Environmental Impacts of Rapid Electric Vehicle Adoption: A Comprehensive Energy Source Analysis

by
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Abstract

The world is at a turning point, with major environmental problems demanding immediate action and the rapid adoption of renewable energy. Electric vehicles (EVs) have emerged as a possible alternative to reduce carbon emissions and dependence on conventional internal combustion engines in the face of growing worries about climate change and diminishing fossil fuel supplies. However, the topic of whether or not the broad adoption of EVs is actually viable without a comparable increase in the utilization of renewable energy is increasingly disputed. This paper examines the many viewpoints on the complex interaction between EV uptake and renewable energy sources. The international push toward EVs as a tool to battle climate change and accomplish sustainability objectives has widespread support among governments, manufacturers, and consumers. The environmental effect of EVs, however, is very variable depending on factors such as the kind of power used for charging, the manner of production, the disposal process, and so on. While EVs have many advantages, their widespread use raises questions about the long-term viability of the world's present energy mix, which still mainly depends on non-renewable sources like coal and natural gas.

As the number of electric vehicles on the road increases, so does the need for power, making it more important than ever to build up renewable energy infrastructure at the same time. The increasing popularity of EVs provides a chance to stimulate investment in renewable energy projects, which in turn might spur innovation and lower the price of these projects. On the other hand, there are a few obstacles to overcome if widespread use of EVs occurs without concurrent growth in the use of renewable energy sources. First, if more people start using electric vehicles, the increased demand for energy to charge them might put a strain on power networks and increase the risk of supply problems and instability. The shift to EVs would be counterproductive if, to satisfy this increased demand, conventional power plants increased output, leading to an increase in greenhouse gas emissions. The environmental advantages of EV adoption may also be reduced if the majority of charging is done using power supplied from non-renewable sources. The long-term viability of the EV revolution is in doubt unless significant effort is made to expand the availability of renewable energy.

Using system dynamics modeling and model simplification techniques, new insights into the electric and non-electric passenger car markets in the United States have been gleaned in this thesis. The goal of this thesis paper is to convey these understandings to a readership that is familiar with or is not familiar with SD. In order to determine the variation in emission and adoption rates, the thesis paper looks at several policies. With the goal of illuminating the dynamics at play throughout the shift from a fleet composed mostly of internal combustion cars to a more varied vehicle fleet. Users may try out potential policies that might hasten the spread of electric vehicles and examine the effects of changing the underlying model assumptions using this analytical tool.

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Chapter 1. Introduction

1.1 Background

The adoption of electric vehicles (EVs) is questionable without an increase in the use of renewable energy. The International Energy Agency (IEA) has reported that 230 million EVs must be on the world's roadways by 2030 in order to achieve a trajectory consistent with the IEA Sustainable Development Scenario. In order for EVs to realize their maximum potential in combating climate change, the 2020s must be the decade of widespread proliferation of electric light-duty vehicles **[1]**. Nonetheless, even this transformative EV growth forecast falls far short of what is necessary to attain net zero emissions **[2]**.

Over fifty percent of EV100 members power all of their charging operations with renewable energy. There are still significant barriers to EV adoption. Members of EV100 identified the dearth of charging infrastructure as the most significant barrier (particularly in the United States and the United Kingdom) **[1]**. The broad adoption of EVs will increase U.S. power consumption by 40% by 2050, according to the U.S. Energy Department **[3]**. For EVs to reach their full potential in the fight against climate change, strategies to support their deployment are essential since word of mouth, vehicle longevity, and presumed emission rates can have a greater impact **[4]**.

1.2 Research Objective

The purpose of this thesis is to hypothesize, investigate, and elucidate the dynamic interactions that have been reflecting the carbon emission resulting from the accelerated adoption of EVs in the U.S. market. A further objective is to determine whether the accelerated adoption drive is sustainable for the environment in comparison to non-EVs. In addition, based on the evolution of adoption to this point, attempt to identify policies that have the potential to accelerate adoption in the coming years.

One method for investigating these study aims is to use simulation modeling to examine and evaluate structural features of the electric car industry in the United States. Simulation modeling has been effective in developing knowledge of complex systems where endogenous interactions and system evolution over time may not be clear. While simulation modeling might be valuable for experienced modelers, it is not always easy to understand for non-modelers. A third goal is to disseminate ideas from systems thinking and system dynamic modeling in a manner that is understandable to non-SD audiences.

1.3 Reference Mode

The forecasts in figures 1, 2, and 3 show the expected changes in the US electric car market in the next years, as well as the uncertainty associated with projecting the dynamics of such a complex structure.

These figures display yearly EV sales in the US, projected EV stocks, projected emission from EV fleet respectively, and represent reference modes for the study.

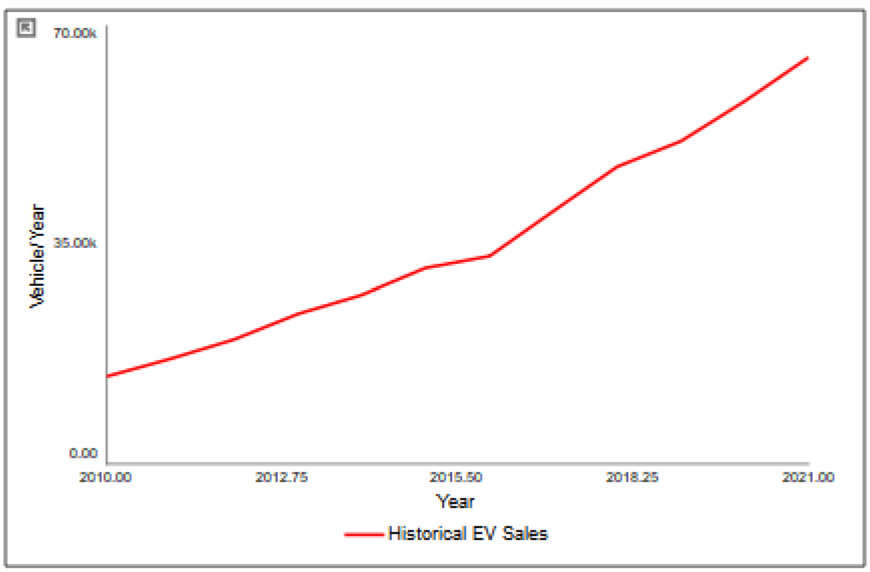


Figure 1: EV sales in the US (2010-2021)

Figure 1 presents yearly EV sales in the US, for the period 2010-2021: According to the data from International Energy Agency (IEA) **[1]**

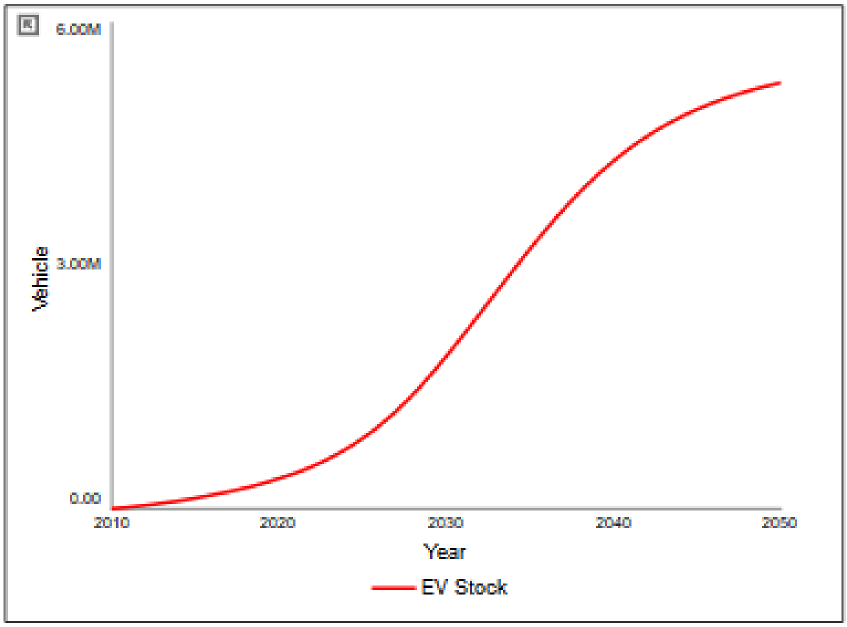


Figure 2: Projected EV stocks in the US states, (2010-2050)

Figure 2 presents projected EV stocks in the US states, for the period 2010-2050: According to the data from International Energy Agency (IEA) **[1]**

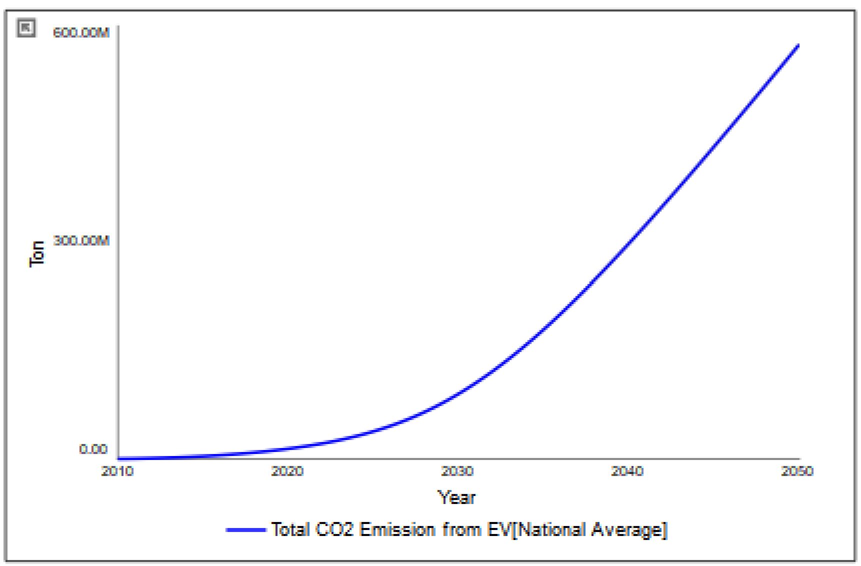


Figure 3: Projected emission from EV fleet in the US states, (2010-2050)

Figure 3 presents projected emission from EV fleet in the US states, for the period 2010-2050: Perceived according to the data from USA department of Energy **[39]** and International Energy Agency (IEA) **[1]** for national energy mix average for power generation and sales of EVs.

1.4 Research Questions

In order to accomplish the aforementioned goals, the following questions will be addressed in this research:

- Is the drive toward EV adoption equally environmentally beneficial for all US states, irrespective of their electrical sources?
- Without incorporating renewable energy sources, could the accelerated proliferation of electric vehicles exacerbate the emission problem?
- Which policies have the potential to maintain an acceptable level of emissions while accelerating adoption in the coming years?

Chapter 2. Methods

2.1 System Dynamics Approach

This thesis employs the system dynamics modeling methodology to obtain a deeper understanding of a complex, dynamic system. By integrating prior work, employing simulation modeling, and employing model simplification techniques, this study seeks to uncover valuable insights and contribute to the existing body of knowledge in the field.

The system dynamics modeling methodology utilized in this thesis provides a number of benefits for the study of complex dynamic systems. Computational modeling is used because it allows for interaction with a representation of the real-world processes that constitute the system under investigation. This method enables the investigation of interactions and feedback cycles within the system, casting light on how behavior emerges from these complex dynamics.

Adopting a system dynamics research strategy is consistent with the conceptual virtual laboratory framework proposed by Gooyert **[5]**. This framework emphasizes the significance of constructing a virtual environment that depicts the essential features and relationships of the real-world system and enables one to conduct experiments and observe the system's behavior under varying conditions. The thesis seeks to provide a deeper comprehension of the investigated system by employing this methodology.

This thesis integrates an exhaustive review of pertinent literature, building on prior work and existing theories. These foundational sources have been meticulously analyzed, updated, and incorporated in order to derive new insights and contribute to the existing body of knowledge. The synthesis of these concepts and theories allows for a more thorough comprehension of the complex system investigated.

Saysel and Barlas **[6]**-proposed techniques have been utilized throughout the modeling process to simplify the model. Model simplification is an essential stage in system dynamics modeling, as it serves to capture the essential dynamics of the system while maintaining a level of complexity that is manageable. These techniques ensure that the model is centered on the critical relationships and feedback cycles that drive the system's behavior, making analysis and interpretation of the results more accessible.

2.2 Prior Research

''Electric Vehicle Popularity in Norway" by V Orliuk and D Yermolova (2019) **[8],** ''The Diffusion of Alternative Fuel Vehicles: A Generalized Model and Future Research Agenda" by Keith et al. (2020) **[9],** and Brownstone et al.'s Joint Mixed Logit Models of stated and revealed preferences for alternative fuel vehicles 2000; **[10]** serve as the foundations of this model. This thesis research introduces a simpler alternative model through system dynamics modeling that makes exploration easier for those with less experience with such research frameworks. Multiple sources were used to obtain the most recent data, all of which are documented in the references section and the model documentation.

2.3 Model Assumptions

The following assumptions are made during model construction:

- To make the model realistic and easy to comprehend, this model implies that the driving population contemplates a Non-EV prior to being influenced to consider an EV by various factors.
- The supposition that there is complete knowledge of EV and Non-EV technology for the duration of the simulation.
- Without the battery, both EV and non-EV vehicles emit constant amounts of CO2.
- The main distinction between an EV and a non-EV is based on the battery and electricity production.
- Battery capacity wouldn't expand with time, and the cars' efficiency would remain constant.
- This model computes the Total Ownership Cost for non-EV and EV vehicles based on the average method described in the citations.
- Grouping together all of the ingredients needed to make batteries and without differentiating between them based on anything other than the CO2 released during their extraction.
- Infrastructure support systems for non-EVs are mature throughout the whole simulation period.

2.4 Model Settings

The model for the thesis has been developed using Stella Architect, Version 3.0. A time increment of 1/4 (or a quarter of a year) has been chosen for the simulation, allowing for a more detailed examination of the model's dynamics. Utilizing Euler's method of integration ensures an accurate numerical approximation of the system's behavior over time. This time step and integration method combination achieves a balance between computational efficiency and capturing the system's intricate dynamics.

The simulation period chosen, 2010-2050, represents a sufficiently extended time horizon for the purposes of this investigation. Beginning in 2010, the model captures the earliest phases of electric vehicle (EV) adoption in the United States, providing insights into the initial factors and dynamics that influenced this process. In addition, extending the simulation to 2050 allows for the examination of long-term trends and the possibility of significant shifts in EV adoption rates and associated dynamics.

To assure transparency and reproducibility, the model file has been appended to this dissertation, allowing readers to interact with the model. In addition, the model documentation adheres to recognized system dynamics modeling guidelines **[7].** This documentation provides a thorough explanation of the model's structure, equations, and parameter values, enabling readers to comprehend the model's underlying assumptions and mechanisms.

The complete model documentation is included in Appendix B of the thesis, serving as a valuable resource for those interested in researching or replicating the model. The thorough documentation increases the research's credibility and transparency, allowing others to evaluate and build upon the thesis's findings.

Chapter 3. Model Description

3.1 Model Overview – Causal Loop Diagram

The model hypothesizes:

- The majority of the CO2 emissions generated by the push for widespread EV adoption are attributable to the energy sources and the extraction of battery materials.
- The market share distribution between non-EVs and EVs is governed by the product of respective customer familiarity through advertisement and the overall impression of total cost, which varies with numerous variables like mining, subsidies, taxes and so on. so, the combined impact of familiarity and budget reflects customer preference for non-EV purchases, and EVs so influence market share distribution.

Figure 4 depicts a causal loop diagram (CLD) that outlines the simulation model's fundamental structure and demonstrates causal relationships. The CLD includes core model variables with arrows that show how the variables impact one another to form feedback loops - it focuses on feedback loops involving:

B1 - Cost Of EV

B2 - Non-EV Customers

B3 - Effect Of Mining On EV Production

B4 – Existing Non-EV Customers

B5 - EV Customers Among The Total Population

B6 – Mining

B7 – Conversion Of Customers From Non-EV To EV

B8 – Adoption Of EV

R1 – New EV Customers

R2 - Effect Of Raw Materials Demand On EV Production

R3 – Non-EV Customers Among The Total Population

R4 – Raw Material Discovery

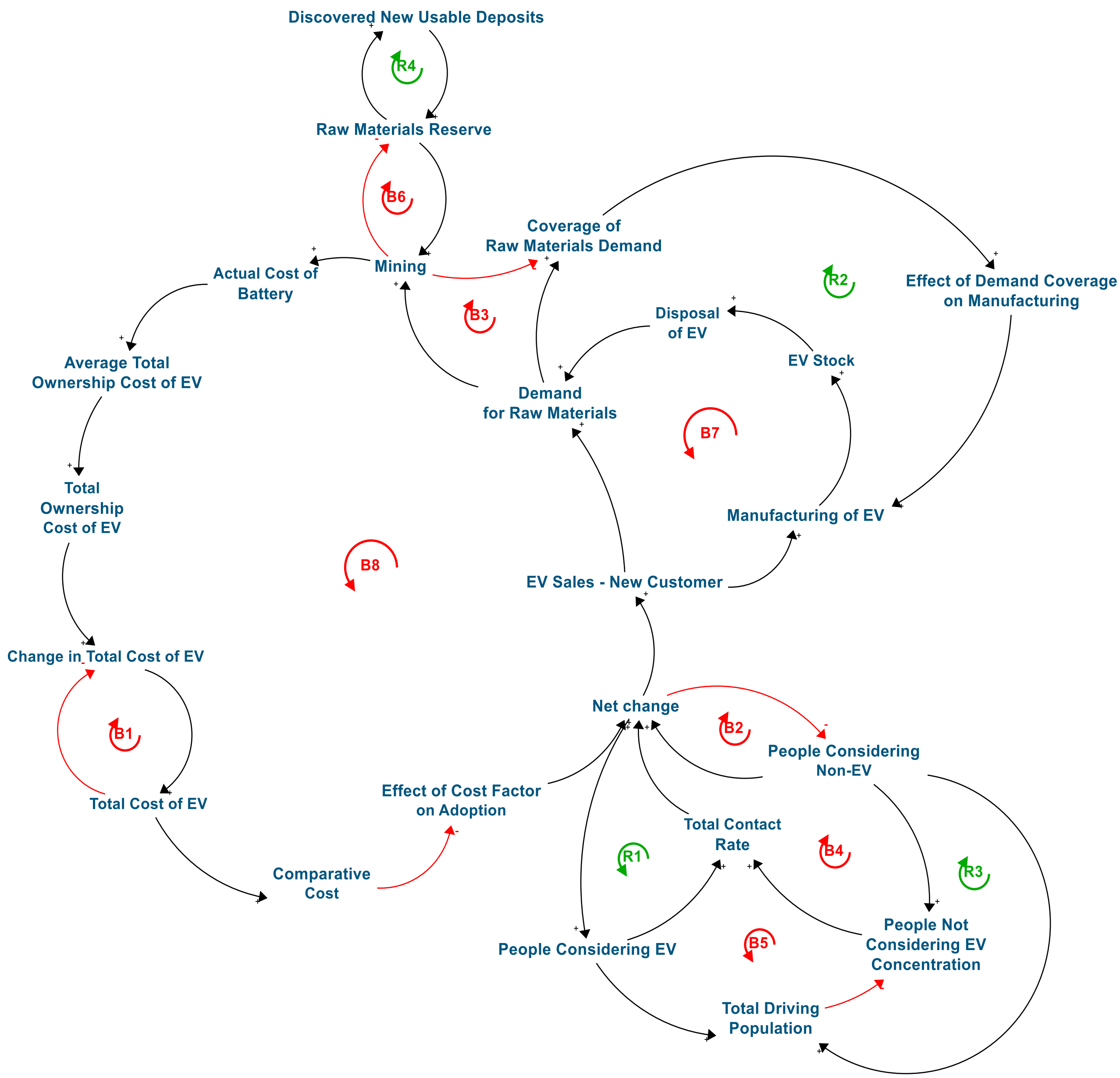


Figure 4: Causal Loop Diagram (CLD).

There are main and minor feedback loops within the system. This will be covered in the subsequent section:

In the **Cost Of EV** balancing feedback cycle, as soon as the public's perception of the cost of EV rises, the total cost decreases as a result of cost adjustments.

In the **Non-EV Customer** feedback loop, the non-EV customer base decreases as a result of advertising and contact rates. The more people leave non-EV vehicles, the more they are aware of the disadvantages of remaining in the non-EV customer base, thereby accelerating the rate of consumer loss.

In the **Effect Of Mining On EV Production** balancing feedback cycle, the demand for mineral resources for EV batteries grows as soon as the desire for EV manufacturing does. This circumstance increases the extraction of raw materials, reducing the demand for raw material coverage. In this manner, the effect of the production of new EVs on consumption is amplified.

In the **Existing Non-EV Customers** balancing feedback loop, as soon as the number of people converting to EVs decreases, the current clientele remains non-EV, and, as a result, the contact rate between people does not increase, preventing non-EV customers from being adopted into the EV customer base.

In the **EV Customers Among The Total Population** balancing feedback loop, the greater the proportion of the driving population that converts to EVs, the greater the contact rate, which in turn increases EV adoption. As a result of this circumstance, the number of individuals in the non-EV customer base begins to decline, resulting in an ever-decreasing number of individuals desiring to remain in the non-EV customer base.

In the **Mining** balancing feedback loop, increased extraction of raw materials from the battery depletes the existing reserve, necessitating the rapid extraction of additional raw materials to meet the anticipated demand for new electric vehicles.

In the **Conversion Of Customers From Non-EV To EV** balancing feedback loop, when people's perception of the total cost of EV rises, the effect of comparative cost on adoption decreases, leading to an increase in EV adoption. This new customer base's need for EVs increases the demand for EVs, leading to an increase in mining, which becomes more expensive as a result of diminishing reserves and superior technology costs. Consequently, the total cost is perceived as being higher.

In the **Adoption Of EV** balancing loop, EV sales to newly adopted consumers increase the demand for raw material extraction, leading to accelerated mining and higher battery and total vehicle costs, but a comparison to the prospective cost of non-EVs still encourages people to adopt EVs.

In the **New EV Customers** reinforcing loop, as more non-EV customers convert to EVs, the contact rate increases, which functions as free advertising and increases the rate of EV adoption.

In the **Effect Of Raw Materials Demand On EV Production** Reinforcing Loop, when the raw demand of new EV manufacturing increases and the old fleets of EV need to be replenished, more raw materials are required, which creates rapid mining, which creates the perception of greater raw materials coverage. This perception encourages increased manufacturing.

In the **Non-EV Customers Among The Total Population** reinforcing loop, whenever the non-EV customer base grows due to less information, less advertising, or any other technological disadvantage, new drivers from the total population add to the non-EV customer base. Which favors the non-EV contact rate and maintains a larger non-EV customer base.

In the **Raw Material Discovery** reinforcing loop, the discovery of additional raw material reserves heightens the perception of the total reserve. As long as the reserve of raw materials increases, people have faith that additional materials will be discovered, resulting in increased efforts to locate additional raw materials.

3.2 Model Overview

The model consists of a total of five sectors: EV Emission, Battery, Non-EV Emission, Energy Mix, and Non-EV to EV Conversion. The sections outline the key aspects of the model, some of which are discussed in further depth in the Model Calibration section that follows.

3.2.1 Non-EV to EV Conversion:

In this sector, EV adoption is estimated relative to non-EVs. Adoption occurs as a result of a change in the conversion rate's net value, which is primarily influenced by contact rate and advertising. According to the IEA, each state had an average of 400 EVs in 2010; however, the vast majority of the population utilized non-EV vehicles. According to the references specified in the model documentations, the proportion of the population that drives is considered.

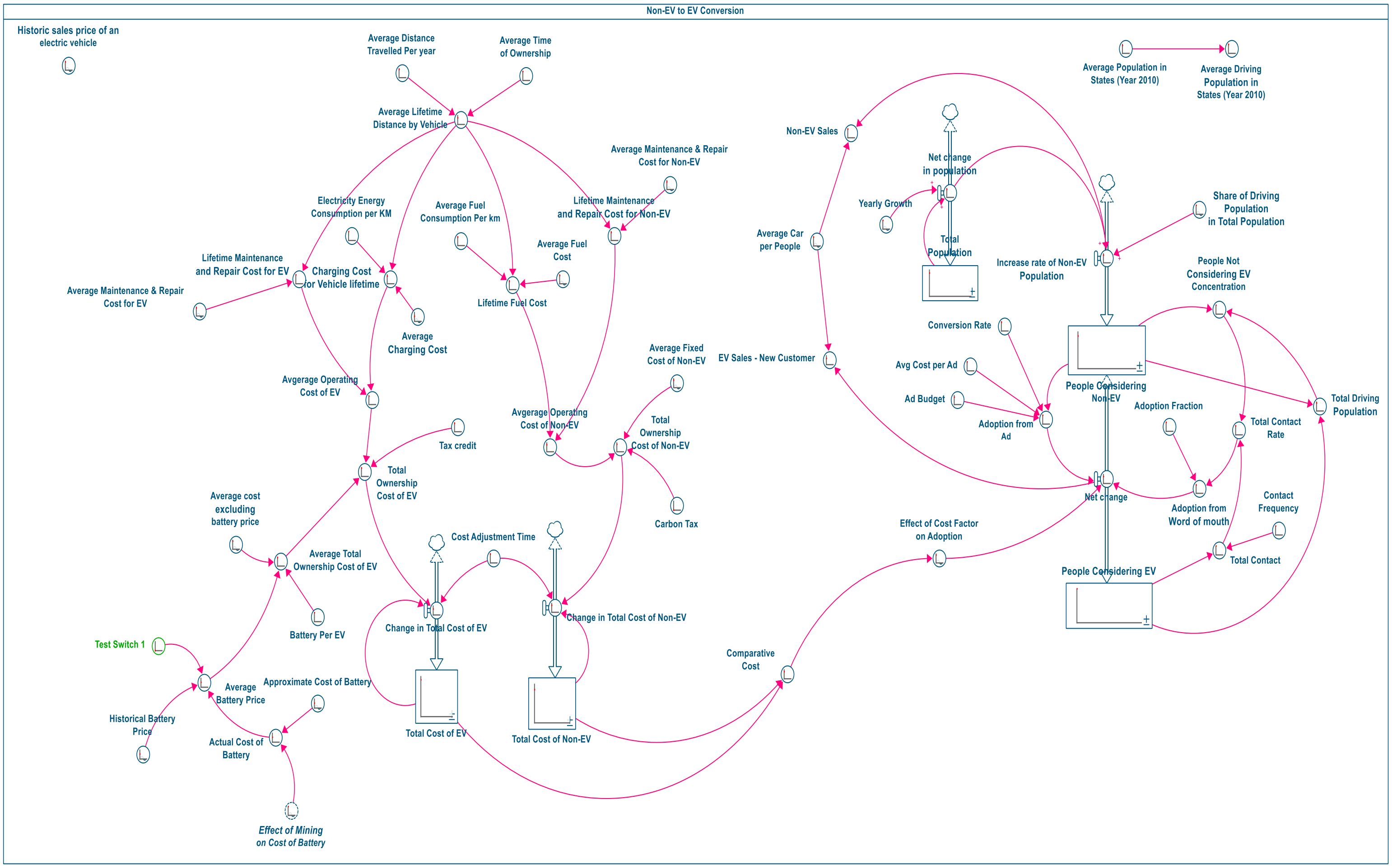


Figure 5: Non-EV to EV Conversion Sector

The perceived total cost of an EV is calculated by factoring in the price of the battery, the cost of charging over the vehicle's lifespan, the cost of maintenance, and the vehicle's price. There are several endogenous variables from other sectors (such as Mining cost) as well as external variables (such as average charging cost, maintenance cost, etc.) considered. In calculating the final cost, a tax credit is accounted for as well. During model testing, the tax credit can be eliminated to generate a variety of scenarios.

