical role that tax rates play in influencing the model's outputs, the tool includes a provision for users to customize these values if needed. By default, the tax rates are pre-filled based on projections based on historical data; however, users have the flexibility to adjust these rates to align with specific scenarios or policy changes. The provision is given for both gasoline excise tax and special fuel tax rates.

1. **Gasoline Excise Tax Rate:**

- Default values are pre-filled for all years
- Users can update these values in the **Modified Values** column by enabling the input fields (red cells).

2. **Special Fuel Excise Tax Rate:**

- Similarly, default values are provided for all years, with changes reflected in the Modified Values section upon user input.

Instructions:

- If no changes are needed, leave the **FALSE** toggle (unticked value) as is, as shown in Figure 4.4.
- To modify tax rates:
 - Click on the toggle box (red cell) to enable input as in Figure below
 - Enter the desired tax rates in the respective fields under the **Modified Values** column as shown in Figure 4.5.

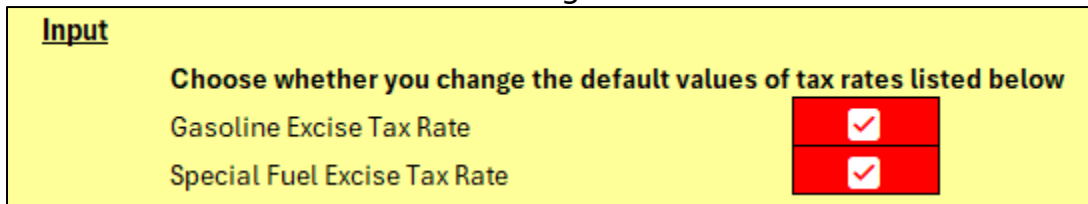


Figure 4.4 Option to modify tax rates as needed

These adjustments allow users to tailor projections based on specific tax policies or proposed changes in excise tax rates.

NOTE: For users with older versions of Excel, the toggle option might not be visible. In such cases, the values for the relevant fields will appear as TRUE or FALSE. Users can manually input the desired value (TRUE to enable or FALSE to disable) directly into the corresponding cell to adjust the settings as required. This ensures compatibility and functionality across different Excel versions.

Year	Default Values		Non Editable	Modified Values	
	Gasoline Excise Tax	Special Fuel Excise Tax		Modified Gasoline Excise Tax	Modified Special Fuel Excise Tax
2015	24	24	Non Editable	24	24
2016	24	24		24	24
2017	24	24		24	24
2018	24	24		24	24
2019	24	24		24	24
2020	24	24		24	24
2021	24	24		24	24
2022	24	24		24	24
2023	24	24			
2024	24	24			
2025	24	24			
2026	24	24			
2027	24	24			
2028	24	24			
2029	24	24			
2030	24	24			
2031	30	30			
2032	30	30			
2033	30	30			
2034	30	30			
2035	30	30			
2036	30	30			
2037	30	30			
2038	30	30			
2039	30	30			
2040	30	30			
2041	30	30			
2042	30	30			
2043	30	30			
2044	30	30			
2045	30	30			
2046	30	30			
2047	30	30			
2048	30	30			
2049	30	30			
2050	30	30			

Figure 4.5 Cells for entering modified tax rates

4.5. Vehicle Class Selection and Growth Rates

The tool allows users to select specific vehicle classes to model EV/HEV growth. By default, **Light Duty Vehicles (LDVs)** are always included in the analysis. Additional vehicle classes such as **Motorcycles**, **Buses**, and **Trucks** can also be enabled by selecting the red toggle boxes (Figure 4.6). Once the desired vehicle classes are selected, users need to provide specific inputs for EV and HEV growth projections:

The users are asked to enter the expected annual EV growth rate and the expected annual HEV growth rate. The values are restricted between 0% and 25%. For each of the selected vehicle class, the user is asked to provide the following inputs for modeling EV and HEV growth, as per the example provided in Figure 4.7 below:

- **EV Sunrise Year:** Enter the year when EV adoption is expected to begin.
- **Expected Annual EV Growth Rate:** Specify the projected annual growth rate for EVs (in percentage).
- **HEV Sunrise Year:** Enter the year when HEV adoption is expected to begin.
- **Expected Annual HEV Growth Rate:** Specify the projected annual growth rate for HEVs (in percentage).