The perceived total cost for the non-EV is calculated in the same manner, excluding battery expenses, and charging fees. Instead, the total petroleum cost over the tenure of the vehicle is considered. Carbon tax is calculated as a fixed quantity, but since there is no carbon tax on the population in the United States due to political issues, the potential policy for the future has been kept in mind **[38].** All references for these external variables are enumerated separately in both the model documentation and the thesis references.

These perceived total cost values are used to compare the costs of EVs and non-EVs, which is a factor in calculating EV adoption.

3.2.2 Energy Mix

In this Sector, we are determining the energy composition of each state in the United States independently. Despite the country's long-standing reliance on fossil fuels—especially coal and natural gas— There has been a significant trend in recent years toward greener and more sustainable forms of energy production. In recent years, the United States has adopted a more diversified energy mix, shifting away from coal and toward natural gas, renewables, nuclear power, hydropower, and so on.

CO_2 emissions have been calculated for each energy source individually, given their unique characteristics. Each state uses its own unique energy mix to create electricity; hence, the total amount of emissions produced by producing 1 kilowatt hour of electricity varies from state to state. The input to this sector is the percentage of each energy source and emission from those energy sources.

Environmental concerns and the declining cost of alternatives have reduced coal's role, while it is still a major source. In recent years, natural gas has risen to prominence as a major energy source. The importance and prevalence of renewable energy sources have grown substantially in recent years. States like Texas, Iowa, and California have seen major increases in their electricity supply from wind farms due to the industry's rapid growth. The use of solar energy has also grown in popularity, particularly in sunny places like California and Arizona. Especially in the Pacific Northwest, where dams provide a sizable share of the region's electricity, hydropower maintains a significant role in the overall mix. As a stable and low-carbon electricity source, nuclear power continues to play an important role in the energy mix for many governments.

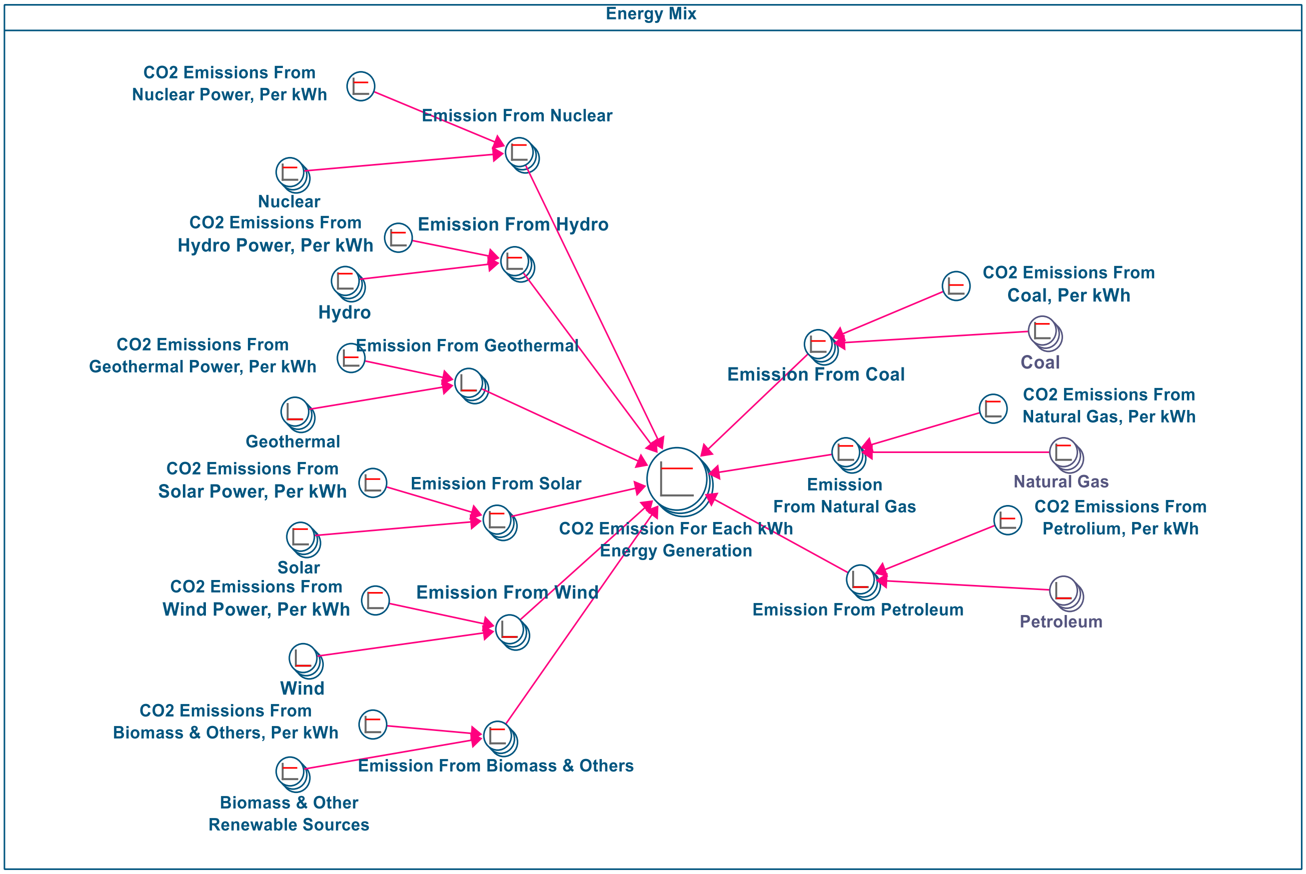


Figure 6: Energy Mix Sector

3.2.3 Non-EV Emission:

In this sector, the total non-EV stock and CO2 emissions from the non-EV fleet are calculated. Since, according to this diffusion paradigm, people are switching from non-EVs to EVs, the stock of non-EVs must be decreasing. The supply of non-EVs increases with production and decreases with disposal. In this section, CO2 emissions are computed for each stage and used as input for the Emission stock. Since the emission is released directly into the atmosphere, no output is calculated to reduce emission stock. In addition, a fixed quantity of CO2 is calculated for the manufacturing and disposal processes in order to simplify the calculation.

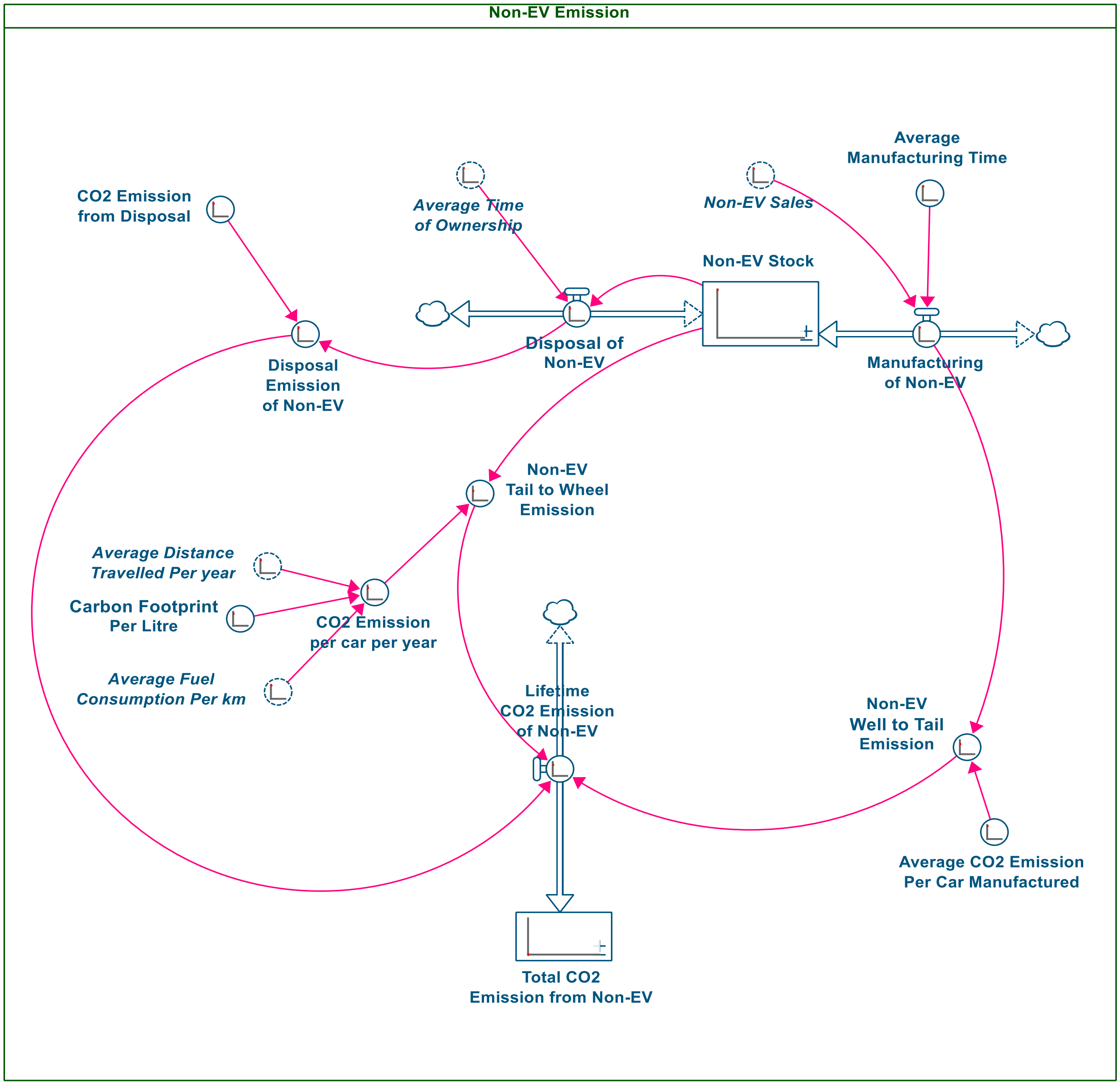


Figure 7: Non-EV Emission Sector

This sector receives multiple inputs from the 'Non-EV to EV Conversion Sector'. To calculate the manufacturing rate, non-EV sales are required. In order to calculate the rate of EV disposal, the average length of ownership is utilized. The average distance traveled, and average petroleum consumption are treated as exogenous variables for the purpose of calculating tailpipe emissions. Each reference for these external variables is listed separately in both the model documentation and the thesis references.

3.2.4 Battery:

In this sector, the extraction of raw materials for battery manufacture is estimated. Additionally, this calculation includes the emissions from raw material extraction and battery manufacture. For both new customer cars and replenishment vehicles for the current customer base, the raw material extraction is determined.

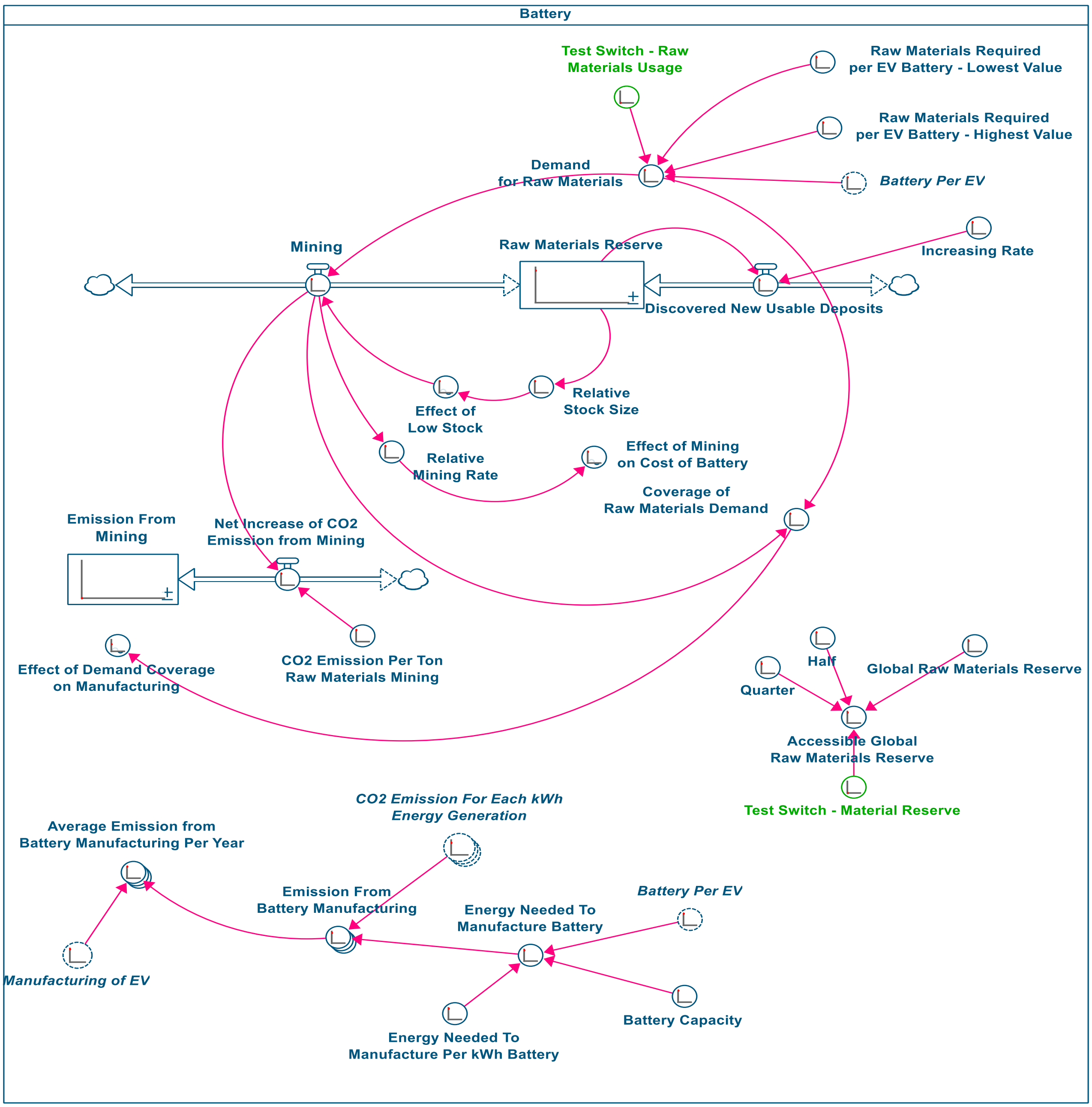


Figure 8: Battery Sector

During the computation, the availability of the raw materials is taken into account. Accessibility to the whole reserve may be a problem because these raw resources are imported. Additionally, it is believed that the raw materials reserve applies to the whole stock of the following materials.

Worldwide lithium deposits are thought to be more than 17 million metric tons (MT), according to the International Energy Agency (IEA). It is important to note that lithium resources are found in several countries, with the largest concentrations being in Australia, Chile, Argentina, and China. There are thought to be 7.1 million metric tons of cobalt deposits in the world. Most of the world's cobalt reserves are located in the Democratic Republic of the Congo (DRC). Globally, there are thought to be 89 million MT of nickel deposits. Indonesia, the Philippines, Russia, and Canada are among the nations with sizable nickel reserves. Over 250 million MT of graphite deposits are thought to exist worldwide. The largest producer and owner of significant graphite reserves is China, followed by countries like Brazil, Canada, and India. Mining-related emissions, which are computed in stock, are released directly into the environment.

Because the raw materials needed to construct an EV battery might differ, a switch has been put into the model to test various values under various circumstances.

3.2.5 EV Emission:

In this sector, both the EV stock and total EV emissions are determined. Calculating the total emission, which includes mining and battery production, requires input from the battery sector. The production of the vehicle without the battery is presumed to be constant, the same as non-EVs, because the construction of these two categories of vehicles is similar except for the battery. For driving and customer amenities, both virtually follow the same principle.

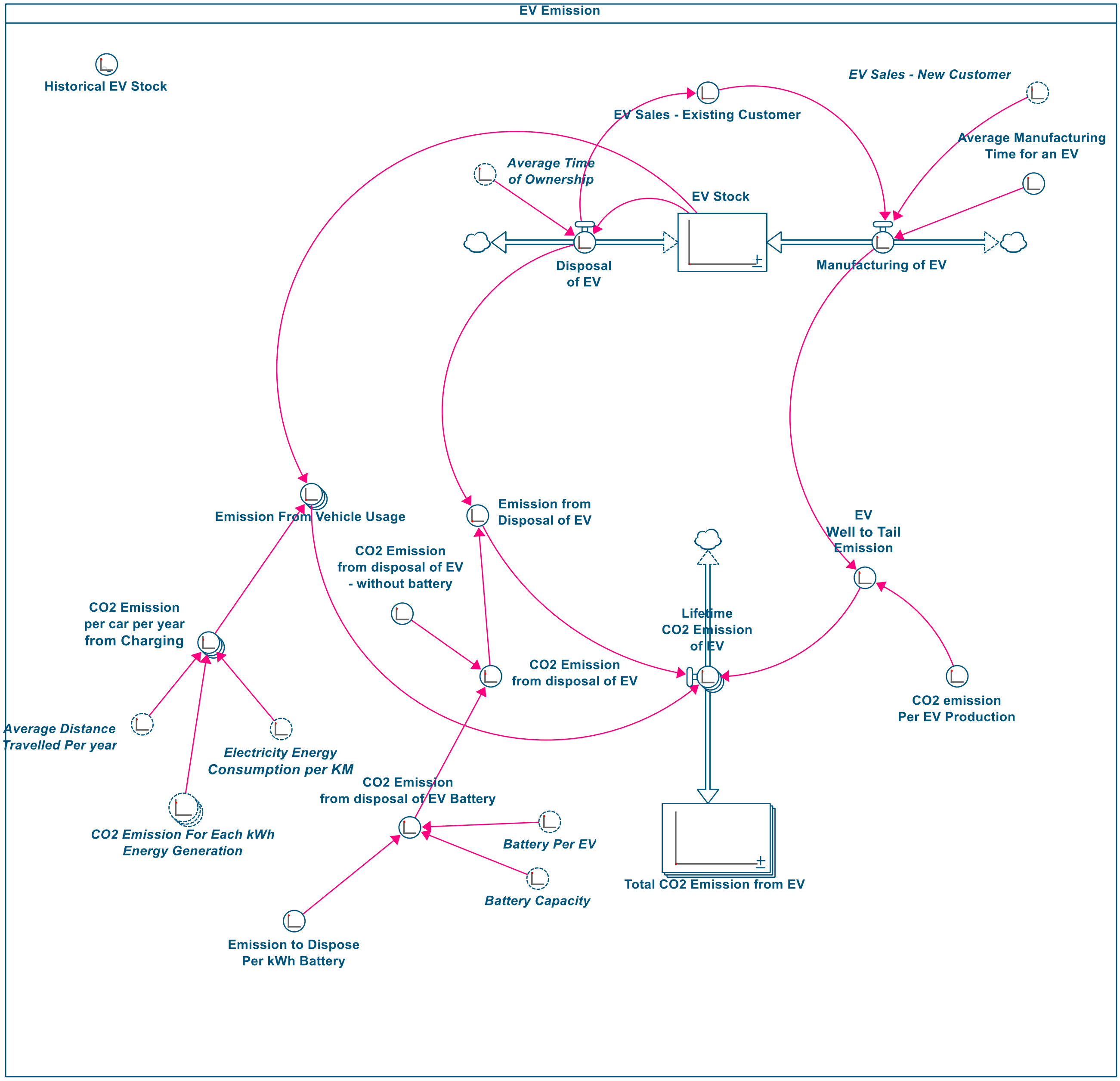


Figure 9: EV Emission Sector

This sector receives a number of inputs from the 'Non-EV to EV Conversion Sector'. Sales of EVs are required to calculate the manufacturing rate. The average length of ownership is utilized to calculate the rate of EV disposal. Since EVs have no exhaust emissions, they are not accounted for in this model; instead, the emission is calculated based on the emission from the charging source. Each reference for these external variables is enumerated individually in the model documentation and thesis references.

3.3 Model Calibration And Assumptions

The majority of the model's parameter values were derived from various sources, each of which is referenced in the model's documentation and cited in the model's references. A small number of variables have been manually calibrated to suit the data; this is described in greater detail in the Model Analysis: Behavior Reproduction and Validation chapter.

The US market is influenced by the global market, which is a central assumption of the thesis model. This assumption has significant implications for the availability of basic materials for battery production. If the rest of the world adopts the EV concept, then the United States faces competition on the market for the required materials.

Non-electric vehicle infrastructure support systems have attained a mature stage throughout the duration of the simulation. The battery capacity would not increase over time, and the efficacy of EVs would remain unchanged.

The thesis model also assumes that consumer familiarity with non-EV technology is complete throughout the simulation period and that consumer familiarity with EV technology is minimal at the beginning of the simulation period. As familiarity with EV technology accumulates over time, it may increase and attain complete familiarity, but it cannot decline. This assumption may be legitimate for the study's time horizon, but it would not be valid for any other time horizon, particularly a very long one. In the model proposed by the thesis, it is presumed that there will be no delay period for EV familiarity adjustments. In addition, the period during which consumers consolidate their newly acquired knowledge of EV technology before allowing it to influence their purchasing decisions.

The model's carbon tax structure applies only to petroleum, which reduces the negative impact of EV operating costs. The assumption that electricity prices are excluded from taxation amplifies the negative impact of non-EV operating costs relative to EVs. As a result of the increased operating costs caused by the carbon tax, it is assumed that the relative significance of this utility attribute in comparison to the two other utility attributes that influence overall utility positively, total price and charge cost, decreases for EVs.

Chapter 4. Model Analysis And Validation

4.1 Model Behavior

The model's base case predicts that the development in US EV adoption begins in 2010 but grows significant after 2020, that the rise in rate of EV adoption is at its steepest between 2030 and 2040, that the development has begun to level off after 2040 and enters a stable phase by 2050, and that the development has reached a plateau by 2050. Beginning in 2020, an increase in EV familiarity will play a significant role in EV adoption in the United States. This occurs through advertising expenditures and interaction with other owners of electric vehicles. The familiarity with EVs follows an S-shaped growth trajectory with the steepest growth between 2030 and 2040. This occurs because the perceived total price of EVs is lower than that of non-EVs [Figure 11]. The non-EV total costs begin to feel higher as a result of the higher operation costs, maintenance, and operating costs. Other than the battery, the cost of owning an EV is virtually identical to that of a conventional vehicle.

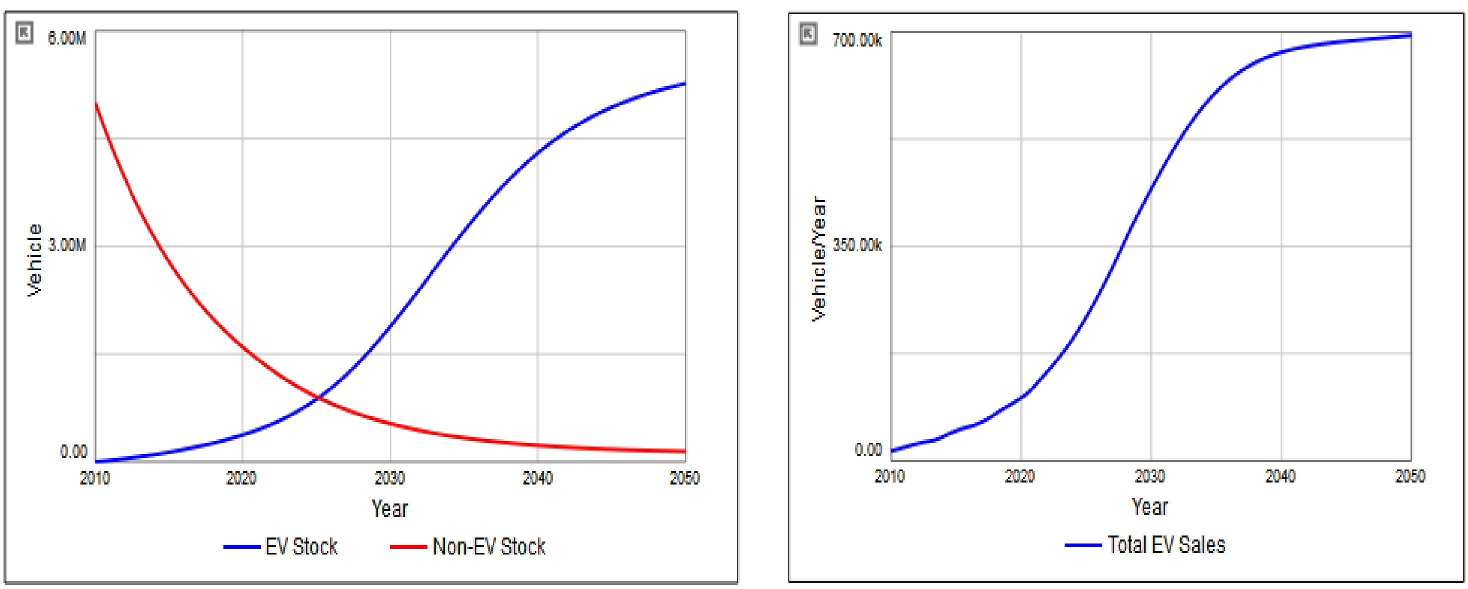


Figure 10: EV Stock/Non-EV stock and EV sales

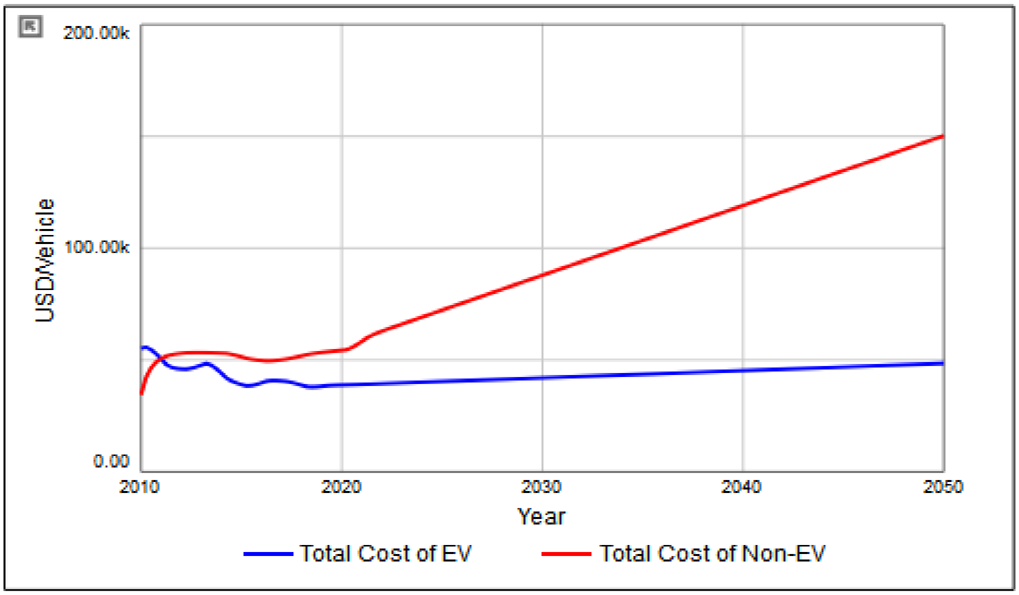


Figure 11: Total cost of EV vs Non-EV

Despite increases in the overall EV fleet relative to non-EV fleet, the complete potential growth in EV market share will be constrained as long as EV technology has not attained full consumer familiarity. The acceptance of EV feedback is self-reinforcing; when EV awareness rises as a result of contact rates and advertising, the market share of EVs rises as well, leading to an increase in new EV sales and the fleet of EVs. Consumer knowledge with EV technology therefore rises. Therefore, people start to leave the non-EV fleet and adopt to EV fleet.

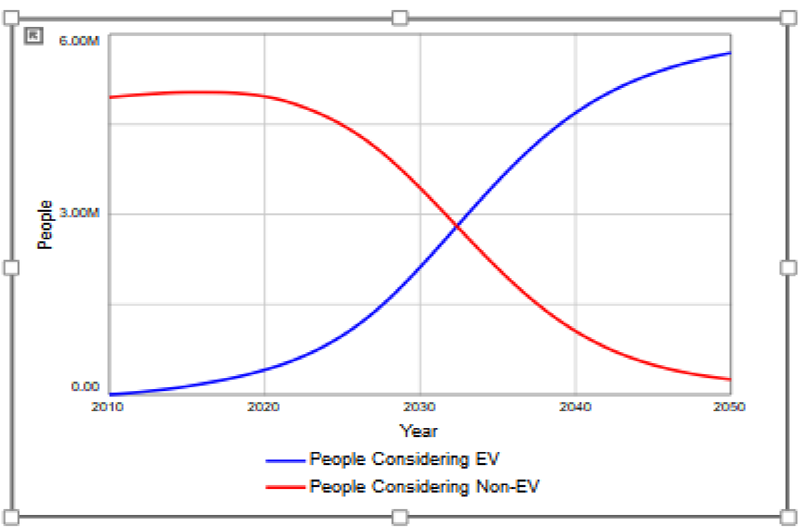


Figure 12: People considering EV vs Non-EV

By 2025, the emissions from the EV sector begin to surpass those from the non-EV sector in all states. It occurs for several distinct reasons. Since the materials required to construct a non-EV and an EV without a battery are virtually identical, the primary difference between these two categories of vehicles is the production of batteries and infrastructure for EVs. As EV is considered a new technology and people are unfamiliar with it in the early stages of the model, and as people become more familiar with it over time, there will be no established infrastructure for EV to recharge, manufacture, or operate.

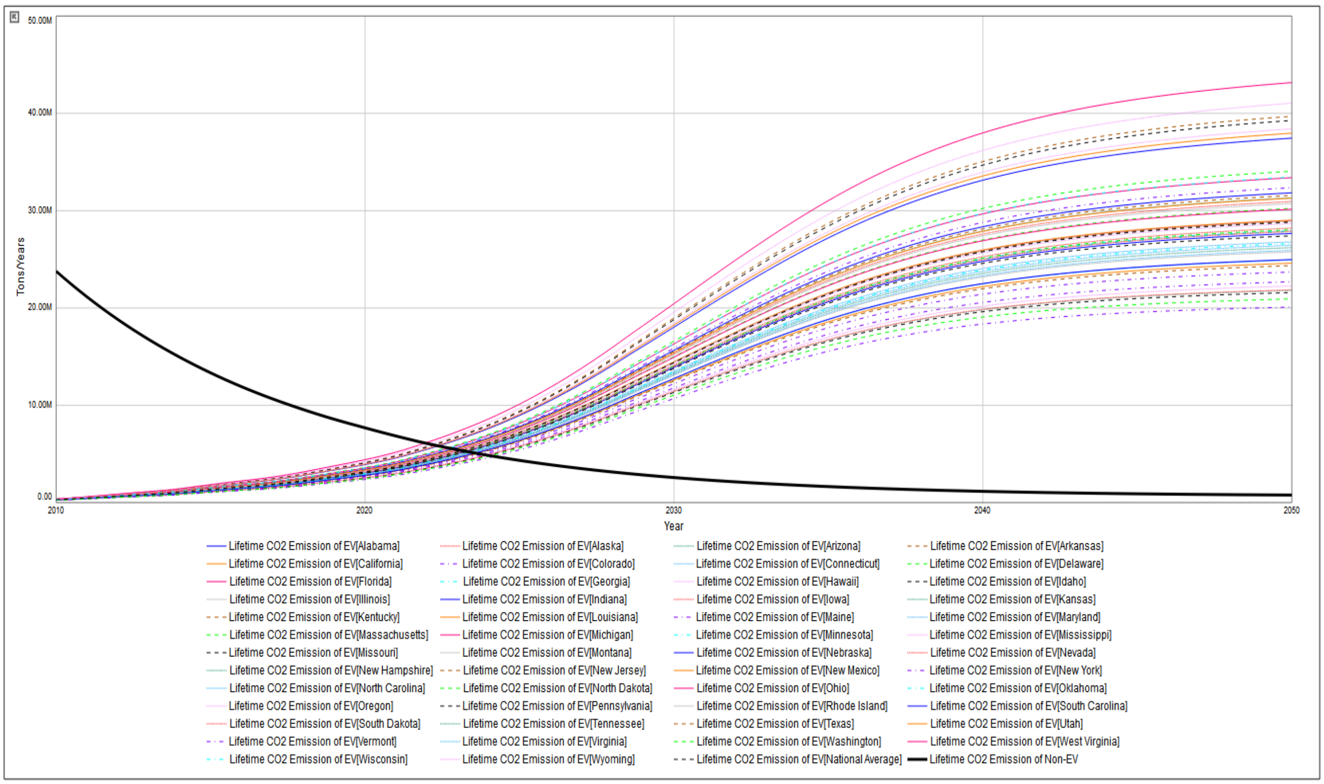


Figure 13: Lifetime CO2 Emission

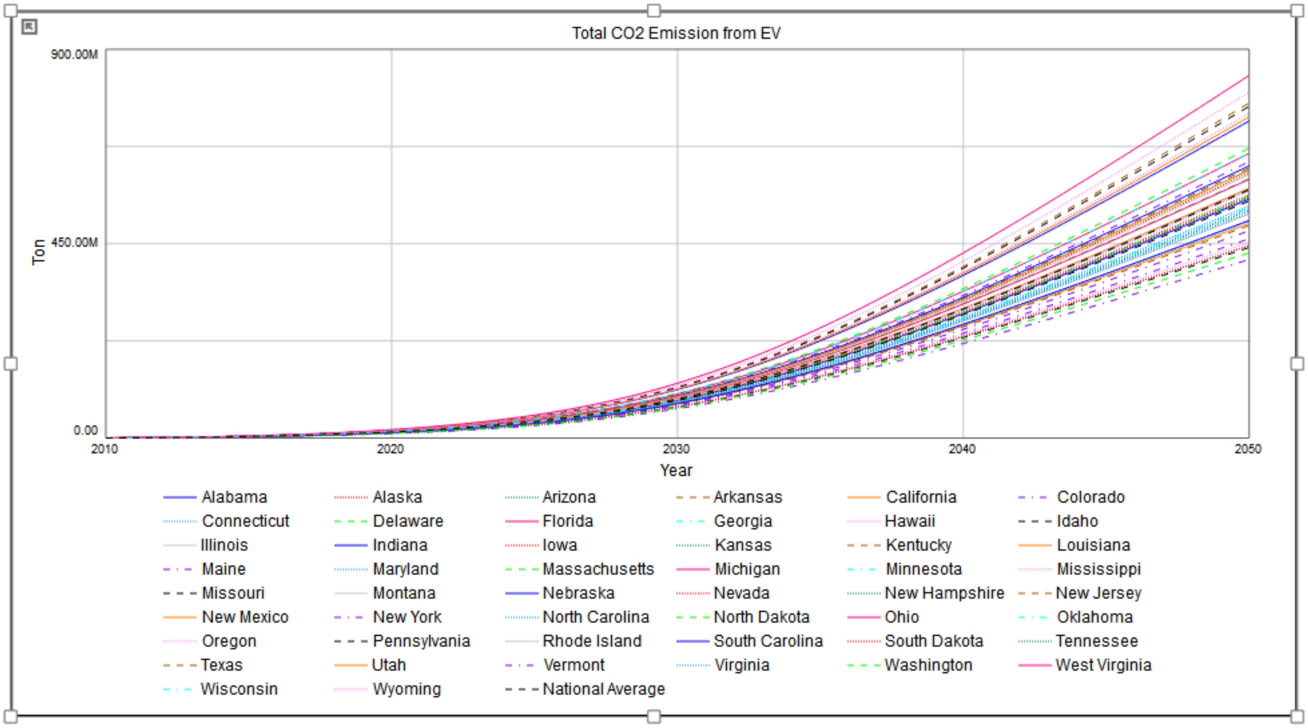


Figure 14: Total CO2 Emission from EV for all States

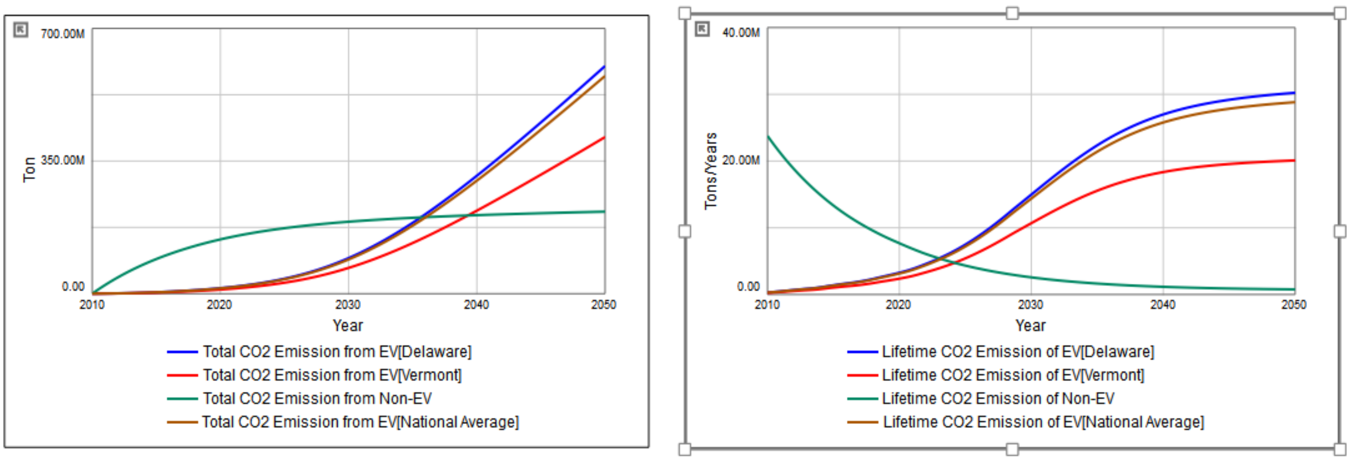
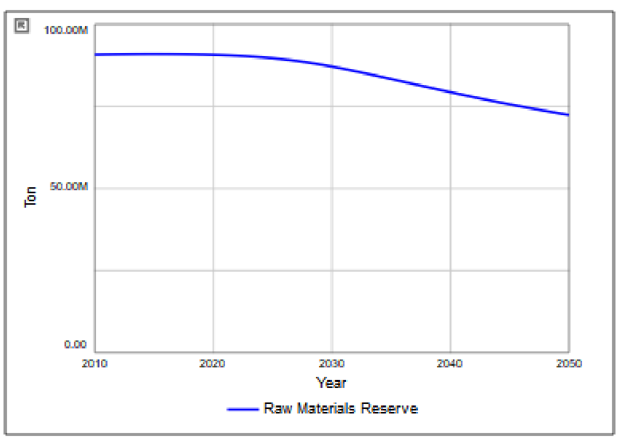


Figure 15: Lifetime CO2 Emission and Total CO2 Emission

To make Figure 15's graph of emissions more comprehensible, the state with the highest fossil fuel consumption (Delaware), the state with the lowest fossil fuel consumption (Vermont), and the national average fuel blend for power generation are grouped together. Since the United States continues to rely significantly on fossil fuels, the national average is virtually identical to that of the state that uses the most fossil fuels. In the short term, the difference in emissions between these two states is relatively small, but in the long term, it is enormous. Due to an increase in the driving population and the construction of new infrastructure for EVs, the lifecycle CO2 emissions of EVs in 2050 and non-EVs in 2010 are virtually comparable. Also, recycling was not accounted for in this model; if it were, emissions would be substantially lower. In addition, in the long term, the total CO2 emission for the EV fleet is greater than the total CO2 emission for the non-EV fleet, as the size of the EV fleet grows as a result of the diffusion process, while the non-EV fleet decreases in number as people abandon them.

The emissions from battery production are a significant factor for EVs because they account for roughly 30% **[34]** of EV emissions. Since EV production requires batteries in advance, EV manufacturing sends positive feedback to add more batteries to the pipeline. In addition, battery production depends on the availability of raw materials. Thus, the reserve decreases over time, but it is replenished by the discovery of new technologies or potential mining sites. In the interim, battery production reaches equilibrium slightly before that of EVs due to the fact that some batteries are already in the pipeline. At the same moment, the annual emission reaches a point of equilibrium [Figure 17]. In addition, mining and battery production continue to add more CO2 emissions each year, which are added to the EV's total emission stock [Figure 16].



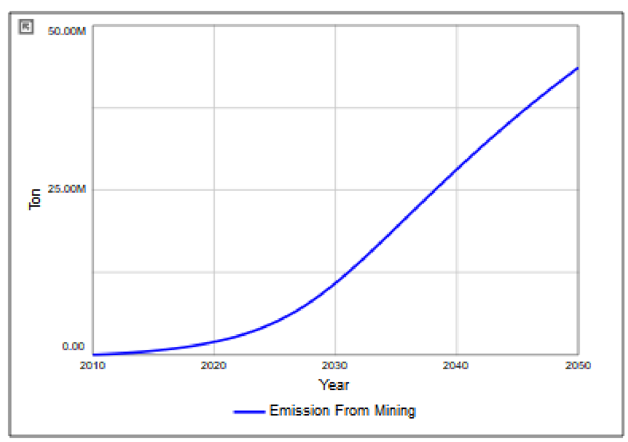


Figure 16: Raw Material Reserve And Total Emission From Mining

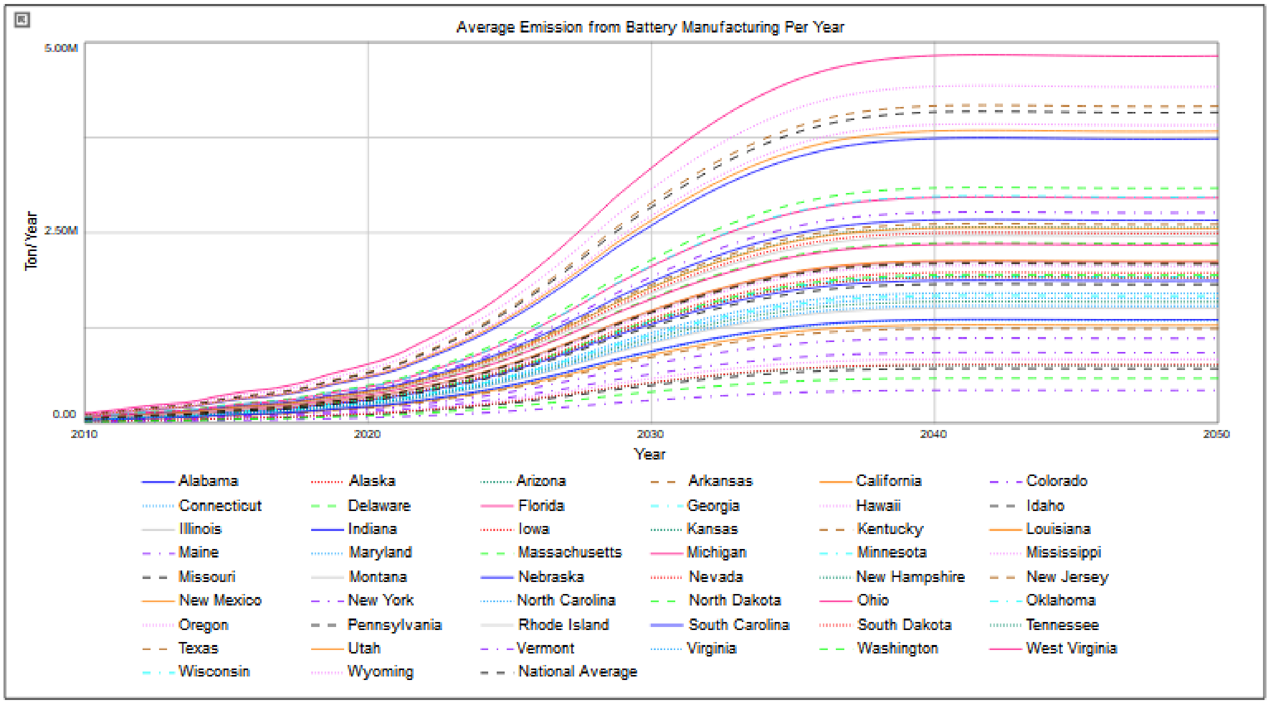


Figure 17: Average Emission From Battery Manufacturing Per Year

4.2 Model Validation

Several tests have been conducted to bolster the model's credibility and validate its validity. The results of the experiments conducted in conformance with accepted guidelines for modeling system dynamics **[7]** are presented in this chapter.

4.2.1 Structural Confirmation:

The thesis model is grounded in literature and past research cited in the 'prior research' chapter. Despite the fact that the thesis model has a simplified structure and undoubtedly oversimplifies the real-world processes of the US EV and non-EV markets, the processes that are included have sufficient theoretical backing in the literature to provide confidence that the structure adequately represents the real-world system for the purposes of this thesis.

4.2.2 Parameter Confirmation:

All model parameters have counterparts in the actual world and have been assigned data-supported values. A small number of variables adopted from the original models represent theory or unit correction variables. In the Model Assumptions and Sensitivity Analysis chapters of this paper, an overview of parameter assumptions, source references, and sensitivity testing of the parameters are presented. Appendix B, "Model Documentation," contains the complete documentation.

4.2.3 Dimensional Consistency Test:

Each parameter's dimensions were examined to ensure that they correspond to something in the real world and are therefore conceptually consistent. In order to ensure mathematical consistency, each equation was examined to ensure that the units of the inputs and outputs matched. Wherever feasible, fractional units were used as opposed to dimensionless units to aid in dimension consistency checks. Stella Architect's unit errors feature was then used to validate that there were no unit errors in the model.

4.2.4 Extreme Condition Test:

On each sector, partial model testing was conducted to evaluate the model's behavior in extreme conditions for critical parameters. Each of these experiments produced plausible model behavior, indicating that each parameter is robust.

4.2.5 Integration Error Test:

The model is established using Euler integration and is insensitive to the selection of integration method. When evaluated using Cycle Time, Runge-Kutta 2, and Runge-Kutta 4, the model's behavior does not vary. Different DT values have also been tested; the DT used in the model is

1/4 of a year. In the experiments, a DT of 1/16 years, 1/32 years, or 1/64 years had no effect on the subjects' behavior.

4.2.6 Behavior Sensitivity Test:

Using the documented key performance indicators, sensitivity experiments were conducted on crucial parameters and table functions. The sensitivity of key parameters was evaluated by executing 200 experiments with Latin Hypercube Sampling (Uniform Distribution) within a range of ± 25% of the parameter value used in the model. There are both highly sensitive and less sensitive variables present in the model, as demonstrated by the sensitivity testing results. The numerical and behavioral sensitivity evaluated in this study demonstrate low and high sensitivity, depending on the variable. Appendix-A contains the outcomes of the sensitivity analysis. ± 25% has been multiplied by the function to evaluate the model's various graphical functions, which have been tested separately and appended to Appendix-A.

4.2.7 Behavior Reproduction And Validation

Central to the iterative process of devising, testing, and analyzing the thesis model was validation. The present model is the result of model iterations that have converged on a plausible and purpose-appropriate model structure. In the following figures, a selection of key model variables is compared to historical data [1] for the period 2010–2021 in order to evaluate how early model projections compare to the historical trend. In the following figures, both historical and projected data provided by the International Energy Agency [1] are contrasted with the model projection of US EV sales in each state on average.

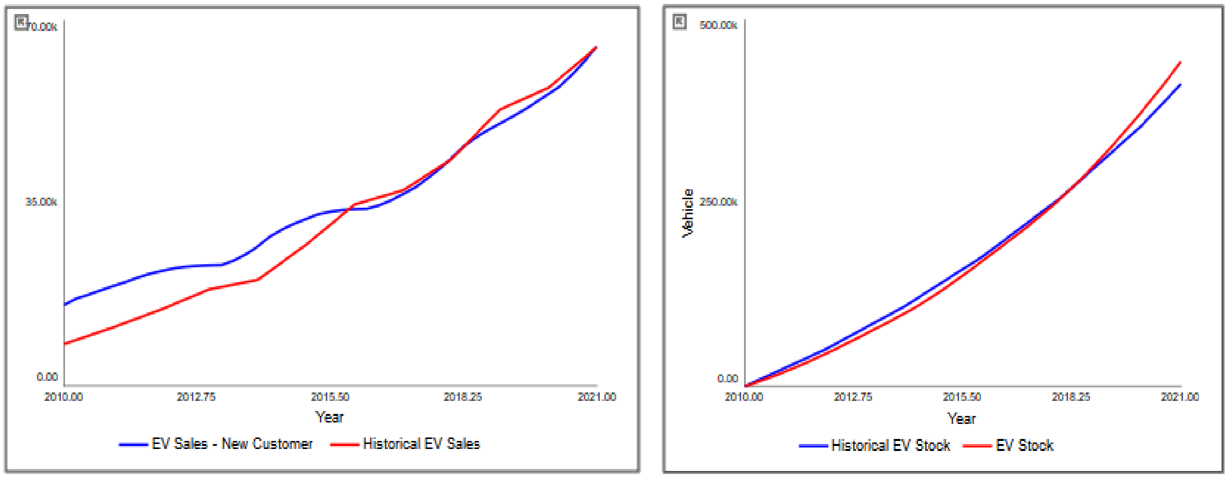


Figure 18: EV sales and EV Stock, Historical Data form IEA [1] and Model Projected Data, (2010 to 2021)

Generally, the model yields equivalent outcomes to historical data. When examining the total vehicle fleet, it is evident that the model does not disclose short-term fluctuations, although it seems to project a satisfactory average approximation. When examining EV sales, it appears that the model cannot accurately reproduce the historical data for the first few years. The model overestimates EV sales over the five-year forecast period. Nonetheless, when examining EV inventories and data made available by the International Energy Agency [1], the model projection exhibits similar behavior to the two projections and is numerically between them. Overall, EV sales projections are relatively indeterminate, and the model's behavior appears sufficiently similar to historical data to permit useful simulations.

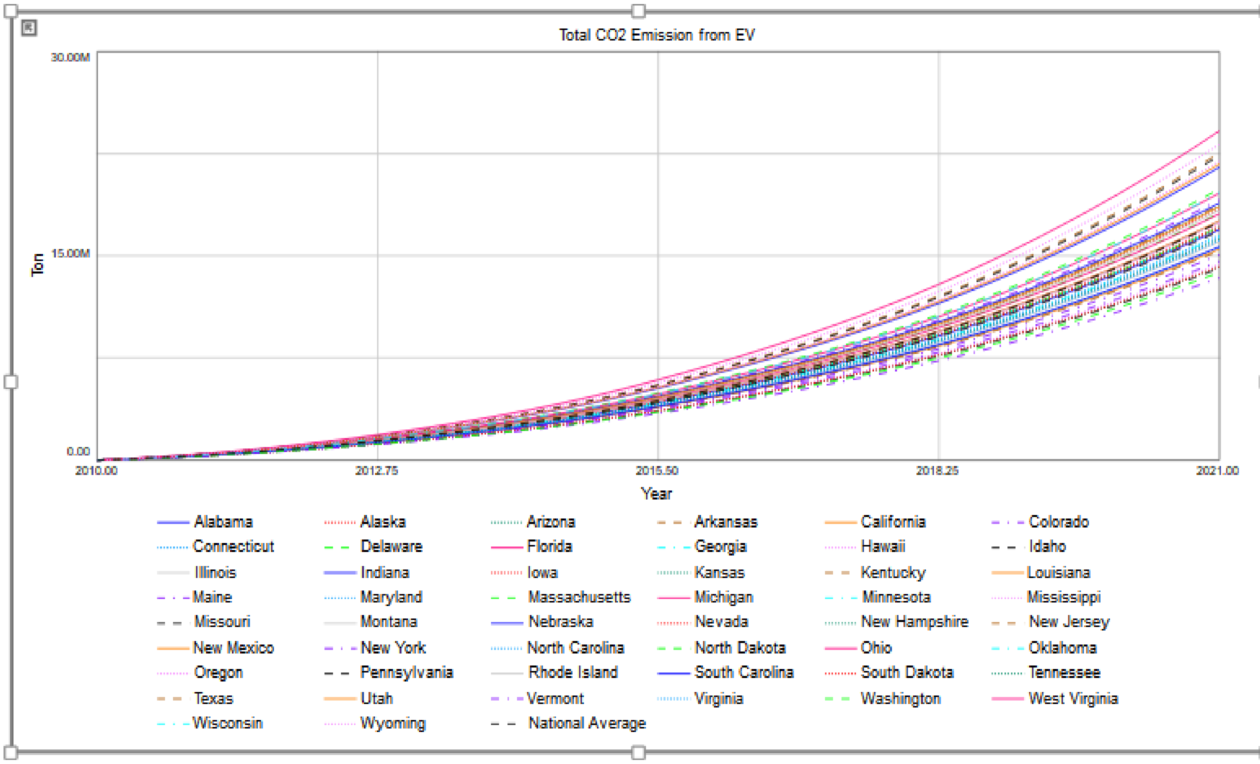


Figure 19: Total CO2 Emission from EV, (2010 to 2021)

Although the pattern of behavior is in predicted findings, not all states have duplicated the assumed CO2 emission stock graph with the identical behavior due to the energy mix for the power source amongst the states.