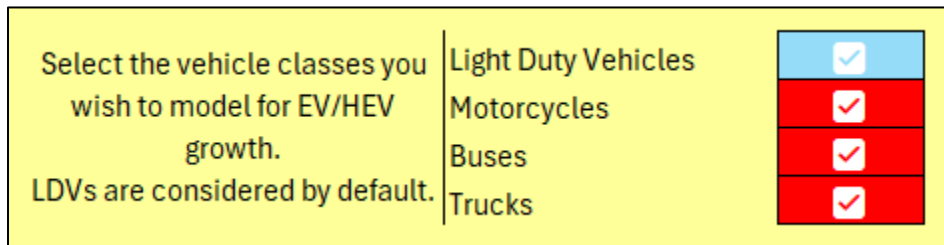


Figure 4.6 Option to select vehicle class as needed

NOTE: For users with older versions of Excel, the toggle option might not be visible. In such cases, the values for the relevant fields will appear as TRUE or FALSE. Users can manually input the desired value (TRUE to enable or FALSE to disable) directly into the corresponding cell to adjust the settings as required. This ensures compatibility and functionality across different Excel versions.

<u>CATEGORY : LIGHT DUTY VEHICLES</u>	
Input expected annual EV Growth Rate	15 %
Input expected annual HEV Growth Rate	10 %
<u>CATEGORY : MOTORCYCLES</u>	
Input the EV Sunrise year	2025
Input expected annual EV Growth Rate	15 %
Input the HEV Sunrise year	2025
Input expected annual HEV Growth Rate	5 %
<u>CATEGORY : BUSES</u>	
Input the EV Sunrise year	2025
Input expected annual EV Growth Rate	15 %
Input the HEV Sunrise year	2025
Input expected annual HEV Growth Rate	5 %
<u>CATEGORY : TRUCKS</u>	
Input the EV Sunrise year	2025
Input expected annual EV Growth Rate	15 %
Input the HEV Sunrise year	2025
Input expected annual HEV Growth Rate	5 %

Figure 4.7 Cells for entering sunrise year and growth rate

5. Revenue Output Sheet

The **Revenue Sheet** provides annual projections for the years 2023–2050, summarizing the revenue impacts of EV and HEV adoption across all vehicle classes. The output includes the following key metrics:

- All-ICEV Revenue:**
 The hypothetical fuel tax revenue assuming all vehicles are Internal Combustion Engine Vehicles (ICEVs), with no EVs or HEVs on the road. This value is calculated by projecting data using the geometric mean of reported values from 2015 to 2022.
- Projected Revenue Loss Due to EVs:**
 The estimated loss in fuel tax revenue caused by the adoption of Electric Vehicles (EVs).
- Projected Revenue Loss Due to HEVs:**
 The estimated loss in fuel tax revenue due to the adoption of Hybrid Electric Vehicles (HEVs), which consume less fuel than traditional ICEVs.
- Realizable Fuel Tax Revenue from ICEVs:**
 The actual revenue collected from ICEVs, after accounting for the shift of market share to EVs and HEVs.
- Realizable Fuel Tax Revenue from HEVs:**
 The revenue generated from HEVs, factoring in their reduced fuel consumption.
- % Difference (Loss in Fuel Tax Revenue from ICEVs):**
 The percentage decrease in fuel tax revenue collected from ICEVs due to the adoption of EVs and HEVs.

These metrics allow users to visualize and quantify the financial implications of EV and HEV adoption and to assess the magnitude of revenue loss and recovery opportunities. The visual chart example (Figure 5.1) and numerical values are presented (Figure 5.2).