Chapter 5. Policy Recommendations

This is a high-level summary of the current EV market situation in the US. The model did not consider a number of factors thoroughly. The policy proposal in this article is based on the model's analysis and prior research; however, further model development is suggested to make the recommendations more accurate.

5.1 Reformation Of EV Subsidies

Base Case includes the Electric Vehicle (EV) Tax Credit that was passed as part of the American Recovery and Reinvestment Act of 2009 and went into effect in the United States in 2010 [45]. Depending on the size of the battery and the curb weight of the car, the tax credit may be worth anywhere from $2,500 to $7,500. Until a manufacturer had sold 200,000 electric vehicles, they were eligible for the tax credit. Modeled after the 2010 Tax Credit, the new EV Tax Credit policy was announced in 2022 as part of the government's 2022 Jobs plan and is set to go into effect in 2023. Manufacturer sales limitations will be eliminated, the pool of eligible cars will be widened, and new sourcing standards for crucial mineral extraction, processing, and recycling, as well as battery component requirements, will be implemented under the new tax credit. Tax credits of up to $3750 are available for vehicles that fulfill the mineral sourcing criteria but not the battery component standards **[46].** Tax credits of up to $7500 are available for vehicles that meet both sets of requirements.

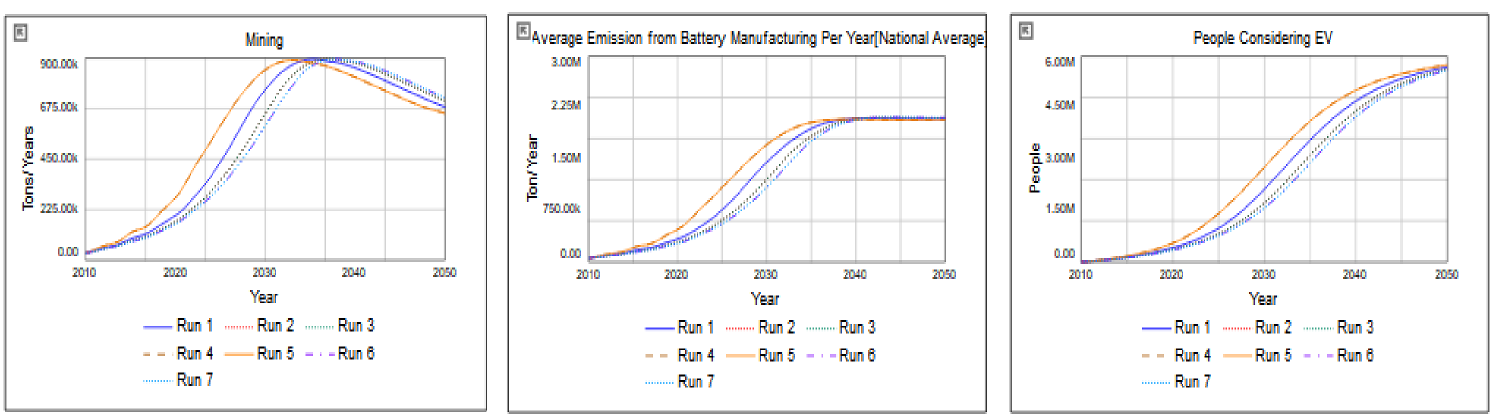


Figure 20: Changes in Tax Credit Amount

Given the expected rapid growth in the number of electric vehicles, the federal government of the United States may want to subsidize related automotive and infrastructure developments. That might lead people to get rid of their non-electric cars sooner than they otherwise would. The mining industry must also adjust. Which might, within the next decade, cause even more carbon dioxide to be released into the atmosphere. Figure 20 will show us what happens when we apply various sized tax credits to various scenarios. The consumer's reaction to the EV tax credit is always positive but the measure to reach net zero is a concept that governments should keep in mind, and the policies should be implemented after extensive analysis.

5.2 Carbon Tax

Implementing a carbon tax can be an effective means of reducing emissions. Although the environmental impact may be significant, the economic repercussions and political viability are major concerns in the United States. At present, there is no national carbon tax in the United States [1]. Nonetheless, a number of states, including California, Oregon, Washington, Hawaii, Pennsylvania, and Massachusetts, have implemented carbon pricing schemes covering emissions within their borders [47].

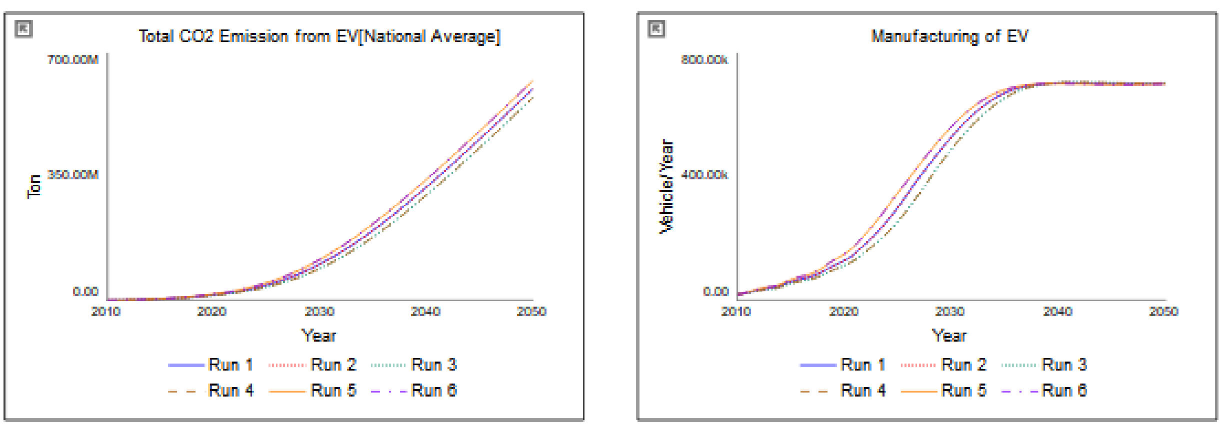


Figure 20: Changes in Carbon Tax Amount

Putting a carbon levy on both EVs and non-EVs could be a solution for the future, given that emissions occur at various stages of production and disposal. If the government wishes to maintain the attractiveness of EVs, the carbon tax amount can be offset by tax credits. During policy formulation, however, the government should bear in mind that rapid adoption of EVs through a combination of tax credit and taxing only non-EV emissions can increase emissions significantly due to the rapid production and disposal of EVs and non-EVs, respectively.

5.3 Technological Advancement

This is a recommendation for a technological advancement policy. If less raw materials can be used to produce efficient batteries or if mining techniques can be improved, this will be a significant step in the direction of reducing emissions. The development of improved battery technology (solid-state batteries, lithium-sulfur batteries) that can be manufactured on a large scale is currently one of the most pressing issues facing the industry. The goal is to create solid-state batteries for electric vehicles that significantly outperform lithium-ion batteries in terms of performance, safety, and manufacturing. These technologies have the potential to produce safer, cheaper, and lighter batteries.

Chapter 6. Conclusions

6.1 Research Findings

This thesis was set out to find the answers for the following questions:

- *Is the drive toward EV adoption equally environmentally beneficial for all US states, irrespective of their electrical sources?*
- *Without incorporating renewable energy sources, could the accelerated proliferation of electric vehicles exacerbate the emission problem?*
- *Which policies have the potential to maintain an acceptable level of emissions while accelerating adoption in the coming years? Policies are discussed in chapter 5.*

To answer these questions: In the short term, a significant increase in the number of electric vehicles can burden power sources and cause energy companies to choose less efficient fossil fuel sources because they are simpler to install than renewable ones. However, states with more renewable energy sources may have an advantage. However, research indicates that the United States is transitioning to renewable energy sources at a moderate rate. So, in the long run, transitioning to EVs will reduce emissions, although renewable resources may require one or two more decades to reach a point where EV emissions are desirable.

Rapid demand for electric vehicles can strain manufacturing, infrastructure, and electricity sources in the short term. Which could lead to a significant increase in emissions. The elimination of non-EVs will generate a positive feedback effect on emissions and new infrastructure to support EV. This is more likely to occur in the United States due to its continued reliance on fossil fuels. However, a state with a high utilization of renewable resources, such as Vermont, will be more advantageous in this situation.

6.2 Model Limitations And Future Research

There are numerous possibilities to further enhance the model. This is a summary of the present state of the EV market in the United States. The model did not adequately account for a number of factors such as energy transition, new technological achievements, political and economic reformation etc. The model was created with the intention of identifying non-essential structures in previous research, replacing excessively complex formulations, and simplifying the model to make the core processes propelling market transformation more accessible to all types of readers.

References

1. IEA “Global EV Outlook 2021” IEA 2021, Paris License: CC BY 4.0 Policies to promote electric vehicle deployment – Global EV Outlook 2021 – Analysis - IEA
2. McKinsey & Company. “Why the Automotive Future Is Electric,” September 7, 2021. Why the future involves e-mobility | McKinsey
3. Reuters. “Creaky U.S. Power Grid Threatens Progress on Renewables, EVs,” May 12, 2022. Creaky U.S. power grid threatens progress on renewables, EVs (reuters.com)
4. Shepherd, Simon, Peter Bonsall, and Gillian Harrison. "Factors affecting future demand for electric vehicles: A model based study." Transport Policy 20 (2012): 62-74.
5. V. d. Gooyert, "Developing dynamic organizational theories; three system dynamics based research strategies," Quality & quantity, vol. Vol.53 (2), pp. p.653-666, 2019, doi: 10.1007/s11135-018-0781-y.
6. A. K. Saysel and T. Barlas, "Model simplification and validation with indirect structure validity tests," System dynamics review, vol. Vol.22 (3), pp. p.241-262, 2006, doi: 10.1002/sdr.345.
7. H. Rahmandad and J. D. Sterman, "Reporting guidelines for simulation-based research in social sciences," System dynamics review, vol. Vol.28 (4), 2012, doi: 10.1002/sdr.1481.
8. Orliuk, Valentina, and Daria Yermolova. "Electric Vehicles Popularity in Norway." (2019).
9. D. R. Keith, J. J. R. Struben, and S. Naumov, "The Diffusion of Alternative Fuel Vehicles: A Generalised Model and Future Research Agenda," Journal of Simulation, vol. 14:4, pp. 260-277, 2020, doi: 10.1080/17477778.2019.1708219.
10. D. Brownstone, D. S. Bunch, and K. Train, "Joint mixed models of stated and revealed preferences for alternative fuel vehicles," Transportation Research Part B, vol. 34, pp. 315-338, 2000.
11. Grantham Research Institute on climate change and the environment. “What Is the Role of Nuclear in the Energy Mix and in Reducing Greenhouse Gas Emissions? - Grantham Research Institute on Climate Change and the Environment,” n.d What is the role of

nuclear in the energy mix and in reducing greenhouse gas emissions? - Grantham Research Institute on climate change and the environment (lse.ac.uk)

12. Greenhouse gas emissions. "Greenhouse Gas Emissions," n.d. Greenhouse gas emissions (hydropower.org)
13. Geothermal Energy and the Climate Bond Standard
14. Jonsdottir, Gudrun Erla, Throstur Olaf Sigurjonsson, Ahmad Rahnema Alavi, and Jordan Mitchell. "Applying responsible ownership to advance SDGs and the ESG framework, resulting in the issuance of green bonds." Sustainability 13, no. 13 (2021): 7331.
15. Electricity Generation and Related CO2 Emissions | Planète Énergies. "Electricity Generation and Related CO2 Emissions," n.d. Electricity Generation and Related CO2 Emissions | Planète Énergies (planete-energies.com)
16. Smoot, Grace. "What Is the Carbon Footprint of Wind Energy? A Life-Cycle Assessment - Impactful Ninja." Impactful Ninja, November 1, 2001. What Is the Carbon Footprint of Wind Energy? A Life-Cycle Assessment
17. Smoot, Grace. "What Is the Carbon Footprint of Biomass Energy? A Life-Cycle Assessment - Impactful Ninja." Impactful Ninja, December 1, 2001. What Is the Carbon Footprint of Biomass Energy? A Life-Cycle Assessment
18. US EPA. "Tailpipe Greenhouse Gas Emissions from a Typical Passenger Vehicle | US EPA," January 12, 2016 Greenhouse Gas Emissions from a Typical Passenger Vehicle | US EPA
19. Statista. "U.S. Household Electricity Prices 2022 | Statista," n.d. U.S. household electricity prices 2022 | Statista
20. Fuel economy in the United States – Analysis - IEA
21. U.S. Regular All Formulations Retail Gasoline Prices (Dollars per Gallon). "U.S. Regular All Formulations Retail Gasoline Prices (Dollars per Gallon)," n.d. U.S. Regular All Formulations Retail Gasoline Prices (Dollars per Gallon) (eia.gov)
22. Statista. "U.S.: Annual Gas Prices 2022 | Statista," n.d. U.S.: annual gas prices 2022 | Statista
23. NADA. "NADA Data," May 8, 2023. NADA Data | NADA

24. Statista. "U.S.: Average Selling Price of New Vehicles 2021 | Statista," n.d. U.S.: average selling price of new vehicles 2021 | Statista
25. Frith, James. "Battery Price Declines Slow Down in Latest Pricing Survey." Bloomberg, November 30, 2021. Battery Price Declines Slow Down in Latest Pricing Survey - Bloomberg
26. Trends in electric light-duty vehicles – Global EV Outlook 2022 – Analysis - IEA
27. Average price and driving range of BEVs, 2010-2019 – Charts – Data & Statistics - IEA. "Average Price and Driving Range of BEVs, 2010-2019 – Charts – Data & Statistics - IEA," October 26, 2022. Average price and driving range of BEVs, 2010-2019 – Charts – Data & Statistics - IEA
28. Macro Trends. "U.S. Population Growth Rate 1950-2023," n.d. U.S. Population Growth Rate 1950-2023 | MacroTrends
29. Federal Highway Administration. "Table DL-22 - Highway Statistics 2021 - Policy | Federal Highway Administration," February 3, 2023. Table DL-22 - Highway Statistics 2021 - Policy | Federal Highway Administration (dot.gov)
30. Brooklin Nash"With the Push Towards Electric, Which Automakers Advertise Most?" August 16, 2021. With the Push Towards Electric, Which Automakers Advertise Most? (mediaradar.com)
31. Wisnes, Tone. "Bergen Open Research Archive: Transitioning to Electric Vehicles in the US." Bergen Open Research Archive: Transitioning to Electric Vehicles in the US, December 12, 2022. Bergen Open Research Archive: Transitioning to Electric Vehicles in the US (uib.no)
32. US EPA. "Tailpipe Greenhouse Gas Emissions from a Typical Passenger Vehicle | US EPA," January 12, 2016. Greenhouse Gas Emissions from a Typical Passenger Vehicle | US EPA
33. Statista. "Topic: Vehicles in Use in the U.S.," n.d. Vehicles in operation in the United States - statistics & facts | Statista
34. US EPA. "Tailpipe Greenhouse Gas Emissions from a Typical Passenger Vehicle | US EPA," January 12, 2016 Greenhouse Gas Emissions from a Typical Passenger Vehicle | US EPA
35. Nature. "Nature Sustainability," March 6, 2023. Nature Sustainability

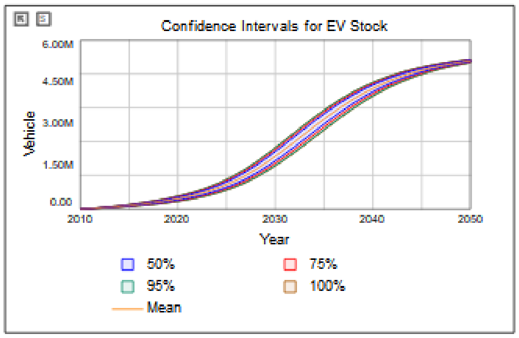
36. Center for Sustainable Systems. “Personal Transportation Factsheet,” n.d. Personal Transportation Factsheet | Center for Sustainable Systems (umich.edu)
37. Harper, Gavin, Roberto Sommerville, Emma Kendrick, Laura Driscoll, Peter Slater, Rustam Stolkin, Allan Walton et al. "Recycling lithium-ion batteries from electric vehicles." nature 575, no. 7781 (2019): 75-86.
38. World Economic Forum. “Explainer: Which Countries Have Introduced a Carbon Tax?,” n.d. Explainer: Which countries have introduced a carbon tax? | World Economic Forum (weforum.org)
39. Alternative Fuels Data Center: Emissions from Electric Vehicles. “Alternative Fuels Data Center: Emissions from Electric Vehicles,” n.d. Alternative Fuels Data Center: Emissions from Electric Vehicles (energy.gov)
40. Gnann, Till, and Patrick Plötz. "A review of combined models for market diffusion of alternative fuel vehicles and their refueling infrastructure." Renewable and Sustainable Energy Reviews 47 (2015): 783-793.
41. Leiby, Paul, and Jonathan Rubin. "Sustainable Transportation: Analyzing the Transition to Alternative Fuel Vehicles." In Asilomar Conference on Policies Fostering Sustainable Transportation Technologies, pp. 17-20. 1997.
42. Brand, Christian, Celine Cluzel, and Jillian Anable. "Modeling the uptake of plug-in vehicles in a heterogeneous car market using a consumer segmentation approach." Transportation Research Part A: Policy and Practice 97 (2017): 121-136.
43. Wangsness, Paal Brevik, Stef Proost, and Kenneth Løvold Rødseth. "Vehicle choices and urban transport externalities. Are Norwegian policy makers getting it right?." Transportation Research Part D: Transport and Environment 86 (2020): 102384.
44. Jang, Dae-Chul, Bosung Kim, and Su-Yol Lee. "A two-sided market platform analysis for the electric vehicle adoption: Firm strategies and policy design." Transportation Research Part D: Transport and Environment 62 (2018): 646-658.
45. American Recovery and Reinvestment Act of 2009: Tax-Based Provisions, I. I. R. P. Database, 2017.

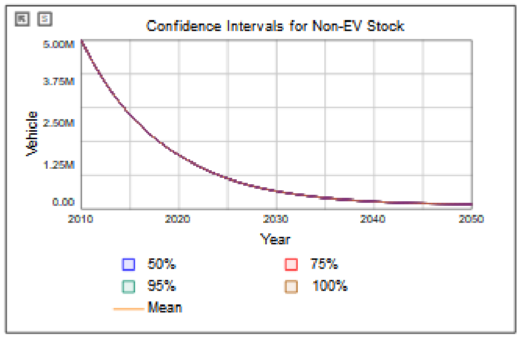
46. Alternative Fuels Data Center. "Search Federal and State Laws and Incentives." U.S. Department of Energy. Department of Energy
47. World Economic Forum. “Explainer: Which Countries Have Introduced a Carbon Tax?,” n.d. Explainer: Which countries have introduced a carbon tax? | World Economic Forum (weforum.org)

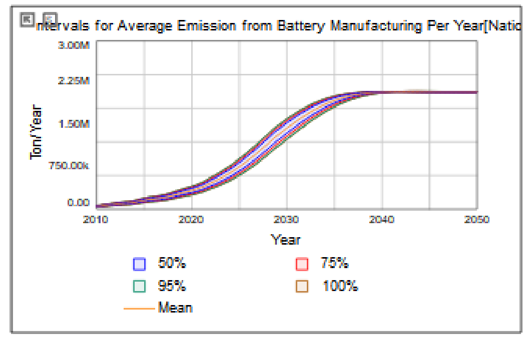
Appendix A – Sensitivity Analysis

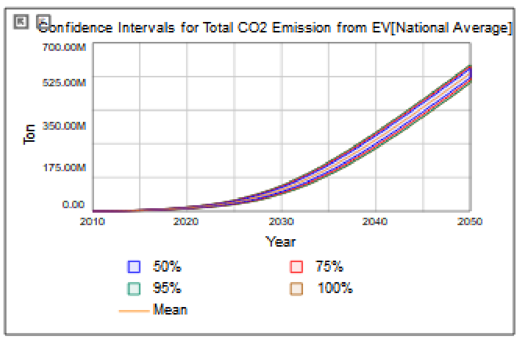
[Ad Budget] Base Value: 33000000 USD/Year **Range:** 24750000 – 41250000 USD/Year

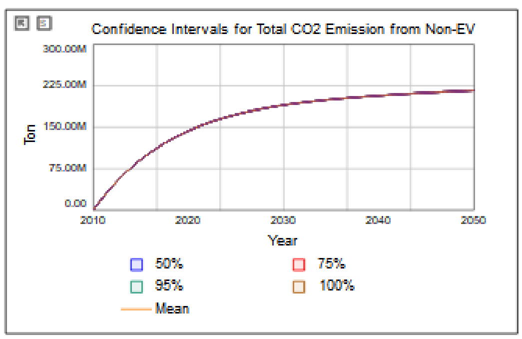
The parameter shows moderate numerical sensitivity for half of the variables. However, the behavior mode remains the same throughout the simulation period for all variables.

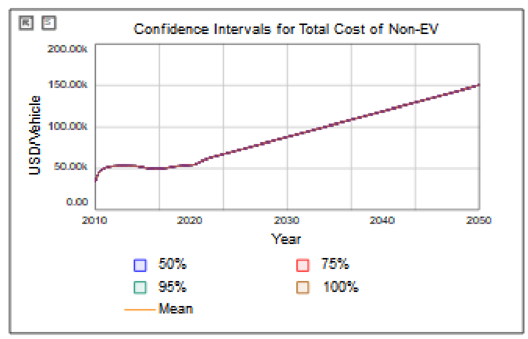


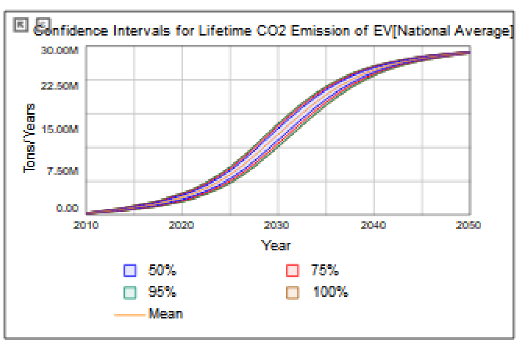


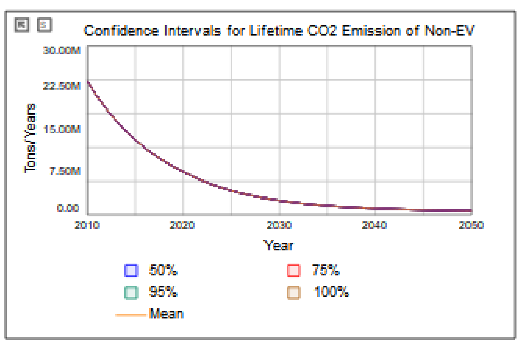


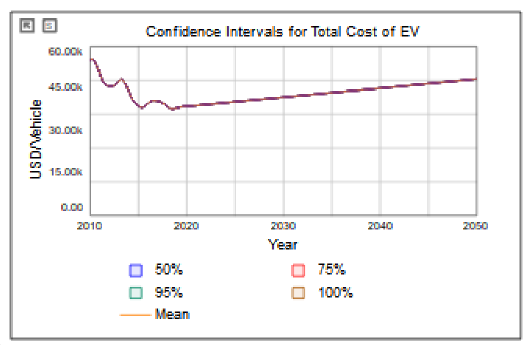


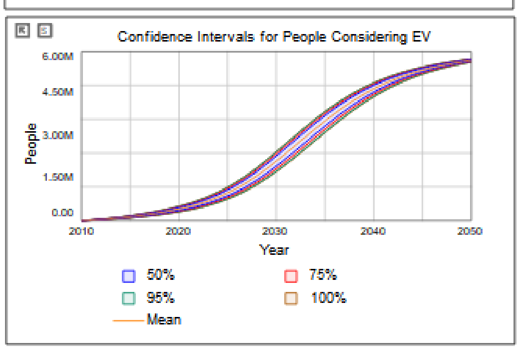


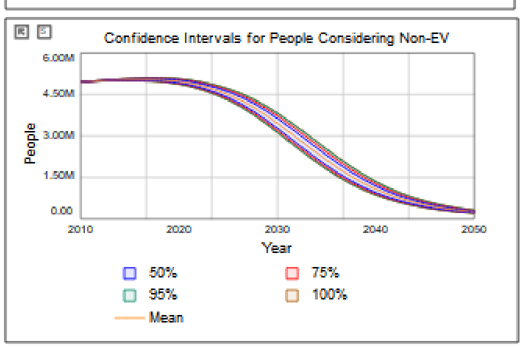


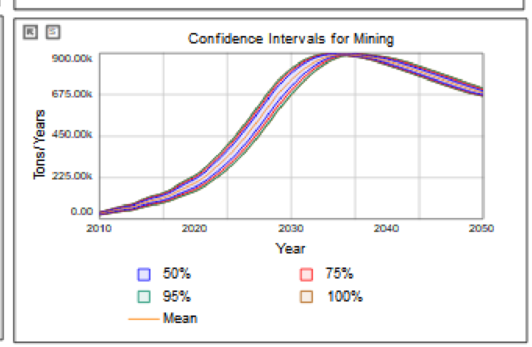






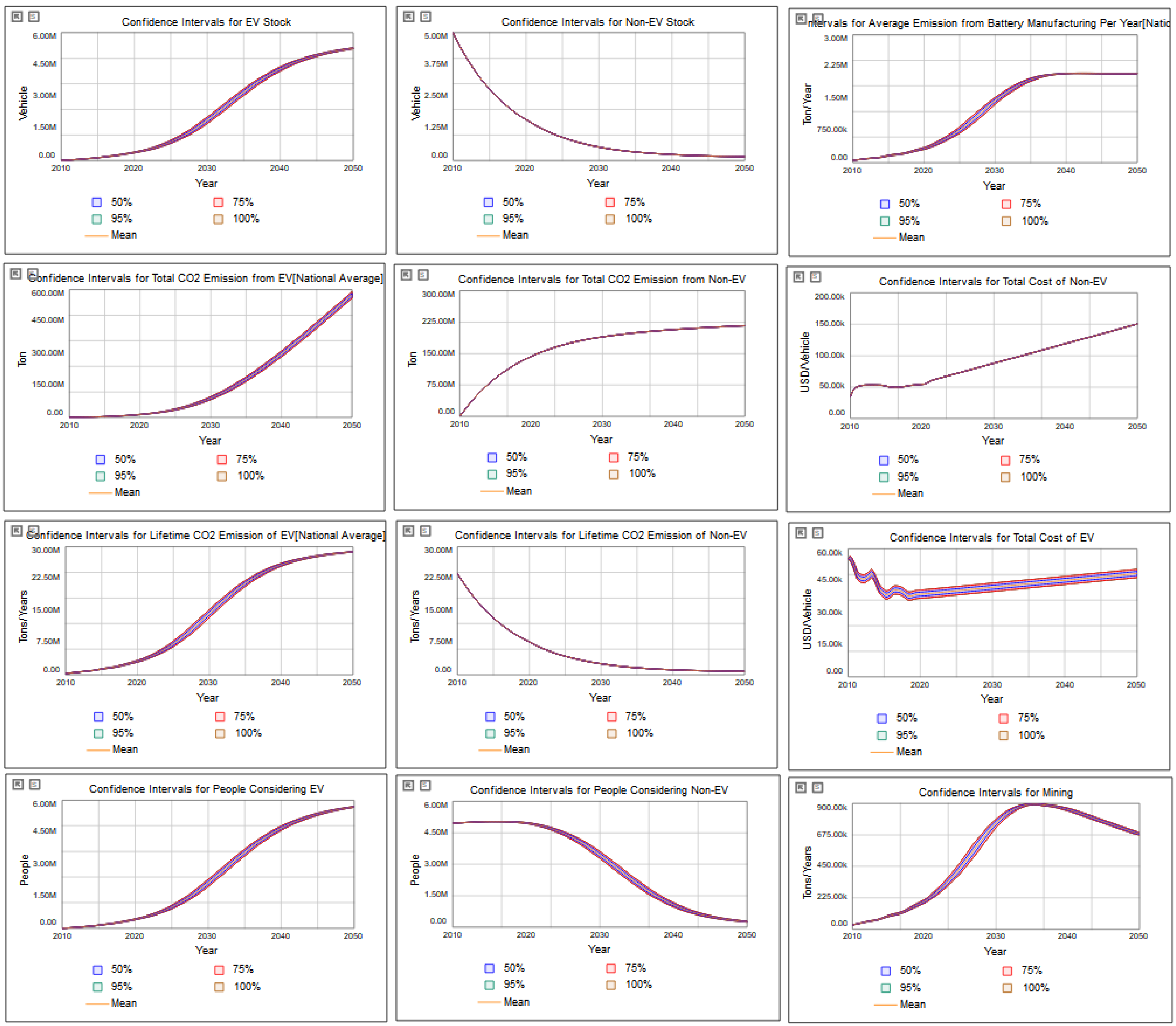






[Tax Credit] Base Value: 7500 USD/Vehicle **Range:** 5625 – 9375 USD/Vehicle

The parameter shows moderate numerical sensitivity for half of the variables. However, the behavior mode remains the same throughout the simulation period for all variables.



[Avg Cost per Ad] Base Value: 500000 USD/Ad **Range:** 375000 – 625000 USD/Ad

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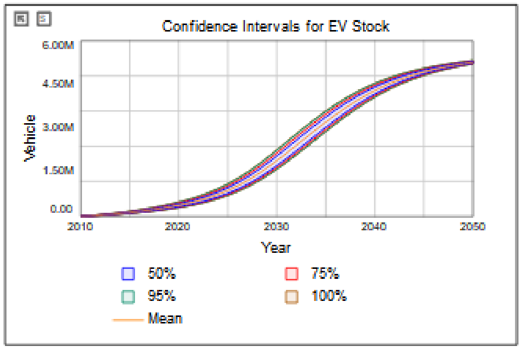
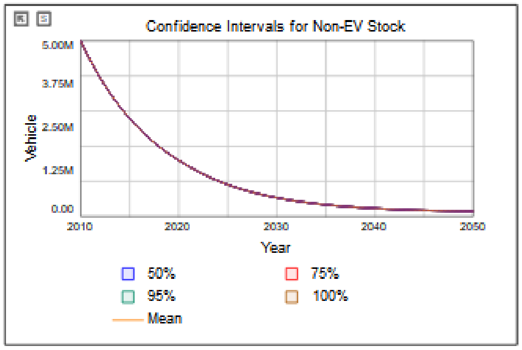
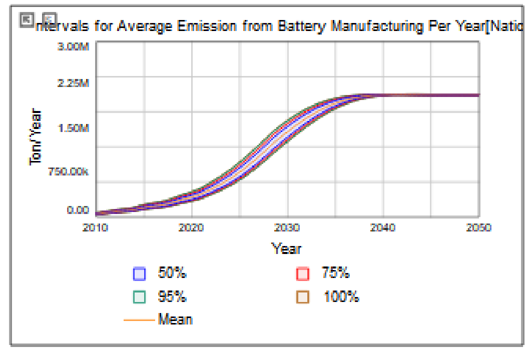
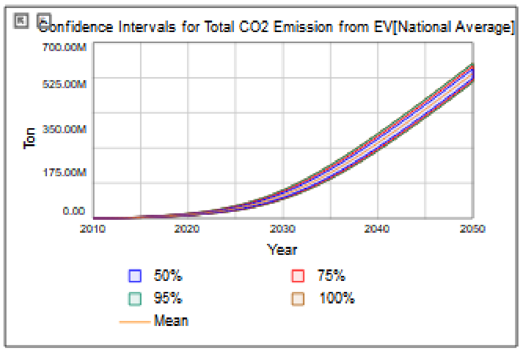
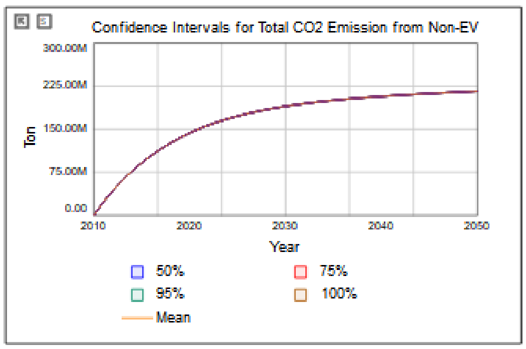
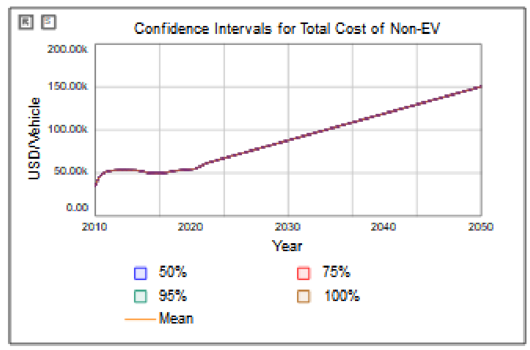


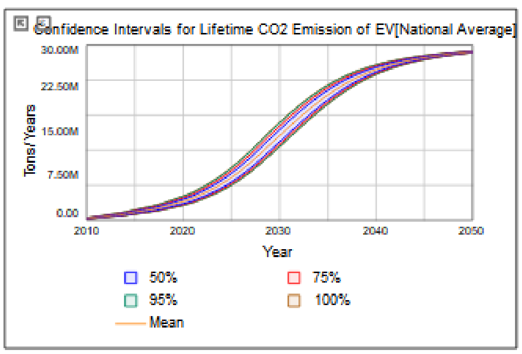


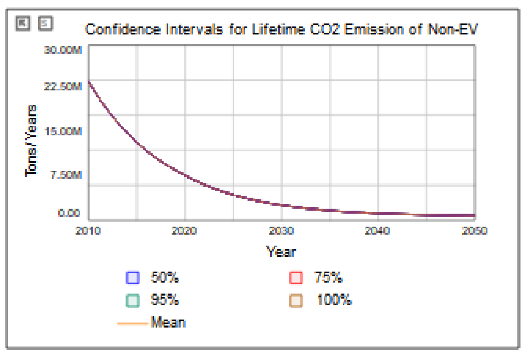


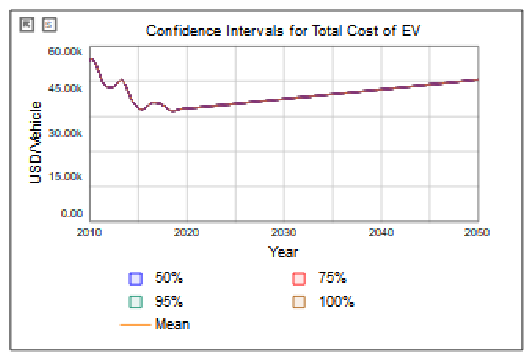


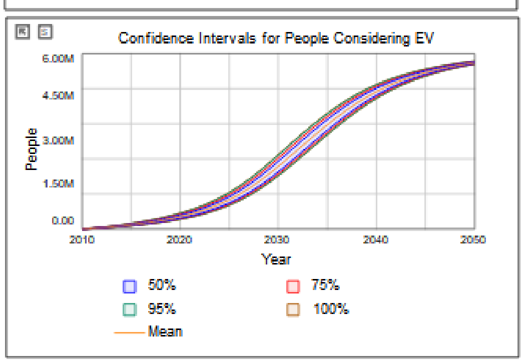


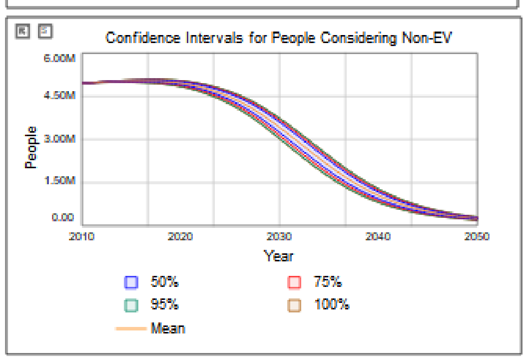


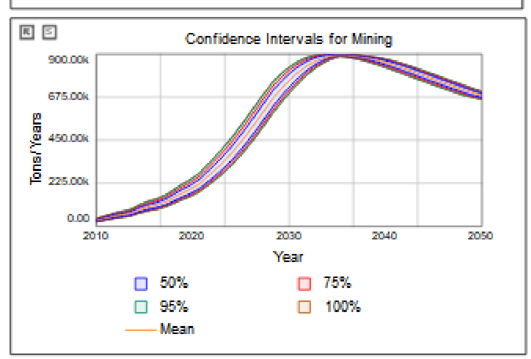










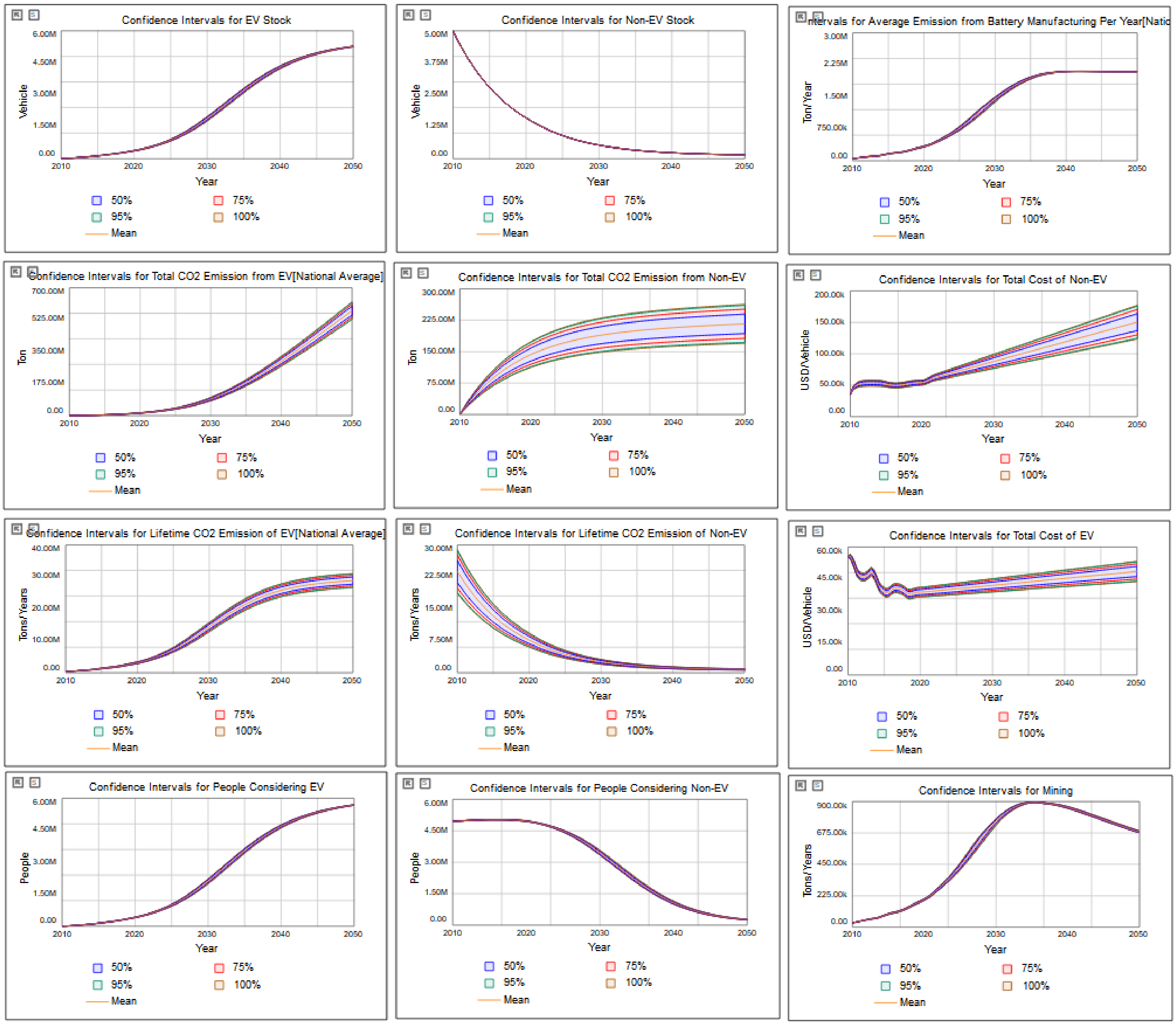


[Average time of ownership] Base Value: 8 Years **Range:** 6 – 10 Years

The parameters show high numerical sensitivity for most of the variables. However, the behavior mode remains nearly similar same throughout the simulation period for all variables.

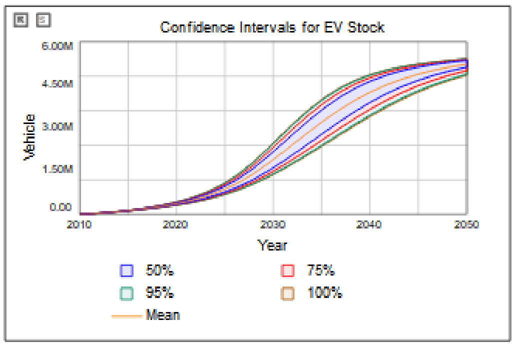
[Average distance travelled per year] **Base Value:** 18500 km/Year/Vehicle **Range:** 13875 – 23125 km/Year/Vehicle

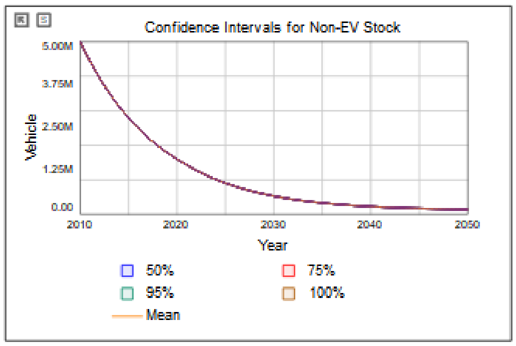
The parameter shows moderate numerical sensitivity for half of the variables. However, the behavior mode remains the same throughout the simulation period for all variables.

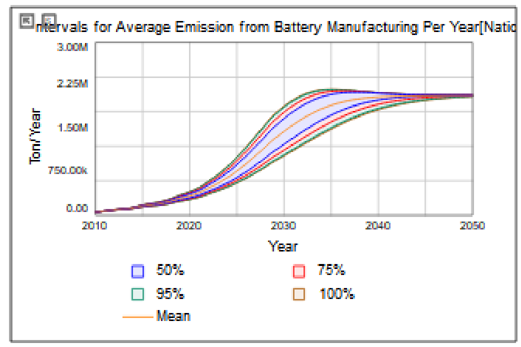


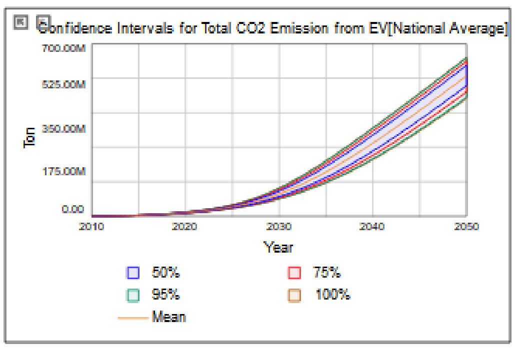
[Contact Frequency] Base Value: 20 People/People/Year **Range:** 15 – 25 People/People/Year

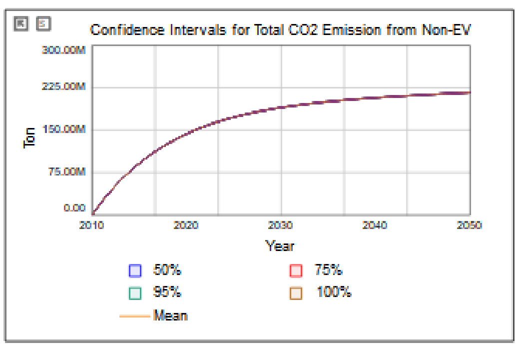
The parameter shows moderate numerical sensitivity for half of the variables. The behavior mode also shows sensitivity for a few of the variables.

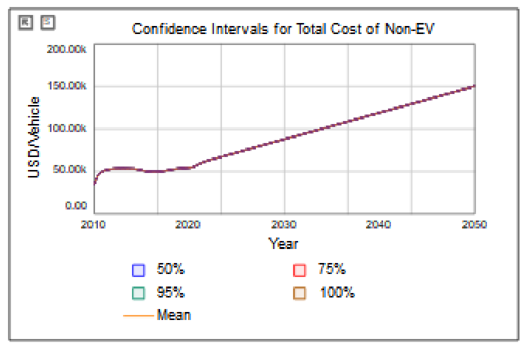


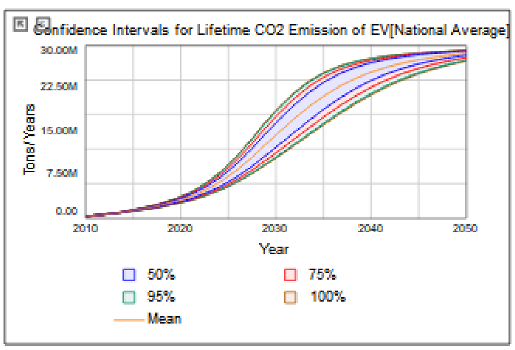


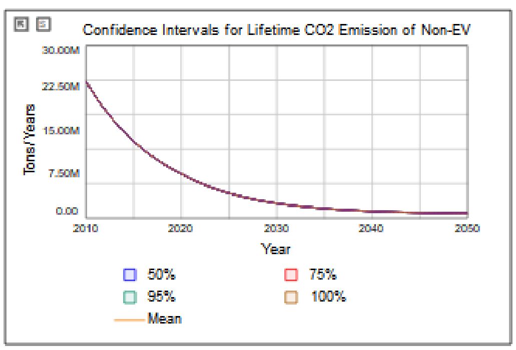


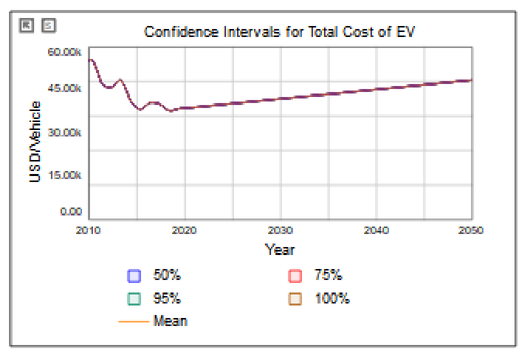


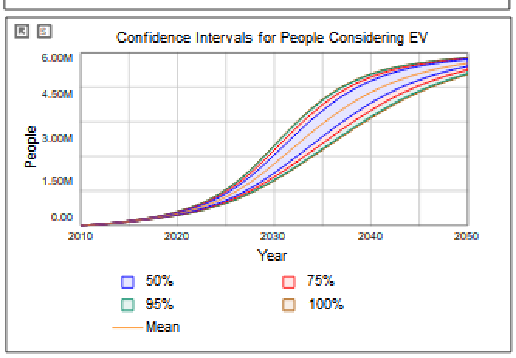


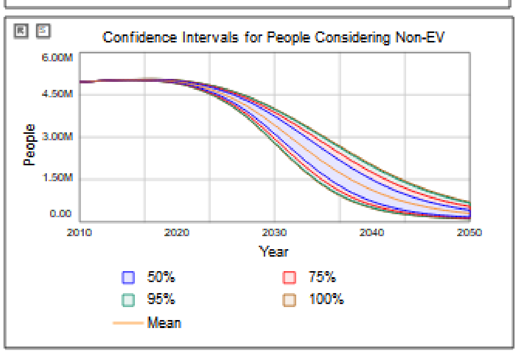












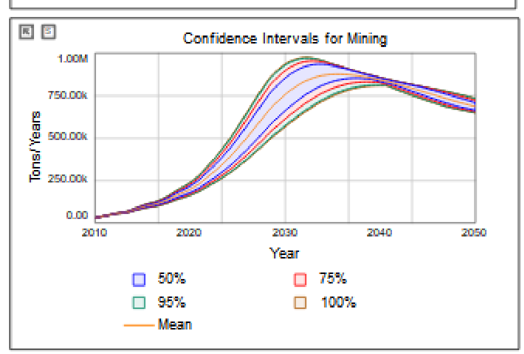
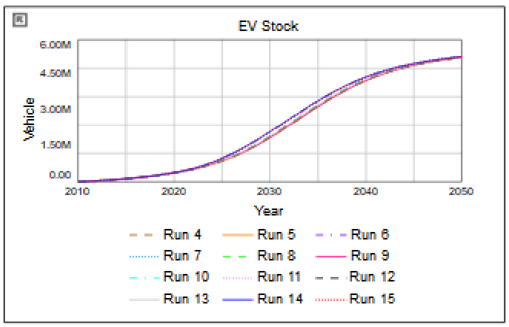
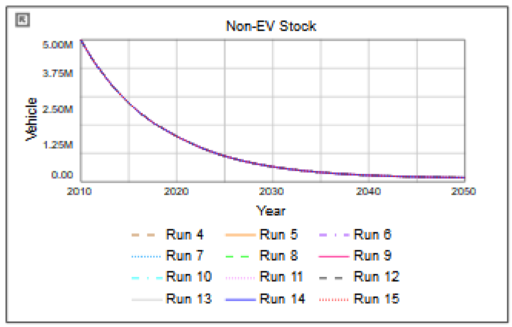
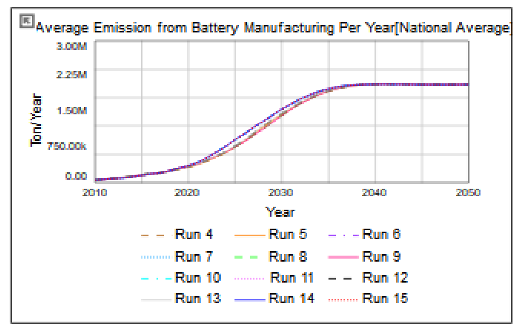


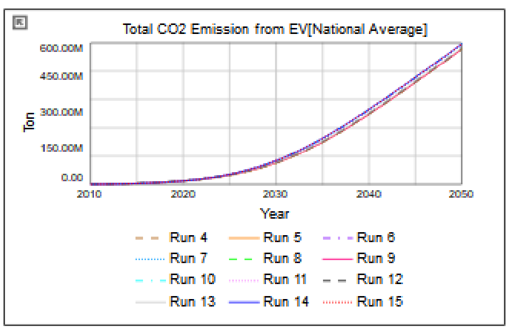
Table Functions [Average Maintenance and Repair Cost of EV]

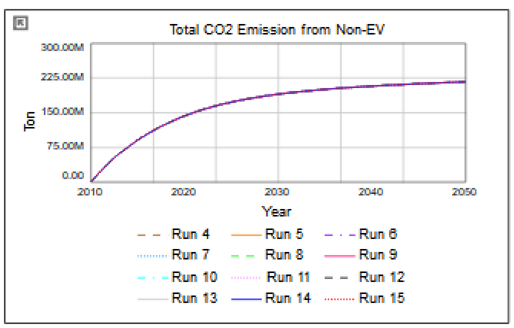
The effect of “Average Maintenance and Repair Cost of EV” goes from (0.025-0.04). Sensitivity analysis of different built in shapes from Stella Architect and also changing the values in both X (0.01 – 0.06) and Y (2015 - 2030) were tested. The graphs from the analysis are below. It was apparent that using different shapes in the table function has very little impact on numerical sensitivity for most of the variables except Total cost of EV. Behavior remained the same for all the variables except Total cost of EV.