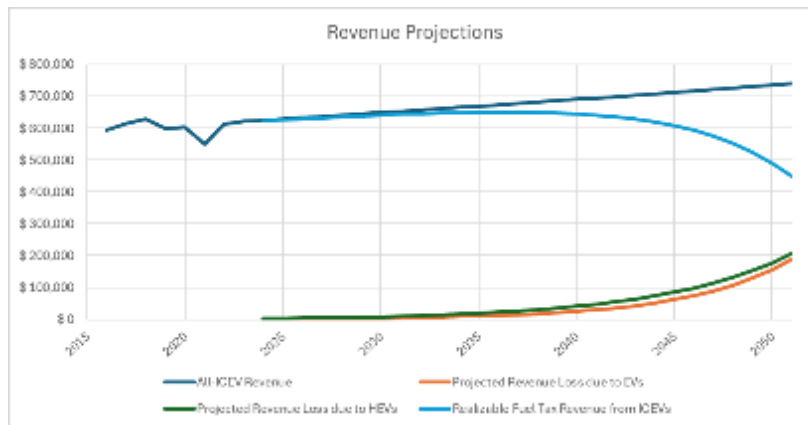


Figure 5.1 Chart showing revenue projections

State		Louisiana					
Revenue Summary (all vehicle classes combined) (in 1000's of Dollars)							
Year	All-ICEV Revenue	Projected Revenue Loss due to EVs	Projected Revenue Loss due to HEVs	Realizable Fuel Tax Revenue from ICEVs	Realizable Fuel Tax Revenue from HEVs	% Difference (Loss in FT Revenue from ICEVs)	
R	2015	\$ 594,767					
E	2016	\$ 616,107					
P	2017	\$ 628,690					
O	2018	\$ 597,779					
R	2019	\$ 604,167					
T	2020	\$ 549,390					
E	2021	\$ 612,213					
D	2022	\$ 621,273					
	2023	\$ 625,155	\$ 820	\$ 3,045	\$ 622,813	\$ 3,045	-0.4%
	2024	\$ 629,061	\$ 991	\$ 3,529	\$ 626,305	\$ 3,529	-0.4%
	2025	\$ 632,992	\$ 1,675	\$ 4,404	\$ 629,113	\$ 4,408	-0.6%
	2026	\$ 636,947	\$ 1,989	\$ 5,065	\$ 632,424	\$ 5,068	-0.7%
	2027	\$ 640,926	\$ 2,363	\$ 5,830	\$ 635,647	\$ 5,833	-0.8%
	2028	\$ 644,931	\$ 2,810	\$ 6,714	\$ 638,762	\$ 6,718	-1.0%
	2029	\$ 648,960	\$ 3,344	\$ 7,739	\$ 641,745	\$ 7,743	-1.1%
	2030	\$ 653,015	\$ 3,983	\$ 8,924	\$ 644,568	\$ 8,929	-1.3%
	2031	\$ 657,095	\$ 5,936	\$ 12,872	\$ 644,721	\$ 12,877	-1.9%
	2032	\$ 661,201	\$ 7,081	\$ 14,859	\$ 646,687	\$ 14,865	-2.2%
	2033	\$ 665,332	\$ 8,454	\$ 17,160	\$ 648,294	\$ 17,167	-2.6%
	2034	\$ 669,489	\$ 10,101	\$ 19,826	\$ 649,472	\$ 19,833	-3.0%
	2035	\$ 673,672	\$ 12,076	\$ 22,913	\$ 650,136	\$ 22,921	-3.5%
	2036	\$ 677,881	\$ 14,446	\$ 26,490	\$ 650,187	\$ 26,498	-4.1%
	2037	\$ 682,117	\$ 17,292	\$ 30,633	\$ 649,504	\$ 30,641	-4.8%
	2038	\$ 686,379	\$ 20,711	\$ 35,433	\$ 647,947	\$ 35,442	-5.6%
	2039	\$ 690,667	\$ 24,819	\$ 40,994	\$ 645,346	\$ 41,004	-6.6%
	2040	\$ 694,983	\$ 29,759	\$ 47,438	\$ 641,500	\$ 47,448	-7.7%
	2041	\$ 699,325	\$ 35,698	\$ 54,904	\$ 636,169	\$ 54,914	-9.0%
	2042	\$ 703,695	\$ 42,844	\$ 63,555	\$ 629,067	\$ 63,566	-10.6%
	2043	\$ 708,091	\$ 51,444	\$ 73,579	\$ 619,852	\$ 73,591	-12.5%
	2044	\$ 712,516	\$ 61,795	\$ 85,195	\$ 608,116	\$ 85,208	-14.7%
	2045	\$ 716,967	\$ 74,260	\$ 98,656	\$ 593,373	\$ 98,670	-17.2%
	2046	\$ 721,447	\$ 89,272	\$ 114,255	\$ 575,040	\$ 114,270	-20.3%
	2047	\$ 725,955	\$ 107,358	\$ 132,332	\$ 552,423	\$ 132,348	-23.9%
	2048	\$ 730,491	\$ 129,152	\$ 153,282	\$ 524,689	\$ 153,299	-28.2%
	2049	\$ 735,055	\$ 155,421	\$ 177,561	\$ 490,845	\$ 177,579	-33.2%
	2050	\$ 739,648	\$ 187,088	\$ 205,698	\$ 449,700	\$ 205,717	-39.2%