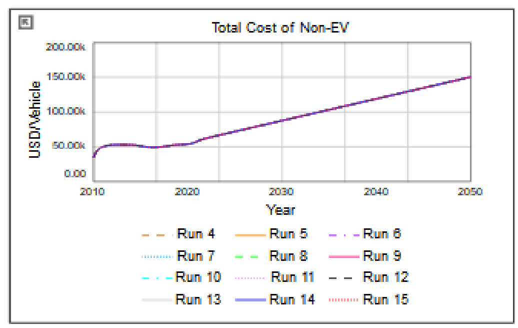


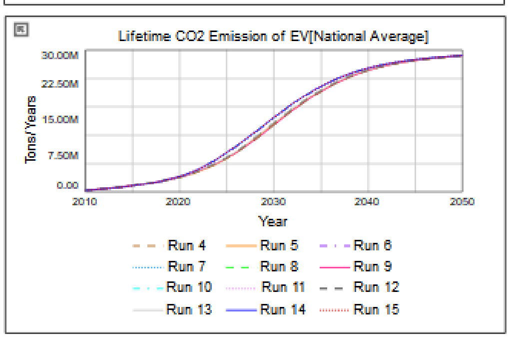


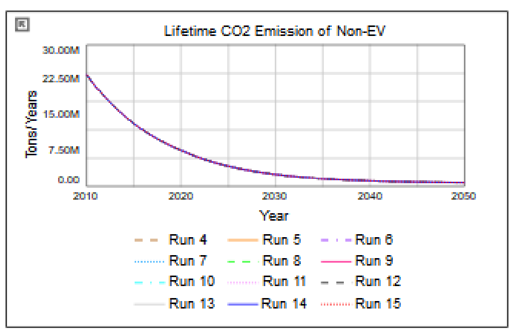


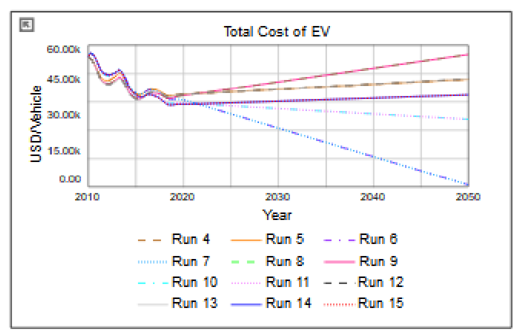


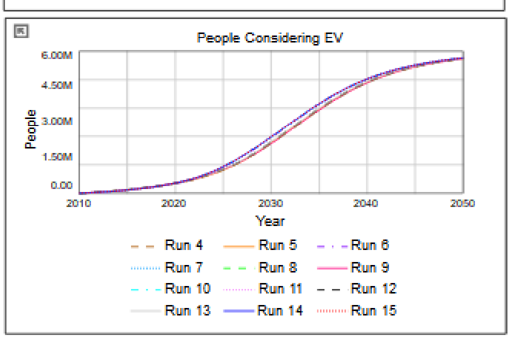


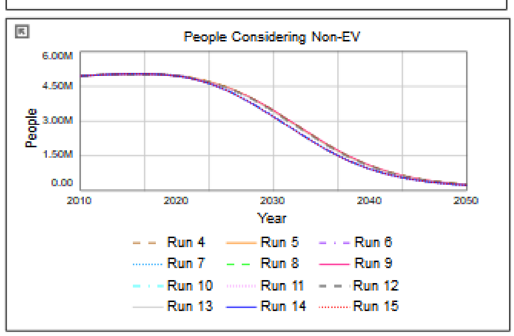












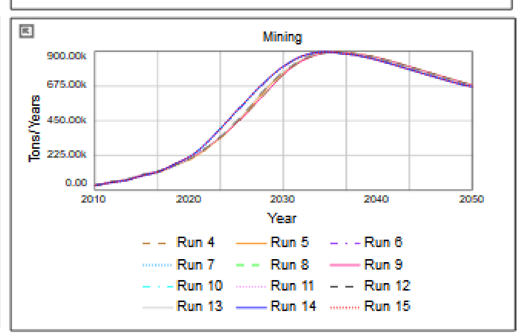
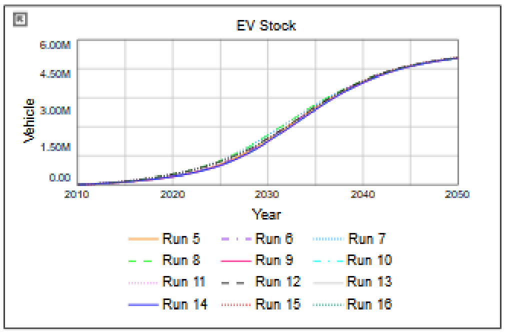
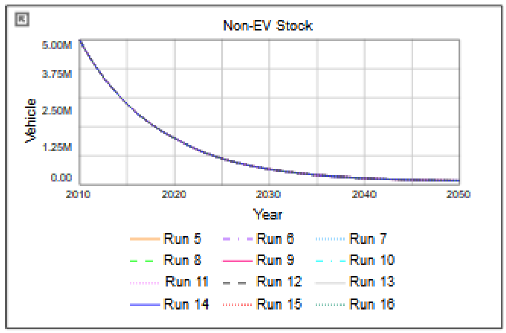
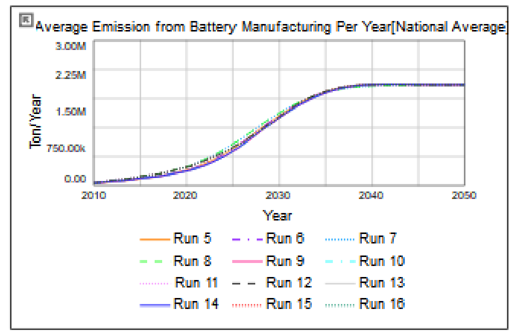


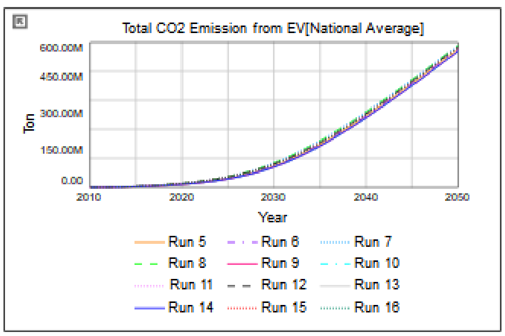
Table Functions [Average Maintenance and Repair Cost of non-EV]

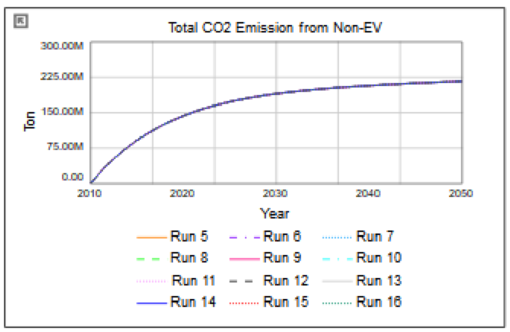
The effect of “Average Maintenance and Repair Cost of non-EV” goes from (0.04-0.07). Sensitivity analysis of different built in shapes from Stella Architect and also changing the values in both X (0.02 – 0.09) and Y (2015 - 2030) were tested. The graphs from the analysis are below. It was apparent that using different shapes in the table function has very little impact on numerical sensitivity for most of the variables except Total cost of non-EV. Behavior remained the same for all the variables except Total cost of non-EV.

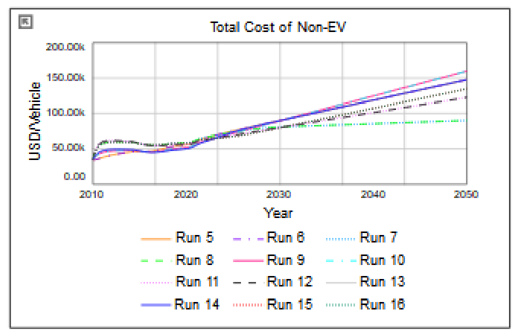


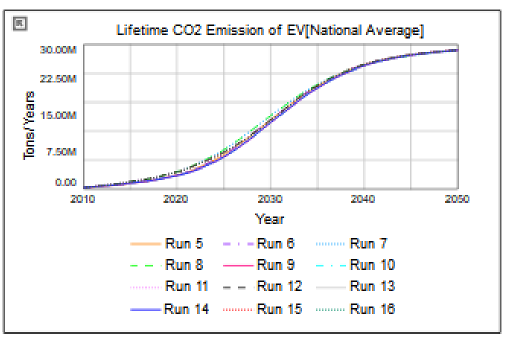


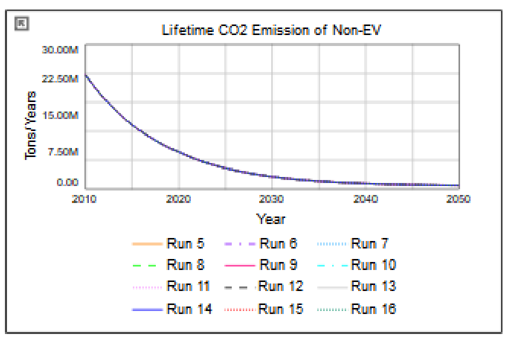


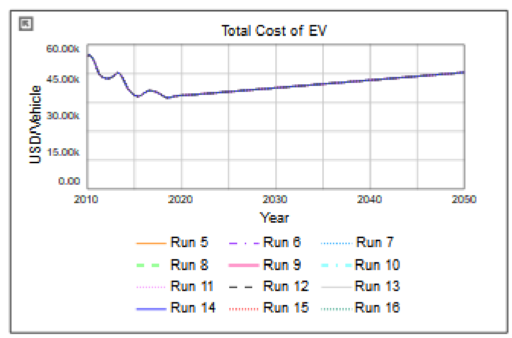


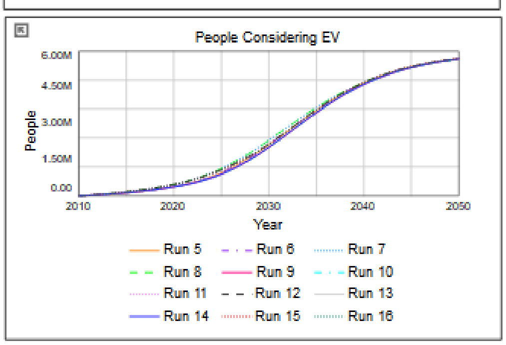


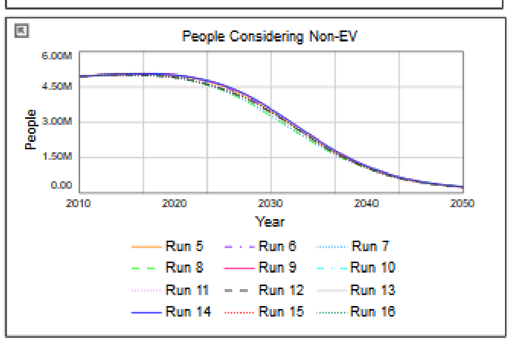












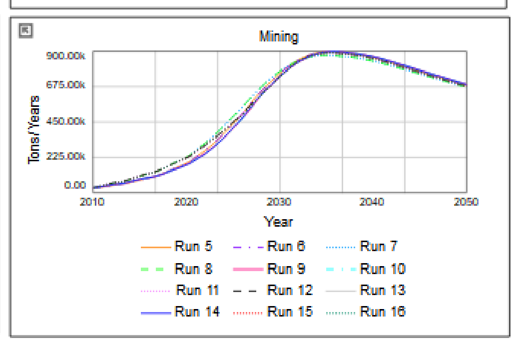
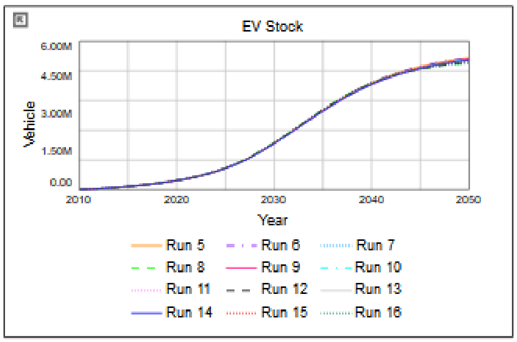
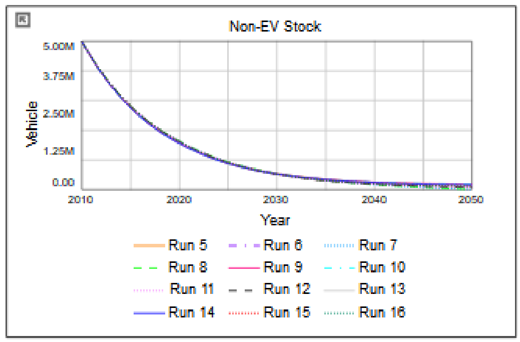
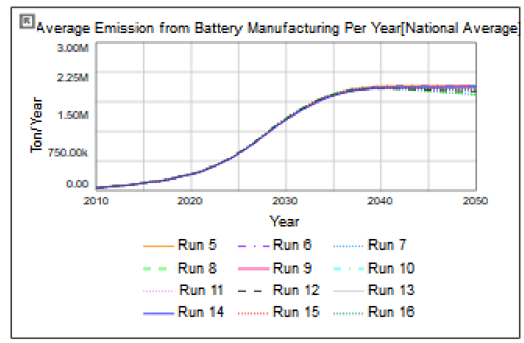


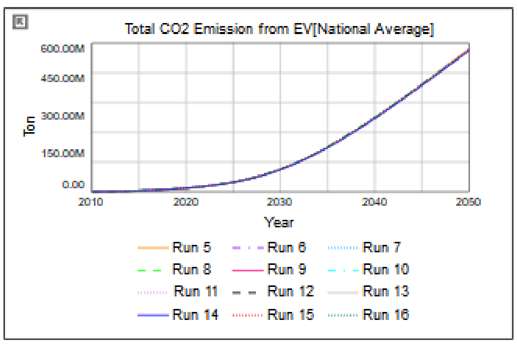
Table Functions [Share of Driving Population in Total Population]

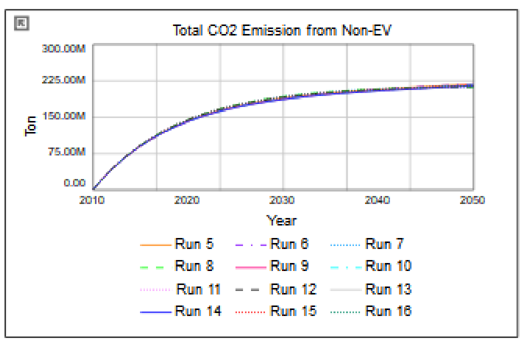
The effect of “Share of Driving Population in Total Population” goes from (0.8-0.85). Sensitivity analysis of different built in shapes from Stella Architect and also changing the values in both X (0.6 – 1.00) and Y (2010 - 2030) were tested. The graphs from the analysis are below. The graphs from the analysis are below. It was apparent that using different shapes in the table function has very little impact on numerical sensitivity and behavioral modes for most of the variables.

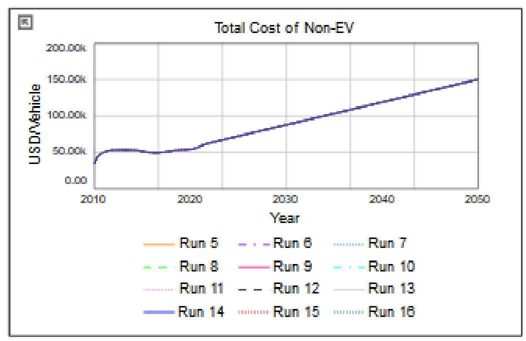


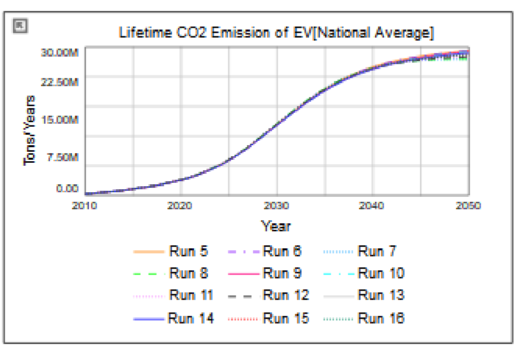


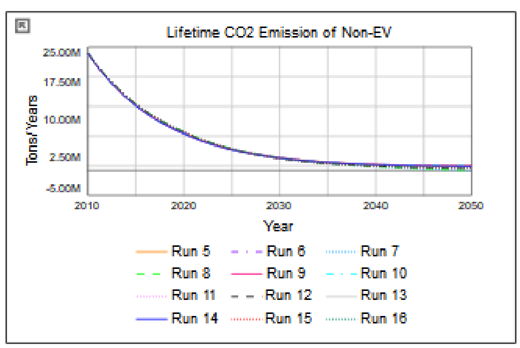


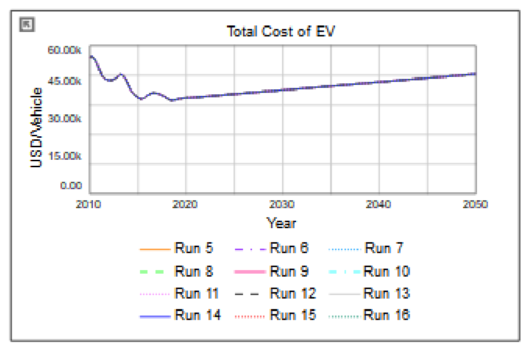


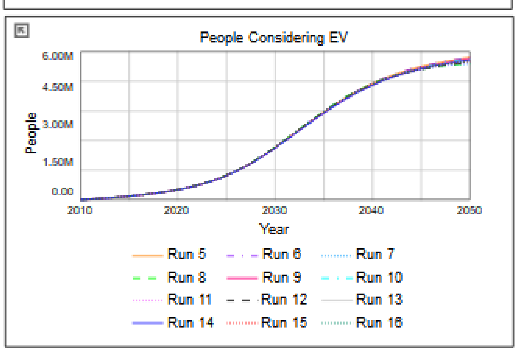


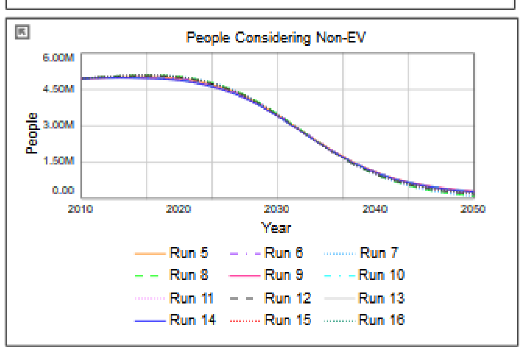


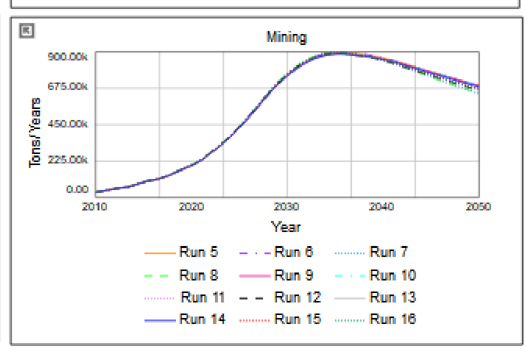












Appendix B

Model Documentation

Name	Equation	Properties	Units	Documentation
Battery:				
Accessible_Global_Raw_Materials_Reserve	IF "Test_Switch_-_Material_Reserve" = 0 THEN Global_Raw_Materials_Reserve*Quarter ELSE IF "Test_Switch_-_Material_Reserve" = 1 THEN Global_Raw_Materials_Reserve*Half ELSE Global_Raw_Materials_Reserve		Ton	This is how much of the world's stockpile of raw resources is within easy reach for the United States.
Average_Emission_from_Battery_Manufacturing_Per_Year[State]	Emission_From_Battery_Manufacturing*Manufacturing_of_EV		Ton/Year	This variable represents the annual emissions from EV manufacturing.
Battery_Capacity	50		kWh/Battery	This represents the total energy storage capacity of each battery in kilowatt hours.
CO2_Emission_Per_Ton_Raw_Materials_Mining	2		Ton/Ton	According to a study published in Nature Sustainability in 2020, the average CO2 emissions associated with the production of various basic materials for EV batteries were estimated to be between 1.3 and 2.3 tonnes per tonne of material produced. This estimation incorporates the phases of mining, processing, and refining.
Coverage_of_Raw_Materials_Demand	Demand_for_Raw_Materials//Mining		dmnl	This metric represents the equilibrium between raw material demand and supply.
Demand_for_Raw_Materials	IF "Test_Switch_-_Raw_Materials_Usage"=0 THEN ("EV_Sales_-_New_Customer"+"EV_Sales_-_Existing_Customer")*Battery_Per_EV*"Raw_Materials_Required_per_EV_Battery_-_Highest_Value" ELSE ("EV_Sales_-_New_Customer"+"EV_Sales_-_Existing_Customer")*Battery_Per_EV*"Raw_Materials_Required_per_EV_Battery_-_Lowest_Value"		Tons/Years	This is a variable that represents the entire demand for raw materials used in the production of EV batteries.
Discovered_New_Usable_Deposits	Increasing_Rate*Raw_Materials_Reserve		Tons/Years	This flow displays the yearly average proportion of newly discovered raw materials that is gets exploited.
Effect_of_Demand_Coverage_on_Manufacturing	GRAPH(Coverage_of_Raw_Materials_Demand) Points: (0.000, 0.500), (0.150, 0.565), (0.300, 0.709), (0.450, 0.816), (0.600, 0.923), (0.750, 1.067), (0.900, 1.184), (1.050, 1.230), (1.200, 1.244), (1.350, 1.263), (1.500, 1.263)		dmnl	This is a graphical representation of a variable that measures how well raw material needs are met. The greater the scope of coverage, the greater the output. If there is less protection, there will be fewer products made.
Effect_of_Low_Stock	GRAPH(Relative_Stock_Size) Points: (0.000, 0.000), (0.100, 0.0168), (0.200, 0.03978), (0.300, 0.0712), (0.400, 0.1142), (0.500, 0.1729), (0.600, 0.2533), (0.700, 0.3632), (0.800, 0.5135), (0.900, 0.719), (1.000, 1.000)		dmnl	This variable is a graphical representation of the stock's relative magnitude. This influence on mining precludes the model from producing a negative reserve stock.

Effect_of_Mining_on_Cost_of_Battery	GRAPH(Relative_Mining_Rate) Points: (0.0, 0), (70.0, 0.006121), (140.0, 0.01289), (210.0, 0.02036), (280.0, 0.02862), (350.0, 0.03775), (420.0, 0.04785), (490.0, 0.059), (560.0, 0.07132), (630.0, 0.08495), (700.0, 0.1)		dmnl	This is a graphical representation of the relative mining rate's effect on battery price.
Emission_From_Battery_Manufacturing[State]	CO2_Emission_For_Each_kWh_Energy_Generation*Energy_Needed_To_Manufacture_Battery		Ton/Vehicle	The value of this variable represents the quantity of carbon dioxide released during battery production for each EV.
Emission_From_Mining(t)	Emission_From_Mining(t - dt) + (Net_Increase_of_CO2_Emission_from_Mining) * dt	INIT Emission_From_Mining = 0	Ton	The stock depicts the total cumulative CO2 emissions from raw material mining.
Energy_Needed_To_Manufacture_Battery	Energy_Needed_To_Manufacture_Per_kWh_Battery*Battery_Capacity*Battery_Per_EV		kWh/Vehicle	This value represents the typical energy expenditure in kilowatt-hours required to manufacture an EV battery.
Energy_Needed_To_Manufacture_Per_kWh_Battery	65		kWh/kWh	This value represents the typical energy expenditure in kilowatt-hours required to manufacture 1 kWh of EV batteries.
Global_Raw_Materials_Reserve	3.63E+08		Ton	According to International Energy Agency (IEA): Lithium reserves are estimated to be over 17 million metric tons (MT) globally. It is worth mentioning that lithium deposits are distributed throughout various nations, with the greatest quantities being located in Australia, Chile, Argentina, and China. Cobalt reserves are estimated to be approximately 7.1 million MT globally. The Democratic Republic of the Congo (DRC) is home to the vast bulk of the world's cobalt deposits. Nickel reserves are estimated to be approximately 89 million MT globally. Countries with significant nickel deposits include Indonesia, the Philippines, Russia, and Canada. Graphite reserves are estimated to be over 250 million MT globally. China is the leading producer and has huge deposits of graphite, followed by nations such as Brazil, Canada, and India.
Half	0.5		dmnl	This variable is used to calculate the half of the ''Global Raw Materials Reserve''.
Increasing_Rate	0.001		dmnl/Year	This variable displays the yearly average proportion of newly discovered raw materials that is viable to exploit economically.
Mining	Demand_for_Raw_Materials*Effect_of_Low_Stock		Tons/Years	This is an outflow of the Stock raw materials.Mining is determined based on raw material demand and the influence of low stock variables.
Net_Increase_of_CO2_Emission_from_Mining	Mining*CO2_Emission_Per_Ton_Raw_Materials_Mining		ton/year	This represents a flux of Emission from mining stock. This input calculated the net increase in CO2 emissions from mining operations.
Quarter	0.25		dmnl	This variable is used to calculate the quarter of the ''Global Raw Materials Reserve''.
				Total Materials needed for an EV battery. Lithium: Assuming a lithium concentration of 0.15 to 0.3 kilograms per kWh of battery capacity, a 50 kWh battery pack would contain around 7.5 to 15 kilograms of lithium. When stated in tons, this equates to around 0.0075 to 0.015 tons of lithium.