Figure 5.2 Example of revenue summary output

6. Fee Output Sheet

The **Fee Model** sheet calculates recovery fees for EVs and HEVs to offset revenue losses from reduced fuel tax collection. The outputs are presented across different vehicle classes and recovery mechanisms for the years modeled (2023–2050). The recovery fee model includes three key mechanisms to offset revenue losses:

1. **Annual Registration Fees:**
 - **EV Recovery Fee per Vehicle (\$/veh):** Calculated for Light Duty Vehicles (LDVs), Motorcycles (MCs), Buses, and Trucks.
 - **HEV Recovery Fee per Vehicle (\$/veh):** Calculated for LDVs, MCs, Buses, and Trucks.
2. **Mileage-Based User Fees (VMT Fees in Cents per Mile):**
 - **EV VMT Fees (cents/mile):** LDVs, MCs, Buses, and Trucks.
 - **HEV VMT Fees (cents/mile):** LDVs, MCs, Buses, and Trucks.
3. **Electricity Excise Fees (Cents per kWh):**
 - **EV Charging Fees (cents/kWh):** LDVs, MCs, Buses, and Trucks.

These recovery fee calculations enable users to evaluate and implement strategies to recover lost revenues due to EV and HEV adoption while maintaining fairness across different vehicle classes. The outputs are tailored to each vehicle type and revenue recovery mechanism, ensuring detailed financial projections and actionable insights. An example of the fee model with its partial output is shown in Figure 6.1.

	State		Louisiana									
	EV Recovery Fee / veh				HEV Recovery Fee (\$ / veh)				EV VMT			
	LDV EV Fee \$/veh	MC EV Fee \$/veh	Bus EV Fee \$/veh	Truck EV Fee \$/veh	LDV HEV Fee \$/veh	MC HEV Fee \$/veh	Bus HEV Fee \$/veh	Truck HEV Fee \$/veh	LDV EV fee cents/mile	MC E cents		
2015	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	¢ -	¢		
2016	\$ 107	\$ -	\$ -	\$ -	\$ 72	\$ -	\$ -	\$ -	¢ 0.91	¢		
2017	\$ 106	\$ -	\$ -	\$ -	\$ 71	\$ -	\$ -	\$ -	¢ 0.90	¢		
2018	\$ 108	\$ -	\$ -	\$ -	\$ 72	\$ -	\$ -	\$ -	¢ 0.89	¢		
2019	\$ 112	\$ -	\$ -	\$ -	\$ 75	\$ -	\$ -	\$ -	¢ 0.90	¢		
2020	\$ 105	\$ -	\$ -	\$ -	\$ 70	\$ -	\$ -	\$ -	¢ 0.89	¢		
2021	\$ 120	\$ -	\$ -	\$ -	\$ 80	\$ -	\$ -	\$ -	¢ 0.89	¢		
2022	\$ 115	\$ -	\$ -	\$ -	\$ 77	\$ -	\$ -	\$ -	¢ 0.88	¢		
2023	\$ 116	\$ -	\$ -	\$ -	\$ 77	\$ -	\$ -	\$ -	¢ 0.87	¢		
2024	\$ 117	\$ -	\$ -	\$ -	\$ 78	\$ -	\$ -	\$ -	¢ 0.86	¢		
2025	\$ 118	\$ 19	\$ 228	\$ 705	\$ 78	\$ 6	\$ 152	\$ 470	¢ 0.85	¢		
2026	\$ 119	\$ 19	\$ 227	\$ 690	\$ 79	\$ 6	\$ 151	\$ 460	¢ 0.84	¢		
2027	\$ 119	\$ 20	\$ 226	\$ 675	\$ 80	\$ 7	\$ 150	\$ 450	¢ 0.83	¢		
2028	\$ 120	\$ 20	\$ 225	\$ 660	\$ 80	\$ 7	\$ 150	\$ 440	¢ 0.83	¢		
2029	\$ 121	\$ 20	\$ 223	\$ 646	\$ 81	\$ 7	\$ 149	\$ 431	¢ 0.82	¢		
2030	\$ 122	\$ 20	\$ 222	\$ 632	\$ 82	\$ 7	\$ 148	\$ 422	¢ 0.81	¢		
2031	\$ 154	\$ 26	\$ 276	\$ 774	\$ 103	\$ 9	\$ 184	\$ 516	¢ 1.00	¢		
2032	\$ 155	\$ 26	\$ 275	\$ 757	\$ 104	\$ 9	\$ 183	\$ 505	¢ 0.99	¢		
2033	\$ 157	\$ 27	\$ 273	\$ 741	\$ 104	\$ 9	\$ 182	\$ 494	¢ 0.98	¢		
2034	\$ 158	\$ 27	\$ 272	\$ 725	\$ 105	\$ 9	\$ 181	\$ 483	¢ 0.97	¢		
2035	\$ 159	\$ 27	\$ 270	\$ 709	\$ 106	\$ 9	\$ 180	\$ 473	¢ 0.96	¢		
2036	\$ 160	\$ 28	\$ 269	\$ 694	\$ 107	\$ 9	\$ 179	\$ 463	¢ 0.95	¢		
2037	\$ 162	\$ 28	\$ 268	\$ 679	\$ 108	\$ 9	\$ 178	\$ 453	¢ 0.94	¢		
2038	\$ 163	\$ 28	\$ 266	\$ 665	\$ 109	\$ 9	\$ 177	\$ 443	¢ 0.94	¢		
2039	\$ 164	\$ 29	\$ 265	\$ 650	\$ 109	\$ 10	\$ 177	\$ 433	¢ 0.93	¢		
2040	\$ 165	\$ 29	\$ 263	\$ 636	\$ 110	\$ 10	\$ 176	\$ 424	¢ 0.92	¢		
2041	\$ 167	\$ 29	\$ 262	\$ 623	\$ 111	\$ 10	\$ 175	\$ 415	¢ 0.91	¢		
2042	\$ 168	\$ 30	\$ 261	\$ 609	\$ 112	\$ 10	\$ 174	\$ 406	¢ 0.90	¢		
2043	\$ 169	\$ 30	\$ 259	\$ 596	\$ 113	\$ 10	\$ 173	\$ 397	¢ 0.89	¢		
2044	\$ 171	\$ 31	\$ 258	\$ 583	\$ 114	\$ 10	\$ 172	\$ 389	¢ 0.88	¢		
2045	\$ 172	\$ 31	\$ 257	\$ 571	\$ 115	\$ 10	\$ 171	\$ 381	¢ 0.87	¢		
2046	\$ 173	\$ 31	\$ 255	\$ 559	\$ 116	\$ 10	\$ 170	\$ 372	¢ 0.86	¢		