"Raw_Materials_Required_per_EV_Battery_-_Highest_Value"	0.965		Ton/Battery	Cobalt: A 50 kWh battery pack is estimated to contain 0.1 to 0.2 tons of cobalt, or 10 to 20 kilograms per kilowatt-hour of battery capacity. If nickel weighs between 30 and 60 kilograms per kilowatt-hour of battery capacity, a 50 kWh battery pack would contain between 0.3 and 0.6 tons of nickel. Graphite: Based on an estimate of 5 to 15 kilos of graphite per kilowatt-hour of battery capacity, a 50 kWh battery pack would contain around 0.05 to 0.15 tons of graphite.
"Raw_Materials_Required_per_EV_Battery_-_Lowest_Value"	0.4575		Ton/Battery	Total Materials needed for an EV battery. For efficient built - Less Material Usage
Raw_Materials_Reserve(t)	Raw_Materials_Reserve(t - dt) + (Discovered_New_Usable_Deposits - Mining) * dt	INIT Raw_Materials_Reserve = Accessible_Global_Raw_Materials_Reserve	Ton	This stock represents the aggregated raw material reserves around the globe which is accessible to USA.
Relative_Mining_Rate	Mining/INIT(Mining)		dmnl	The value of extracting raw materials is normalized by this parameter.
Relative_Stock_Size	Raw_Materials_Reserve/INIT(Raw_Materials_Reserve)		dmnl	This metric evaluates the current raw material stockpile against the starting stockpile.
"Test_Switch_-_Material_Reserve"	0		dmnl	To switch between accessible raw material reserve amount.
"Test_Switch_-_Raw_Materials_Usage"	0		dmnl	To switch between battery production raw materials lowest and highest value.
Energy_Mix:				
Biomass_&_Other_Renewable_Sources[Alabama]	0.022			
Biomass_&_Other_Renewable_Sources[Alaska]	0.006			
Biomass_&_Other_Renewable_Sources[Arizona]	0.002			
Biomass_&_Other_Renewable_Sources[Arkansas]	0.017			
Biomass_&_Other_Renewable_Sources[California]	0.04			
Biomass_&_Other_Renewable_Sources[Colorado]	0.004			
Biomass_&_Other_Renewable_Sources[Connecticut]	0.032			
Biomass_&_Other_Renewable_Sources[Delaware]	0.053			
Biomass_&_Other_Renewable_Sources[Florida]	0.028			
Biomass_&_Other_Renewable_Sources[Georgia]	0.046			

Biomass_&_Other_Renewable_Sources[Hawaii]	0.068			
Biomass_&_Other_Renewable_Sources[Idaho]	0.033			
Biomass_&_Other_Renewable_Sources[Illinois]	0.005			
Biomass_&_Other_Renewable_Sources[Indiana]	0.033			
Biomass_&_Other_Renewable_Sources[Iowa]	0.003			
Biomass_&_Other_Renewable_Sources[Kansas]	0.001			
Biomass_&_Other_Renewable_Sources[Kentucky]	0.006			
Biomass_&_Other_Renewable_Sources[Louisiana]	0.042			
Biomass_&_Other_Renewable_Sources[Maine]	0.223			
Biomass_&_Other_Renewable_Sources[Maryland]	0.019			
Biomass_&_Other_Renewable_Sources[Massachusetts]	0.103			
Biomass_&_Other_Renewable_Sources[Michigan]	0.031			
Biomass_&_Other_Renewable_Sources[Minnesota]	0.027			
Biomass_&_Other_Renewable_Sources[Mississippi]	0.021			
Biomass_&_Other_Renewable_Sources[Missouri]	0.002			
Biomass_&_Other_Renewable_Sources[Montana]	0.013		dmnl	The value of this variable represents the share of biomass & other renewable power in each state's overall electricity production.
Biomass_&_Other_Renewable_Sources[Nebraska]	0.002			
Biomass_&_Other_Renewable_Sources[Nevada]	0.002			
Biomass_&_Other_Renewable_Sources[New_Hampshire]	0.062			
Biomass_&_Other_Renewable_Sources[New_Jersey]	0.023			
Biomass_&_Other_Renewable_Sources[New_Mexico]	0.001			
Biomass_&_Other_Renewable_Sources[New_York]	0.023			
Biomass_&_Other_Renewable_Sources[North_Carolina]	0.018			
Biomass_&_Other_Renewable_Sources[North_Dakota]	0.002			

Biomass_&_Other_Renewable_Sources[Ohio]	0.011	
Biomass_&_Other_Renewable_Sources[Oklahoma]	0.004	
Biomass_&_Other_Renewable_Sources[Oregon]	0.017	
Biomass_&_Other_Renewable_Sources[Pennsylvania]	0.014	
Biomass_&_Other_Renewable_Sources[Rhode_Island]	0.025	
Biomass_&_Other_Renewable_Sources[South_Carolina]	0.024	
Biomass_&_Other_Renewable_Sources[South_Dakota]	0.001	
Biomass_&_Other_Renewable_Sources[Tennessee]	0.008	
Biomass_&_Other_Renewable_Sources[Texas]	0.009	
Biomass_&_Other_Renewable_Sources[Utah]	0.006	
Biomass_&_Other_Renewable_Sources[Vermont]	0.252	
Biomass_&_Other_Renewable_Sources[Virginia]	0.042	
Biomass_&_Other_Renewable_Sources[Washington]	0.016	
Biomass_&_Other_Renewable_Sources[West_Virginia]	0.001	
Biomass_&_Other_Renewable_Sources[Wisconsin]	0.018	
Biomass_&_Other_Renewable_Sources[Wyoming]	0.01	
Biomass_&_Other_Renewable_Sources[National_Average]	0.0067	
CO2_Emission_For_Each_kWh_Energy_Generation[Alabama]	Emission_From_Nuclear[Alabama]+Emission_From_Hydro[Alabama]+Emission_From_Geothermal[Alabama]+Emission_From_Solar[Alabama]+Emission_From_Wind[Alabama]+Emission_From_Biomass_&_Others[Alabama]+Emission_From_Coal[Alabama]+Emission_From_Natural_Gas[Alabama]+Emission_From_Petroleum[Alabama]	
CO2_Emission_For_Each_kWh_Energy_Generation[Alaska]	Emission_From_Nuclear[Alaska]+Emission_From_Hydro[Alaska]+Emission_From_Geothermal[Alaska]+Emission_From_Solar[Alaska]+Emission_From_Wind[Alaska]+Emission_From_Biomass_&_Others[Alaska]+Emission_From_Coal[Alaska]+Emission_From_Natural_Gas[Alaska]+Emission_From_Petroleum[Alaska]	

CO2_Emission_For_Each_kWh_Energy_Generation[Arizona]	Emission_From_Nuclear[Arizona]+Emission_From_Hydro[Arizona]+Emission_From_Geothermal[Arizona]+Emission_From_Solar[Arizona]+Emission_From_Wind[Arizona]+Emission_From_Biomass_&_Others[Arizona]+Emission_From_Coal[Arizona]+Emission_From_Natural_Gas[Arizona]+Emission_From_Petroleum[Arizona]	
CO2_Emission_For_Each_kWh_Energy_Generation[Arkansas]	Emission_From_Nuclear[Arkansas]+Emission_From_Hydro[Arkansas]+Emission_From_Solar+Emission_From_Geothermal[Arkansas]+Emission_From_Wind[Arkansas]+Emission_From_Biomass_&_Others[Arkansas]+Emission_From_Coal[Arkansas]+Emission_From_Natural_Gas[Arkansas]+Emission_From_Petroleum[Arkansas]	
CO2_Emission_For_Each_kWh_Energy_Generation[California]	Emission_From_Nuclear[California]+Emission_From_Hydro[California]+Emission_From_Geothermal[California]+Emission_From_Solar[California]+Emission_From_Wind[California]+Emission_From_Biomass_&_Others[California]+Emission_From_Coal[California]+Emission_From_Natural_Gas[California]+Emission_From_Petroleum[California]	
CO2_Emission_For_Each_kWh_Energy_Generation[Colorado]	Emission_From_Nuclear[Colorado]+Emission_From_Hydro[Colorado]+Emission_From_Geothermal[Colorado]+Emission_From_Solar[Colorado]+Emission_From_Wind[Colorado]+Emission_From_Biomass_&_Others[Colorado]+Emission_From_Coal[Colorado]+Emission_From_Natural_Gas[Colorado]+Emission_From_Petroleum[Colorado]	
CO2_Emission_For_Each_kWh_Energy_Generation[Connecticut]	Emission_From_Nuclear[Connecticut]+Emission_From_Hydro[Connecticut]+Emission_From_Geothermal[Connecticut]+Emission_From_Solar[Connecticut]+Emission_From_Wind[Connecticut]+Emission_From_Biomass_&_Others[Connecticut]+Emission_From_Coal[Connecticut]+Emission_From_Natural_Gas[Connecticut]+Emission_From_Petroleum[Connecticut]	
CO2_Emission_For_Each_kWh_Energy_Generation[Delaware]	Emission_From_Nuclear[Delaware]+Emission_From_Hydro[Delaware]+Emission_From_Geothermal[Delaware]+Emission_From_Solar[Delaware]+Emission_From_Wind[Delaware]+Emission_From_Biomass_&_Others[Delaware]+Emission_From_Coal[Delaware]+Emission_From_Natural_Gas[Delaware]+Emission_From_Petroleum[Delaware]	

CO2_Emission_For_Each_kWh_Energy_Generation[Florida]	Emission_From_Nuclear[Florida]+Emission_From_Hydro[Florida]+Emission_From_Geothermal[Florida]+Emission_From_Solar[Florida]+Emission_From_Wind[Florida]+Emission_From_Biomass_&_Others[Florida]+Emission_From_Coal[Florida]+Emission_From_Natural_Gas[Florida]+Emission_From_Petroleum[Florida]	
CO2_Emission_For_Each_kWh_Energy_Generation[Georgia]	Emission_From_Nuclear[Georgia]+Emission_From_Hydro[Georgia]+Emission_From_Geothermal[Georgia]+Emission_From_Solar[Georgia]+Emission_From_Wind[Georgia]+Emission_From_Biomass_&_Others[Georgia]+Emission_From_Coal[Georgia]+Emission_From_Natural_Gas[Georgia]+Emission_From_Petroleum[Georgia]	
CO2_Emission_For_Each_kWh_Energy_Generation[Hawaii]	Emission_From_Nuclear[Hawaii]+Emission_From_Hydro[Hawaii]+Emission_From_Geothermal[Hawaii]+Emission_From_Solar[Hawaii]+Emission_From_Wind[Hawaii]+Emission_From_Biomass_&_Others[Hawaii]+Emission_From_Coal[Hawaii]+Emission_From_Natural_Gas[Hawaii]+Emission_From_Petroleum[Hawaii]	
CO2_Emission_For_Each_kWh_Energy_Generation[Idaho]	Emission_From_Nuclear[Idaho]+Emission_From_Hydro[Idaho]+Emission_From_Geothermal[Idaho]+Emission_From_Solar[Idaho]+Emission_From_Wind[Idaho]+Emission_From_Biomass_&_Others[Idaho]+Emission_From_Coal[Idaho]+Emission_From_Natural_Gas[Idaho]+Emission_From_Petroleum[Idaho]	
CO2_Emission_For_Each_kWh_Energy_Generation[Illinois]	Emission_From_Nuclear[Illinois]+Emission_From_Hydro[Illinois]+Emission_From_Geothermal[Illinois]+Emission_From_Solar[Illinois]+Emission_From_Wind[Illinois]+Emission_From_Biomass_&_Others[Illinois]+Emission_From_Coal[Illinois]+Emission_From_Natural_Gas[Illinois]+Emission_From_Petroleum[Illinois]	
CO2_Emission_For_Each_kWh_Energy_Generation[Indiana]	Emission_From_Nuclear[Indiana]+Emission_From_Hydro[Indiana]+Emission_From_Geothermal[Indiana]+Emission_From_Solar[Indiana]+Emission_From_Wind[Indiana]+Emission_From_Biomass_&_Others[Indiana]+Emission_From_Coal[Indiana]+Emission_From_Natural_Gas[Indiana]+Emission_From_Petroleum[Indiana]	

CO2_Emission_For_Each_kWh_Energy_Generation[Iowa]	Emission_From_Nuclear[Iowa]+Emission_From_Hydro[Iowa]+Emission_From_Geothermal[Iowa]+Emission_From_Solar[Iowa]+Emission_From_Wind[Iowa]+Emission_From_Biomass_&_Others[Iowa]+Emission_From_Coal[Iowa]+Emission_From_Natural_Gas[Iowa]+Emission_From_Petroleum[Iowa]	
CO2_Emission_For_Each_kWh_Energy_Generation[Kansas]	Emission_From_Nuclear[Kansas]+Emission_From_Hydro[Kansas]+Emission_From_Geothermal[Kansas]+Emission_From_Solar[Kansas]+Emission_From_Wind[Kansas]+Emission_From_Biomass_&_Others[Kansas]+Emission_From_Coal[Kansas]+Emission_From_Natural_Gas[Kansas]+Emission_From_Petroleum[Kansas]	
CO2_Emission_For_Each_kWh_Energy_Generation[Kentucky]	Emission_From_Nuclear[Kentucky]+Emission_From_Hydro[Kentucky]+Emission_From_Geothermal[Kentucky]+Emission_From_Solar[Kentucky]+Emission_From_Wind[Kentucky]+Emission_From_Biomass_&_Others[Kentucky]+Emission_From_Coal[Kentucky]+Emission_From_Natural_Gas[Kentucky]+Emission_From_Petroleum[Kentucky]	
CO2_Emission_For_Each_kWh_Energy_Generation[Louisiana]	Emission_From_Nuclear[Louisiana]+Emission_From_Hydro[Louisiana]+Emission_From_Geothermal[Louisiana]+Emission_From_Solar[Louisiana]+Emission_From_Wind[Louisiana]+Emission_From_Biomass_&_Others[Louisiana]+Emission_From_Coal[Louisiana]+Emission_From_Natural_Gas[Louisiana]+Emission_From_Petroleum[Louisiana]	
CO2_Emission_For_Each_kWh_Energy_Generation[Maine]	Emission_From_Nuclear[Maine]+Emission_From_Hydro[Maine]+Emission_From_Geothermal[Maine]+Emission_From_Solar[Maine]+Emission_From_Wind[Maine]+Emission_From_Biomass_&_Others[Maine]+Emission_From_Coal[Maine]+Emission_From_Natural_Gas[Maine]+Emission_From_Petroleum[Maine]	
CO2_Emission_For_Each_kWh_Energy_Generation[Maryland]	Emission_From_Nuclear[Maryland]+Emission_From_Hydro[Maryland]+Emission_From_Geothermal[Maryland]+Emission_From_Solar[Maryland]+Emission_From_Wind[Maryland]+Emission_From_Biomass_&_Others[Maryland]+Emission_From_Coal[Maryland]+Emission_From_Natural_Gas[Maryland]+Emission_From_Petroleum[Maryland]	

CO2_Emission_For_Each_kWh_Energy_Generation[Massachusetts]	Emission_From_Nuclear[Massachusetts]+Emission_From_Hydro[Massachusetts]+Emission_From_Geothermal[Massachusetts]+Emission_From_Solar[Massachusetts]+Emission_From_Wind[Massachusetts]+Emission_From_Biomass_&_Others[Massachusetts]+Emission_From_Coal[Massachusetts]+Emission_From_Natural_Gas[Massachusetts]+Emission_From_Petroleum[Massachusetts]	
CO2_Emission_For_Each_kWh_Energy_Generation[Michigan]	Emission_From_Nuclear[Michigan]+Emission_From_Hydro[Michigan]+Emission_From_Geothermal[Michigan]+Emission_From_Solar[Michigan]+Emission_From_Wind[Michigan]+Emission_From_Biomass_&_Others[Michigan]+Emission_From_Coal[Michigan]+Emission_From_Natural_Gas[Michigan]+Emission_From_Petroleum[Michigan]	
CO2_Emission_For_Each_kWh_Energy_Generation[Minnesota]	Emission_From_Nuclear[Minnesota]+Emission_From_Hydro[Minnesota]+Emission_From_Geothermal[Minnesota]+Emission_From_Solar[Minnesota]+Emission_From_Wind[Minnesota]+Emission_From_Biomass_&_Others[Minnesota]+Emission_From_Coal[Minnesota]+Emission_From_Natural_Gas[Minnesota]+Emission_From_Petroleum[Minnesota]	
CO2_Emission_For_Each_kWh_Energy_Generation[Mississippi]	Emission_From_Nuclear[Mississippi]+Emission_From_Hydro[Mississippi]+Emission_From_Geothermal[Mississippi]+Emission_From_Solar[Mississippi]+Emission_From_Wind[Mississippi]+Emission_From_Biomass_&_Others[Mississippi]+Emission_From_Coal[Mississippi]+Emission_From_Petroleum[Mississippi]+Emission_From_Natural_Gas[Mississippi]	
CO2_Emission_For_Each_kWh_Energy_Generation[Missouri]	Emission_From_Nuclear[Missouri]+Emission_From_Hydro[Missouri]+Emission_From_Geothermal[Missouri]+Emission_From_Solar[Missouri]+Emission_From_Wind[Missouri]+Emission_From_Biomass_&_Others[Missouri]+Emission_From_Coal[Missouri]+Emission_From_Natural_Gas[Missouri]+Emission_From_Petroleum[Missouri]	
CO2_Emission_For_Each_kWh_Energy_Generation[Montana]	Emission_From_Nuclear[Montana]+Emission_From_Hydro[Montana]+Emission_From_Geothermal[Montana]+Emission_From_Solar[Montana]+Emission_From_Wind[Montana]+Emission_From_Biomass_&_Others[Montana]+Emission_From_Coal[Montana]+Emission_From_Natural_Gas[Montana]+Emission_From_Petroleum[Montana]	

CO2_Emission_For_Each_kWh_Energy_Generation[Nebraska]	Emission_From_Nuclear[Nebraska]+Emission_From_Hydro[Nebraska]+Emission_From_Geothermal[Nebraska]+Emission_From_Solar[Nebraska]+Emission_From_Wind[Nebraska]+Emission_From_Biomass_&_Others[Nebraska]+Emission_From_Coal[Nebraska]+Emission_From_Natural_Gas[Nebraska]+Emission_From_Petroleum[Nebraska]		Ton/kWh	This represents the amount of CO2 emitted to create one kWh of power in each state.
CO2_Emission_For_Each_kWh_Energy_Generation[Nevada]	Emission_From_Nuclear[Nevada]+Emission_From_Hydro[Nevada]+Emission_From_Solar[Nevada]+Emission_From_Geothermal[Nevada]+Emission_From_Wind[Nevada]+Emission_From_Biomass_&_Others[Nevada]+Emission_From_Coal[Nevada]+Emission_From_Natural_Gas[Nevada]+Emission_From_Petroleum[Nevada]			
CO2_Emission_For_Each_kWh_Energy_Generation[New_Hampshire]	Emission_From_Nuclear[New_Hampshire]+Emission_From_Hydro[New_Hampshire]+Emission_From_Geothermal[New_Hampshire]+Emission_From_Solar[New_Hampshire]+Emission_From_Wind[New_Hampshire]+Emission_From_Biomass_&_Others[New_Hampshire]+Emission_From_Coal[New_Hampshire]+Emission_From_Natural_Gas[New_Hampshire]+Emission_From_Petroleum[New_Hampshire]			
CO2_Emission_For_Each_kWh_Energy_Generation[New_Jersey]	Emission_From_Nuclear[New_Jersey]+Emission_From_Hydro[New_Jersey]+Emission_From_Geothermal[New_Jersey]+Emission_From_Solar[New_Jersey]+Emission_From_Wind[New_Jersey]+Emission_From_Biomass_&_Others[New_Jersey]+Emission_From_Coal[New_Jersey]+Emission_From_Natural_Gas[New_Jersey]+Emission_From_Petroleum[New_Jersey]			
CO2_Emission_For_Each_kWh_Energy_Generation[New_Mexico]	Emission_From_Nuclear[New_Mexico]+Emission_From_Hydro[New_Mexico]+Emission_From_Geothermal[New_Mexico]+Emission_From_Solar[New_Mexico]+Emission_From_Wind[New_Mexico]+Emission_From_Biomass_&_Others[New_Mexico]+Emission_From_Coal[New_Mexico]+Emission_From_Natural_Gas[New_Mexico]+Emission_From_Petroleum[New_Mexico]			
CO2_Emission_For_Each_kWh_Energy_Generation[New_York]	Emission_From_Nuclear[New_York]+Emission_From_Hydro[New_York]+Emission_From_Geothermal[New_York]+Emission_From_Solar[New_York]+Emission_From_Wind[New_York]+Emission_From_Biomass_&_Others[New_York]+Emission_From_Natural_Gas[New_York]+Emission_From_Coal[New_York]+Emission_From_Petroleum[New_York]			

CO2_Emission_For_Each_kWh_Energy_Generation[North_Carolina]	Emission_From_Nuclear[North_Carolina]+Emission_From_Hydro[North_Carolina]+Emission_From_Geothermal[North_Carolina]+Emission_From_Solar[North_Carolina]+Emission_From_Wind[North_Carolina]+Emission_From_Biomass_&_Others[North_Carolina]+Emission_From_Coal[North_Carolina]+Emission_From_Natural_Gas[North_Carolina]+Emission_From_Petroleum[North_Carolina]	
CO2_Emission_For_Each_kWh_Energy_Generation[North_Dakota]	Emission_From_Nuclear[North_Dakota]+Emission_From_Hydro[North_Dakota]+Emission_From_Geothermal[North_Dakota]+Emission_From_Solar[North_Dakota]+Emission_From_Wind[North_Dakota]+Emission_From_Biomass_&_Others[North_Dakota]+Emission_From_Coal[North_Dakota]+Emission_From_Natural_Gas[North_Dakota]+Emission_From_Petroleum[North_Dakota]	
CO2_Emission_For_Each_kWh_Energy_Generation[Ohio]	Emission_From_Nuclear[Ohio]+Emission_From_Hydro[Ohio]+Emission_From_Geothermal[Ohio]+Emission_From_Solar[Ohio]+Emission_From_Wind[Ohio]+Emission_From_Biomass_&_Others[Ohio]+Emission_From_Coal[Ohio]+Emission_From_Natural_Gas[Ohio]+Emission_From_Petroleum[Ohio]	
CO2_Emission_For_Each_kWh_Energy_Generation[Oklahoma]	Emission_From_Nuclear[Oklahoma]+Emission_From_Hydro[Oklahoma]+Emission_From_Geothermal[Oklahoma]+Emission_From_Solar[Oklahoma]+Emission_From_Wind[Oklahoma]+Emission_From_Biomass_&_Others[Oklahoma]+Emission_From_Natural_Gas[Oklahoma]+Emission_From_Coal[Oklahoma]+Emission_From_Petroleum[Oklahoma]	
CO2_Emission_For_Each_kWh_Energy_Generation[Oregon]	Emission_From_Nuclear[Oregon]+Emission_From_Hydro[Oregon]+Emission_From_Geothermal[Oregon]+Emission_From_Solar[Oregon]+Emission_From_Wind[Oregon]+Emission_From_Biomass_&_Others[Oregon]+Emission_From_Coal[Oregon]+Emission_From_Natural_Gas[Oregon]+Emission_From_Petroleum[Oregon]	
CO2_Emission_For_Each_kWh_Energy_Generation[Pennsylvania]	Emission_From_Nuclear[Pennsylvania]+Emission_From_Hydro[Pennsylvania]+Emission_From_Geothermal[Pennsylvania]+Emission_From_Solar[Pennsylvania]+Emission_From_Wind[Pennsylvania]+Emission_From_Biomass_&_Others[Pennsylvania]+Emission_From_Coal[Pennsylvania]+Emission_From_Natural_Gas[Pennsylvania]+Emission_From_Petroleum[Pennsylvania]	

CO2_Emission_For_Each_kWh_Energy_Generation[Rhode_Island]	Emission_From_Nuclear[Rhode_Island]+Emission_From_Hydro[Rhode_Island]+Emission_From_Geothermal[Rhode_Island]+Emission_From_Solar[Rhode_Island]+Emission_From_Wind[Rhode_Island]+Emission_From_Biomass_&_Others[Rhode_Island]+Emission_From_Coal[Rhode_Island]+Emission_From_Natural_Gas[Rhode_Island]+Emission_From_Petroleum[Rhode_Island]	
CO2_Emission_For_Each_kWh_Energy_Generation[South_Carolina]	Emission_From_Nuclear[South_Carolina]+Emission_From_Hydro[South_Carolina]+Emission_From_Geothermal[South_Carolina]+Emission_From_Solar[South_Carolina]+Emission_From_Wind[South_Carolina]+Emission_From_Biomass_&_Others[South_Carolina]+Emission_From_Coal[South_Carolina]+Emission_From_Natural_Gas[South_Carolina]+Emission_From_Petroleum[South_Carolina]	
CO2_Emission_For_Each_kWh_Energy_Generation[South_Dakota]	Emission_From_Nuclear[South_Dakota]+Emission_From_Hydro[South_Dakota]+Emission_From_Geothermal[South_Dakota]+Emission_From_Solar[South_Dakota]+Emission_From_Wind[North_Dakota]+Emission_From_Biomass_&_Others[South_Dakota]+Emission_From_Coal[South_Dakota]+Emission_From_Natural_Gas[South_Dakota]+Emission_From_Petroleum[South_Dakota]	
CO2_Emission_For_Each_kWh_Energy_Generation[Tennessee]	Emission_From_Nuclear[Tennessee]+Emission_From_Hydro[Tennessee]+Emission_From_Geothermal[Tennessee]+Emission_From_Solar[Tennessee]+Emission_From_Wind[Tennessee]+Emission_From_Biomass_&_Others[Tennessee]+Emission_From_Coal[Tennessee]+Emission_From_Natural_Gas[Tennessee]+Emission_From_Petroleum[Tennessee]	
CO2_Emission_For_Each_kWh_Energy_Generation[Texas]	Emission_From_Nuclear[Texas]+Emission_From_Hydro[Texas]+Emission_From_Geothermal[Texas]+Emission_From_Solar[Texas]+Emission_From_Wind[Texas]+Emission_From_Biomass_&_Others[Texas]+Emission_From_Coal[Texas]+Emission_From_Natural_Gas[Texas]+Emission_From_Petroleum[Texas]	
CO2_Emission_For_Each_kWh_Energy_Generation[Utah]	Emission_From_Nuclear[Utah]+Emission_From_Hydro[Utah]+Emission_From_Geothermal[Utah]+Emission_From_Solar[Utah]+Emission_From_Wind[Utah]+Emission_From_Biomass_&_Others[Utah]+Emission_From_Coal[Utah]+Emission_From_Natural_Gas[Utah]+Emission_From_Petroleum[Utah]	

CO2_Emission_For_Each_kWh_Energy_Generation[Vermont]	Emission_From_Nuclear[Vermont]+Emission_From_Hydro[Vermont]+Emission_From_Geothermal[Vermont]+Emission_From_Solar[Vermont]+Emission_From_Wind[Vermont]+Emission_From_Biomass_&_Others[Vermont]+Emission_From_Coal[Vermont]+Emission_From_Natural_Gas[Vermont]+Emission_From_Petroleum[Vermont]	
CO2_Emission_For_Each_kWh_Energy_Generation[Virginia]	Emission_From_Nuclear[Virginia]+Emission_From_Hydro[Virginia]+Emission_From_Geothermal[Virginia]+Emission_From_Solar[Virginia]+Emission_From_Wind[Virginia]+Emission_From_Biomass_&_Others[Virginia]+Emission_From_Coal[Virginia]+Emission_From_Natural_Gas[Virginia]+Emission_From_Petroleum[Virginia]	
CO2_Emission_For_Each_kWh_Energy_Generation[Washington]	Emission_From_Nuclear[Washington]+Emission_From_Hydro[Washington]+Emission_From_Geothermal[Washington]+Emission_From_Solar[Washington]+Emission_From_Wind[Washington]+Emission_From_Biomass_&_Others[Washington]+Emission_From_Coal[Washington]+Emission_From_Natural_Gas[Washington]+Emission_From_Petroleum[Washington]	
CO2_Emission_For_Each_kWh_Energy_Generation[West_Virginia]	Emission_From_Nuclear[West_Virginia]+Emission_From_Hydro[West_Virginia]+Emission_From_Geothermal[West_Virginia]+Emission_From_Solar[West_Virginia]+Emission_From_Wind[West_Virginia]+Emission_From_Biomass_&_Others[West_Virginia]+Emission_From_Coal[West_Virginia]+Emission_From_Natural_Gas[West_Virginia]+Emission_From_Petroleum[West_Virginia]	
CO2_Emission_For_Each_kWh_Energy_Generation[Wisconsin]	Emission_From_Nuclear[Wisconsin]+Emission_From_Hydro[Wisconsin]+Emission_From_Geothermal[Wisconsin]+Emission_From_Solar[Wisconsin]+Emission_From_Wind[Wisconsin]+Emission_From_Biomass_&_Others[Wisconsin]+Emission_From_Coal[Wisconsin]+Emission_From_Natural_Gas[Wisconsin]+Emission_From_Petroleum[Wisconsin]	
CO2_Emission_For_Each_kWh_Energy_Generation[Wyoming]	Emission_From_Nuclear[Wyoming]+Emission_From_Hydro[Wyoming]+Emission_From_Geothermal[Wyoming]+Emission_From_Solar[Wyoming]+Emission_From_Wind[Wyoming]+Emission_From_Biomass_&_Others[Wyoming]+Emission_From_Coal[Wyoming]+Emission_From_Natural_Gas[Wyoming]+Emission_From_Petroleum[Wyoming]	