Figure 6.1 Example of fee model partial output

7. Model Sheet

The working model sheet provides a comprehensive breakdown of inputs, calculations, and outputs for assessing revenue recovery. Key inputs, such as gas and special fuel (SF) tax rates, Vehicle Miles Traveled (VMT), and vehicle registrations across categories (Motorcycles, LDVs, Buses, and Trucks), are sourced directly from the Data Sheet. The sheet also provides pre-calculated VMT splits (EV, HEV, ICEV) and associated VMT values for each vehicle class. Fuel efficiency metrics are modeled for ICEVs and HEVs, enabling revenue loss projections due to EVs and HEVs. Outputs include revenue loss per vehicle, realizable gas revenues, and contributions from HEVs. Fee structures are calculated in terms of annual vehicle fees, VMT fees (cents/mile), and electricity excise fees (cents/kWh) for LDVs, Motorcycles, Buses, and Trucks. The summary also highlights total revenue loss due to EV and HEV adoption, realizable revenue from ICEVs, and detailed EV charging fees across vehicle classes. This sheet is non-editable for users. An example of the working model with partial output is shown in Figure 7.1.

Color Legend		Description	2021	2022	2023	2024	2025
User Input		Gas Tax	20	20	20	20	20
Author Computations		SF Tax	20	20	20	20	20
Description		VMT	54,728	56,514	57,817	59,150	60,513
		Revenue ('000s)	612,213	621,273	625,155	629,061	632,992
Input State	Louisiana	Motorcycles	100,058	109,369	109,916	110,465	111,018
		LDV	3,472,899	3,690,488	3,708,940	3,727,485	3,746,123
		Buses	31,681	34,044	34,840	35,654	36,487
		Trucks	257,852	271,254	278,035	284,986	292,111
VMT Split	0.79%	Motorcycles	431	445	455	465	476
	85.52%	LDV	46,801	48,329	49,443	50,583	51,749
	0.52%	Buses	283	292	299	306	313
	13.18%	Trucks	7,213	7,449	7,620	7,796	7,976
		Avg VMT					
		Motorcycles	4,303	4,065	4,138	4,212	4,288
		LDV	13,476	13,096	13,331	13,570	13,814
		Buses	8,925	8,577	8,574	8,572	8,569
		Trucks	27,974	27,460	27,408	27,355	27,304
		LDV Split					
		EV	3,200	5,900	7,080	8,496	10,195
		HEV	28,000	34,300	39,445	45,362	52,166
		ICEV	3,441,699	3,650,288	3,662,415	3,673,627	3,683,761
		LDV VMT					
		EV VMT	43	77	94	115	141
		HEV VMT	377	449	526	616	721
		ICEV VMT	46,381	47,802	48,823	49,852	50,888
Start Year	GR	MC Split					
2025	15%	EV	0	0	0	0	500
2025	5%	HEV	0	0	0	0	500
		ICEV	100,058	109,369	109,916	110,465	111,018

Figure 7.1 Example of working model partial output

8. All Data Sheet

The **All Data** sheet is a non-editable compilation of comprehensive datasets for all U.S. states and the District of Columbia. It includes both publicly reported data and author-computed projections. Key information comprises the number of vehicle registrations for Motorcycles, Light Duty Vehicles (LDVs), Buses, and Trucks, as well as values for gas tax and special fuel tax (SFT). Annual Vehicle Miles Traveled (VMT), gas revenue, and the number of LDV EVs and HEVs are also provided. Additionally, the sheet calculates the number of ICEVs as the difference between total LDVs and the combined count of LDV-EVs and LDV-HEVs. The datasheet also includes VMT distribution across the four vehicle categories for each state and provides projections for fuel efficiency. This dataset serves as a foundational resource for detailed analysis and modeling.

	2021	2022	2023	2024	2025	2026	2027
LDV							
Alabama	5,078,806	5,115,767	5,141,346	5,167,053	5,192,888	5,218,852	5,244,816
Alaska	674,563	669,907	673,257	676,623	680,006	683,406	686,809
Arizona	5,658,994	5,726,890	5,827,713	5,930,312	6,034,716	6,140,958	6,249,957
Arkansas	2,644,077	2,634,898	2,652,444	2,670,107	2,687,888	2,705,788	2,723,688
California	28,660,439	28,505,884	28,714,491	28,924,625	29,136,296	29,349,516	29,564,336
Colorado	4,985,261	5,070,189	5,144,260	5,219,413	5,295,664	5,373,029	5,451,394
Connecticut	2,640,579	2,668,424	2,681,766	2,695,175	2,708,651	2,722,194	2,735,737
Delaware	747,575	759,354	763,150	766,966	770,801	774,655	778,509
Dist. of Col.	329,489	337,833	343,895	350,065	356,347	362,741	369,135
Florida	17,386,812	17,755,976	18,199,876	18,654,873	19,121,244	19,599,276	20,089,268
Georgia	8,147,475	8,181,115	8,279,930	8,379,938	8,481,155	8,583,594	8,687,288
Hawaii	1,180,574	1,174,346	1,180,218	1,186,119	1,192,050	1,198,010	1,204,000
Idaho	1,779,116	1,791,614	1,807,968	1,824,471	1,841,124	1,857,930	1,874,888
Illinois	9,724,286	9,450,871	9,498,126	9,545,616	9,593,345	9,641,311	9,689,322
Indiana	5,419,055	5,418,793	5,445,887	5,473,117	5,500,482	5,527,985	5,555,527
Iowa	3,290,002	3,273,399	3,289,766	3,306,215	3,322,746	3,339,359	3,356,025
Kansas	2,299,843	2,280,596	2,291,999	2,303,459	2,314,977	2,326,551	2,338,179
Kentucky	4,051,757	4,030,374	4,059,781	4,089,403	4,119,241	4,149,297	4,179,468
Louisiana	3,472,899	3,690,488	3,708,940	3,727,485	3,746,123	3,764,853	3,783,583
Maine	1,065,363	1,036,939	1,043,967	1,051,043	1,058,166	1,065,338	1,072,460
Maryland	4,218,845	4,224,334	4,284,912	4,346,359	4,408,687	4,471,908	4,536,029
Massachusetts	4,784,191	4,785,094	4,809,019	4,833,064	4,857,230	4,881,516	4,905,811
Michigan	8,190,565	8,190,899	8,260,611	8,330,916	8,401,819	8,473,325	8,545,431
Minnesota	4,902,363	4,954,307	4,983,822	5,013,514	5,043,382	5,073,429	5,103,566
Mississippi	1,955,450	1,894,619	1,904,092	1,913,613	1,923,181	1,932,797	1,942,413
Missouri	4,976,295	4,861,602	4,885,910	4,910,340	4,934,891	4,959,566	4,984,241

Figure 8.1 Example of partial data

9. Getting Help

If you encounter any issues while using the tool or have questions about its functionality, it is advised that users refer to the "Introduction" sheet for an overview of the tool's features, terminologies, and instructions. If additional support is needed, including the modification of any particular default values, you can contact the developers or the support team using the email addresses - bac@umd.edu, dbenny@purdue.edu or labi@purdue.edu.