CO2_Emission_For_Each_kWh_Energy_Generation[National_Average]	Emission_From_Nuclear[National_Average]+Emission_From_Hydro[National_Average]+Emission_From_Geothermal[National_Average]+Emission_From_Solar[National_Average]+Emission_From_Wind[National_Average]+Emission_From_Biomass_&_Others[National_Average]+Emission_From_Coal[National_Average]+Emission_From_Natural_Gas[National_Average]+Emission_From_Petroleum[National_Average]			
"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	0.00025		Ton/kWh	This variable represents the amount of CO2 emitted by Biomass Energy Plants to generate 1 KWH of energy.
"CO2_Emissions_From_Coal,_Per_kWh"	0.00113		Ton/kWh	This variable represents the amount of CO2 emitted by Coal Power Plants to generate 1 KWH of energy.
"CO2_Emissions_From_Geothermal_Power,_Per_kWh"	0.00011		Ton/kWh	This variable represents the amount of CO2 emitted by Geothermal Energy Plants to generate 1 KWH of energy.
"CO2_Emissions_From_Hydro_Power,_Per_kWh"	2.50E-05		Ton/kWh	This variable represents the amount of CO2 emitted by Hydro Energy Plants to generate 1 KWH of energy.
"CO2_Emissions_From_Natural_Gas,_Per_kWh"	0.000485		Ton/kWh	This variable represents the amount of CO2 emitted by Natural Gas Power Plants to generate 1 KWH of energy.
"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	1.50E-05		Ton/kWh	This variable represents the amount of CO2 emitted by Nuclear Energy Plants to generate 1 KWH of energy.
"CO2_Emissions_From_Petrolium,_Per_kWh"	0.00122		Ton/kWh	This variable represents the amount of CO2 emitted by Petroleum Power Plants to generate 1 KWH of energy.
"CO2_Emissions_From_Solar_Power,_Per_kWh"	0.00015		Ton/kWh	This variable represents the amount of CO2 emitted by Solar Energy Plants to generate 1 KWH of energy.
"CO2_Emissions_From_Wind_Power,_Per_kWh"	1.00E-05		Ton/kWh	This variable represents the amount of CO2 emitted by Wind Energy Plants to generate 1 KWH of energy.
Coal[Alabama]	0.188			
Coal[Alaska]	0.137			
Coal[Arizona]	0.291			
Coal[Arkansas]	0.356			
Coal[California]	0.001			
Coal[Colorado]	0.416			
Coal[Connecticut]	0.006			
Coal[Delaware]	0.068			
Coal[Florida]	0.075			
Coal[Georgia]	0.151			
Coal[Hawaii]	0.118			
Coal[Idaho]	0.001			
Coal[Illinois]	0.239			
Coal[Indiana]	0.577			
Coal[Iowa]	0.335			
Coal[Kansas]	0.342			
Coal[Kentucky]	0.707			
Coal[Louisiana]	0.08			
Coal[Maine]	0.006			
Coal[Maryland]	0.147			

Coal[Massachusetts]	0		dmnl	The value of this variable represents the share of coal power in each state's overall electricity production.
Coal[Michigan]	0.319			
Coal[Minnesota]	0.265			
Coal[Mississippi]	0.08			
Coal[Missouri]	0.744			
Coal[Montana]	0.432			
Coal[Nebraska]	0.492			
Coal[Nevada]	0.066			
Coal[New_Hampshire]	0.016			
Coal[New_Jersey]	0.017			
Coal[New_Mexico]	0.355			
Coal[New_York]	0			
Coal[North_Carolina]	0.155			
Coal[North_Dakota]	0.571			
Coal[Ohio]	0.371			
Coal[Oklahoma]	0.14			
Coal[Oregon]	0			
Coal[Pennsylvania]	0.121			
Coal[Rhode_Island]	0			
Coal[South_Carolina]	0.152			
Coal[South_Dakota]	0.092			
Coal[Tennessee]	0.224			
Coal[Texas]	0.184			
Coal[Utah]	0.618			
Coal[Vermont]	0			
Coal[Virginia]	0.033			
Coal[Washington]	0.029			
Coal[West_Virginia]	0.908			
Coal[Wisconsin]	0.419			
Coal[Wyoming]	0.733			
Coal[National_Average]	0.228			
Emission_From_Biomass_&_Others[Alabama]	Biomass_&_Other_Renewable_Sources[Alabama]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Alaska]	Biomass_&_Other_Renewable_Sources[Alaska]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Arizona]	Biomass_&_Other_Renewable_Sources[Arizona]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Arkansas]	Biomass_&_Other_Renewable_Sources[Arkansas]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[California]	Biomass_&_Other_Renewable_Sources[Alabama]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			

Emission_From_Biomass_&_Others[Colorado]	Biomass_&_Other_Renewable_Sources[Colorado]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Connecticut]	Biomass_&_Other_Renewable_Sources[Connecticut]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Delaware]	Biomass_&_Other_Renewable_Sources[Delaware]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Florida]	Biomass_&_Other_Renewable_Sources[Florida]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Georgia]	Biomass_&_Other_Renewable_Sources[Georgia]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Hawaii]	Biomass_&_Other_Renewable_Sources[Hawaii]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Idaho]	Biomass_&_Other_Renewable_Sources[Idaho]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Illinois]	Biomass_&_Other_Renewable_Sources[Illinois]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Indiana]	Biomass_&_Other_Renewable_Sources[Indiana]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Iowa]	Biomass_&_Other_Renewable_Sources[Iowa]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Kansas]	Biomass_&_Other_Renewable_Sources[Kansas]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Kentucky]	Biomass_&_Other_Renewable_Sources[Kentucky]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Louisiana]	Biomass_&_Other_Renewable_Sources[Louisiana]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Maine]	Biomass_&_Other_Renewable_Sources[Maine]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Maryland]	Biomass_&_Other_Renewable_Sources[Maryland]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	
Emission_From_Biomass_&_Others[Massachusetts]	Biomass_&_Other_Renewable_Sources[Massachusetts]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"	

Emission_From_Biomass_&_Others[Michigan]	Biomass_&_Other_Renewable_Sources[Michigan]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"		Ton/kWh	This shows the amount of CO2 emissions caused by the use of biomass & other energy to generate 1kWh of electricity in each state.
Emission_From_Biomass_&_Others[Minnesota]	Biomass_&_Other_Renewable_Sources[Minnesota]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Mississippi]	Biomass_&_Other_Renewable_Sources[Mississippi]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Missouri]	Biomass_&_Other_Renewable_Sources[Missouri]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Montana]	Biomass_&_Other_Renewable_Sources[Montana]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Nebraska]	Biomass_&_Other_Renewable_Sources[Nebraska]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Nevada]	Biomass_&_Other_Renewable_Sources[Nevada]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[New_Hampshire]	Biomass_&_Other_Renewable_Sources[New_Hampshire]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[New_Jersey]	Biomass_&_Other_Renewable_Sources[New_Jersey]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[New_Mexico]	Biomass_&_Other_Renewable_Sources[New_Mexico]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[New_York]	Biomass_&_Other_Renewable_Sources[New_York]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[North_Carolina]	Biomass_&_Other_Renewable_Sources[North_Carolina]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[North_Dakota]	Biomass_&_Other_Renewable_Sources[North_Dakota]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Ohio]	Biomass_&_Other_Renewable_Sources[Ohio]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Oklahoma]	Biomass_&_Other_Renewable_Sources[Oklahoma]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Oregon]	Biomass_&_Other_Renewable_Sources[Oregon]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			

Emission_From_Biomass_&_Others[Pennsylvania]	Biomass_&_Other_Renewable_Sources[Pennsylvania]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Rhode_Island]	Biomass_&_Other_Renewable_Sources[Rhode_Island]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[South_Carolina]	Biomass_&_Other_Renewable_Sources[South_Carolina]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[South_Dakota]	Biomass_&_Other_Renewable_Sources[South_Dakota]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Tennessee]	Biomass_&_Other_Renewable_Sources[Tennessee]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Texas]	Biomass_&_Other_Renewable_Sources[Texas]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Utah]	Biomass_&_Other_Renewable_Sources[Utah]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Vermont]	Biomass_&_Other_Renewable_Sources[Vermont]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Virginia]	Biomass_&_Other_Renewable_Sources[Virginia]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Washington]	Biomass_&_Other_Renewable_Sources[Washington]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[West_Virginia]	Biomass_&_Other_Renewable_Sources[West_Virginia]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Wisconsin]	Biomass_&_Other_Renewable_Sources[Wisconsin]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[Wyoming]	Biomass_&_Other_Renewable_Sources[Wyoming]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Biomass_&_Others[National_Average]	Biomass_&_Other_Renewable_Sources[National_Average]*"CO2_Emissions_From_Biomass_&_Others,_Per_kWh"			
Emission_From_Coal[Alabama]	Coal[Alabama]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Alaska]	Coal[Alaska]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Arizona]	Coal[Arizona]*"CO2_Emissions_From_Coal,_Per_kWh"			

Emission_From_Coal[Arkansas]	Coal[Arkansas]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[California]	Coal[California]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Colorado]	Coal[Colorado]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Connecticut]	Coal[Connecticut]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Delaware]	Coal[Delaware]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Florida]	Coal[Florida]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Georgia]	Coal[Georgia]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Hawaii]	Coal[Hawaii]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Idaho]	Coal[Idaho]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Illinois]	Coal[Illinois]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Indiana]	Coal[Indiana]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Iowa]	Coal[Iowa]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Kansas]	Coal[Kansas]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Kentucky]	Coal[Kentucky]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Louisiana]	Coal[Louisiana]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Maine]	Coal[Maine]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Maryland]	Coal[Maryland]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Massachusetts]	Coal[Massachusetts]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Michigan]	Coal[Michigan]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Minnesota]	Coal[Minnesota]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Mississippi]	Coal[Mississippi]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Missouri]	Coal[Missouri]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Montana]	Coal[Montana]*"CO2_Emissions_From_Coal,_Per_kWh"		Ton/kWh	This shows the amount of CO2 emissions caused by the use of coal energy to generate 1kWh of electricity in each state.
Emission_From_Coal[Nebraska]	Coal[Nebraska]*"CO2_Emissions_From_Coal,_Per_kWh"			

Emission_From_Coal[Nevada]	Coal[Nevada]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[New_Hampshire]	Coal[New_Hampshire]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[New_Jersey]	Coal[New_Jersey]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[New_Mexico]	Coal[New_Mexico]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[New_York]	Coal[New_York]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[North_Carolina]	Coal[North_Carolina]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[North_Dakota]	Coal[North_Dakota]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Ohio]	Coal[Ohio]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Oklahoma]	Coal[Oklahoma]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Oregon]	Coal[Oregon]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Pennsylvania]	Coal[Pennsylvania]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Rhode_Island]	Coal[Rhode_Island]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[South_Carolina]	Coal[South_Carolina]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[South_Dakota]	Coal[South_Dakota]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Tennessee]	Coal[Tennessee]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Texas]	Coal[Texas]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Utah]	Coal[Utah]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Vermont]	Coal[Vermont]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Virginia]	Coal[Virginia]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Washington]	Coal[Washington]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[West_Virginia]	Coal[West_Virginia]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Wisconsin]	Coal[Wisconsin]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[Wyoming]	Coal[Wyoming]*"CO2_Emissions_From_Coal,_Per_kWh"			
Emission_From_Coal[National_Average]	Coal[National_Average]*"CO2_Emissions_From_Coal,_Per_kWh"			

Emission_From_Geothermal[Alabama]	Geothermal[Alabama]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Alaska]	Geothermal[Alaska]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Arizona]	Geothermal[Arizona]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Arkansas]	Geothermal[Arkansas]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[California]	Geothermal[California]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Colorado]	Geothermal[Colorado]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Connecticut]	Geothermal[Connecticut]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Delaware]	Geothermal[Delaware]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Florida]	Geothermal[Florida]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Georgia]	Geothermal[Georgia]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Hawaii]	Geothermal[Hawaii]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Idaho]	Geothermal[Idaho]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Illinois]	Geothermal[Illinois]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Indiana]	Geothermal[Indiana]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Iowa]	Geothermal[Iowa]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Kansas]	Geothermal[Kansas]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Kentucky]	Geothermal[Kentucky]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Louisiana]	Geothermal[Louisiana]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Maine]	Geothermal[Maine]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Maryland]	Geothermal[Maryland]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Massachusetts]	Geothermal[Massachusetts]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Michigan]	Geothermal[Michigan]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Minnesota]	Geothermal[Minnesota]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			

Emission_From_Geothermal[Mississippi]	Geothermal[Mississippi]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"		Ton/kWh	This shows the amount of CO2 emissions caused by the use of geothermal energy to generate 1kWh of electricity in each state.
Emission_From_Geothermal[Missouri]	Geothermal[Missouri]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Montana]	Geothermal[Montana]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Nebraska]	Geothermal[Nebraska]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Nevada]	Geothermal[Nevada]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[New_Hampshire]	Geothermal[New_Hampshire]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[New_Jersey]	Geothermal[New_Jersey]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[New_Mexico]	Geothermal[New_Mexico]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[New_York]	Geothermal[New_York]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[North_Carolina]	Geothermal[North_Carolina]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[North_Dakota]	Geothermal[North_Dakota]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Ohio]	Geothermal[Ohio]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Oklahoma]	Geothermal[Oklahoma]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Oregon]	Geothermal[Oregon]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Pennsylvania]	Geothermal[Pennsylvania]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Rhode_Island]	Geothermal[Rhode_Island]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[South_Carolina]	Geothermal[South_Carolina]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[South_Dakota]	Geothermal[South_Dakota]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Tennessee]	Geothermal[Tennessee]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Texas]	Geothermal[Texas]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Utah]	Geothermal[Utah]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Vermont]	Geothermal[Vermont]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Virginia]	Geothermal[Virginia]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Washington]	Geothermal[Washington]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			

Emission_From_Geothermal[West_Virginia]	Geothermal[West_Virginia]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Wisconsin]	Geothermal[Wisconsin]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[Wyoming]	Geothermal[Wyoming]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Geothermal[National_Average]	Geothermal[National_Average]*"CO2_Emissions_From_Geothermal_Power,_Per_kWh"			
Emission_From_Hydro[Alabama]	Hydro[Alabama]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Alaska]	Hydro[Alaska]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Arizona]	Hydro[Arizona]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Arkansas]	Hydro[Arkansas]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[California]	Hydro[California]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Colorado]	Hydro[Colorado]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Connecticut]	Hydro[Connecticut]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Delaware]	Hydro[Delaware]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Florida]	Hydro[Florida]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Georgia]	Hydro[Georgia]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Hawaii]	Hydro[Hawaii]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Idaho]	Hydro[Idaho]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Illinois]	Hydro[Illinois]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Indiana]	Hydro[Indiana]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Iowa]	Hydro[Iowa]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Kansas]	Hydro[Kansas]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Kentucky]	Hydro[Kentucky]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Louisiana]	Hydro[Louisiana]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Maine]	Hydro[Maine]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			

Emission_From_Hydro[Maryland]	Hydro[Maryland]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"		Ton/kWh	This shows the amount of CO2 emissions caused by the use of hydro energy to generate 1kWh of electricity in each state.
Emission_From_Hydro[Massachusetts]	Hydro[Massachusetts]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Michigan]	Hydro[Michigan]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Minnesota]	Hydro[Minnesota]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Mississippi]	Hydro[Mississippi]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Missouri]	Hydro[Missouri]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Montana]	Hydro[Montana]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Nebraska]	Hydro[Nebraska]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Nevada]	Hydro[Nevada]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[New_Hampshire]	Hydro[New_Hampshire]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[New_Jersey]	Hydro[New_Jersey]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[New_Mexico]	Hydro[New_Mexico]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[New_York]	Hydro[New_York]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[North_Carolina]	Hydro[North_Carolina]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[North_Dakota]	Hydro[North_Dakota]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Ohio]	Hydro[Ohio]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Oklahoma]	Hydro[Oklahoma]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Oregon]	Hydro[Oregon]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Pennsylvania]	Hydro[Pennsylvania]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Rhode_Island]	Hydro[Rhode_Island]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[South_Carolina]	Hydro[South_Carolina]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[South_Dakota]	Hydro[South_Dakota]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Tennessee]	Hydro[Tennessee]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Texas]	Hydro[Texas]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			

Emission_From_Hydro[Utah]	Hydro[Utah]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Vermont]	Hydro[Vermont]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Virginia]	Hydro[Virginia]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Washington]	Hydro[Washington]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[West_Virginia]	Hydro[West_Virginia]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Wisconsin]	Hydro[Wisconsin]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[Wyoming]	Hydro[Wyoming]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Hydro[National_Average]	Hydro[National_Average]*"CO2_Emissions_From_Hydro_Power,_Per_kWh"			
Emission_From_Natural_Gas[Alabama]	Natural_Gas[Alabama]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Alaska]	Natural_Gas[Alaska]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Arizona]	Natural_Gas[Arizona]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Arkansas]	Natural_Gas[Arkansas]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[California]	Natural_Gas[California]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Colorado]	Natural_Gas[Colorado]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Connecticut]	Natural_Gas[Connecticut]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Delaware]	Natural_Gas[Delaware]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Florida]	Natural_Gas[Florida]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Georgia]	Natural_Gas[Georgia]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Hawaii]	Natural_Gas[Hawaii]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Idaho]	Natural_Gas[Idaho]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Illinois]	Natural_Gas[Illinois]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Indiana]	Natural_Gas[Indiana]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Iowa]	Natural_Gas[Iowa]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			

Emission_From_Natural_Gas[Kansas]	Natural_Gas[Kansas]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"		Ton/kWh	This shows the amount of CO2 emissions caused by the use of natural gas energy to generate 1kWh of electricity in each state.
Emission_From_Natural_Gas[Kentucky]	Natural_Gas[Kentucky]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Louisiana]	Natural_Gas[Louisiana]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Maine]	Natural_Gas[Maine]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Maryland]	Natural_Gas[Maryland]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Massachusetts]	Natural_Gas[Massachusetts]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Michigan]	Natural_Gas[Michigan]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Minnesota]	Natural_Gas[Minnesota]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Mississippi]	Natural_Gas[Mississippi]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Missouri]	Natural_Gas[Missouri]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Montana]	Natural_Gas[Montana]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Nebraska]	Natural_Gas[Nebraska]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Nevada]	Natural_Gas[Nevada]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[New_Hampshire]	Natural_Gas[New_Hampshire]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[New_Jersey]	Natural_Gas[New_Jersey]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[New_Mexico]	Natural_Gas[New_Mexico]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[New_York]	Natural_Gas[New_York]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[North_Carolina]	Natural_Gas[North_Carolina]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[North_Dakota]	Natural_Gas[North_Dakota]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Ohio]	Natural_Gas[Ohio]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Oklahoma]	Natural_Gas[Oklahoma]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Oregon]	Natural_Gas[Oregon]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Pennsylvania]	Natural_Gas[Pennsylvania]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			
Emission_From_Natural_Gas[Rhode_Island]	Natural_Gas[Rhode_Island]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"			

Emission_From_Natural_Gas[South_Carolina]	Natural_Gas[South_Carolina]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[South_Dakota]	Natural_Gas[South_Dakota]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[Tennessee]	Natural_Gas[Tennessee]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[Texas]	Natural_Gas[Texas]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[Utah]	Natural_Gas[Utah]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[Vermont]	Natural_Gas[Vermont]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[Virginia]	Natural_Gas[Virginia]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[Washington]	Natural_Gas[Washington]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[West_Virginia]	Natural_Gas[West_Virginia]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[Wisconsin]	Natural_Gas[Wisconsin]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[Wyoming]	Natural_Gas[Wyoming]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Natural_Gas[National_Average]	Natural_Gas[National_Average]*"CO2_Emissions_From_Natural_Gas,_Per_kWh"	
Emission_From_Nuclear[Alabama]	Nuclear[Alabama]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Alaska]	Nuclear[Alaska]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Arizona]	Nuclear[Arizona]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Arkansas]	Nuclear[Arkansas]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[California]	Nuclear[California]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Colorado]	Nuclear[Colorado]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Connecticut]	Nuclear[Connecticut]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Delaware]	Nuclear[Delaware]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Florida]	Nuclear[Florida]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Georgia]	Nuclear[Georgia]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Hawaii]	Nuclear[Hawaii]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	

Emission_From_Nuclear[Idaho]	Nuclear[Idaho]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"		Ton/kWh	This shows the amount of CO2 emissions caused by the use of nuclear energy to generate 1kWh of electricity in each state.
Emission_From_Nuclear[Illinois]	Nuclear[Illinois]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Indiana]	Nuclear[Indiana]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Iowa]	Nuclear[Iowa]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Kansas]	Nuclear[Kansas]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Kentucky]	Nuclear[Kentucky]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Louisiana]	Nuclear[Louisiana]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Maine]	Nuclear[Maine]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Maryland]	Nuclear[Maryland]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Massachusetts]	Nuclear[Massachusetts]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Michigan]	Nuclear[Michigan]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Minnesota]	Nuclear[Minnesota]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Mississippi]	Nuclear[Mississippi]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Missouri]	Nuclear[Missouri]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Montana]	Nuclear[Montana]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Nebraska]	Nuclear[Nebraska]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Nevada]	Nuclear[Nevada]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[New_Hampshire]	Nuclear[New_Hampshire]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[New_Jersey]	Nuclear[New_Jersey]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[New_Mexico]	Nuclear[New_Mexico]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[New_York]	Nuclear[New_York]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[North_Carolina]	Nuclear[North_Carolina]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[North_Dakota]	Nuclear[North_Dakota]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			
Emission_From_Nuclear[Ohio]	Nuclear[Ohio]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"			

Emission_From_Nuclear[Oklahoma]	Nuclear[Oklahoma]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Oregon]	Nuclear[Oregon]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Pennsylvania]	Nuclear[Pennsylvania]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Rhode_Island]	Nuclear[Rhode_Island]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[South_Carolina]	Nuclear[South_Carolina]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[South_Dakota]	Nuclear[South_Dakota]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Tennessee]	Nuclear[Tennessee]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Texas]	Nuclear[Texas]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Utah]	Nuclear[Utah]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Vermont]	Nuclear[Vermont]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Virginia]	Nuclear[Virginia]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Washington]	Nuclear[Washington]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[West_Virginia]	Nuclear[West_Virginia]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Wisconsin]	Nuclear[Wisconsin]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[Wyoming]	Nuclear[Wyoming]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Nuclear[National_Average]	Nuclear[National_Average]*"CO2_Emissions_From_Nuclear_Power,_Per_kWh"	
Emission_From_Petroleum[Alabama]	Petroleum[Alabama]*"CO2_Emissions_From_Petrolium,_Per_kWh"	
Emission_From_Petroleum[Alaska]	Petroleum[Alaska]*"CO2_Emissions_From_Petrolium,_Per_kWh"	
Emission_From_Petroleum[Arizona]	Petroleum[Arizona]*"CO2_Emissions_From_Petrolium,_Per_kWh"	
Emission_From_Petroleum[Arkansas]	Petroleum[Arkansas]*"CO2_Emissions_From_Petrolium,_Per_kWh"	
Emission_From_Petroleum[California]	Petroleum[California]*"CO2_Emissions_From_Petrolium,_Per_kWh"	
Emission_From_Petroleum[Colorado]	Petroleum[Colorado]*"CO2_Emissions_From_Petrolium,_Per_kWh"	
Emission_From_Petroleum[Connecticut]	Petroleum[Connecticut]*"CO2_Emissions_From_Petrolium,_Per_kWh"	

Emission_From_Petroleum[Delaware]	Petroleum[Delaware]*"CO2_Emissions_From_Petrolium,_Per_kWh"		Ton/kWh	This shows the amount of CO2 emissions caused by the use of petroleum energy to generate 1kWh of electricity in each state.
Emission_From_Petroleum[Florida]	Petroleum[Florida]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Georgia]	Petroleum[Georgia]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Hawaii]	Petroleum[Hawaii]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Idaho]	Petroleum[Idaho]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Illinois]	Petroleum[Illinois]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Indiana]	Petroleum[Indiana]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Iowa]	Petroleum[Iowa]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Kansas]	Petroleum[Kansas]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Kentucky]	Petroleum[Kentucky]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Louisiana]	Petroleum[Louisiana]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Maine]	Petroleum[Maine]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Maryland]	Petroleum[Maryland]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Massachusetts]	Petroleum[Massachusetts]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Michigan]	Petroleum[Michigan]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Minnesota]	Petroleum[Minnesota]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Mississippi]	Petroleum[Mississippi]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Missouri]	Petroleum[Missouri]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Montana]	Petroleum[Montana]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Nebraska]	Petroleum[Nebraska]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Nevada]	Petroleum[Nevada]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[New_Hampshire]	Petroleum[New_Hampshire]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[New_Jersey]	Petroleum[New_Jersey]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[New_Mexico]	Petroleum[New_Mexico]*"CO2_Emissions_From_Petrolium,_Per_kWh"			

Emission_From_Petroleum[New_York]	Petroleum[New_York]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[North_Carolina]	Petroleum[North_Carolina]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[North_Dakota]	Petroleum[North_Dakota]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Ohio]	Petroleum[Ohio]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Oklahoma]	Petroleum[Oklahoma]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Oregon]	Petroleum[Oregon]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Pennsylvania]	Petroleum[Pennsylvania]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Rhode_Island]	Petroleum[Rhode_Island]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[South_Carolina]	Petroleum[South_Carolina]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[South_Dakota]	Petroleum[South_Dakota]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Tennessee]	Petroleum[Tennessee]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Texas]	Petroleum[Texas]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Utah]	Petroleum[Utah]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Vermont]	Petroleum[Vermont]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Virginia]	Petroleum[Virginia]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Washington]	Petroleum[Washington]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[West_Virginia]	Petroleum[West_Virginia]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Wisconsin]	Petroleum[Wisconsin]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[Wyoming]	Petroleum[Wyoming]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Petroleum[National_Average]	Petroleum[National_Average]*"CO2_Emissions_From_Petrolium,_Per_kWh"			
Emission_From_Solar[Alabama]	Solar[Alabama]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Alaska]	Solar[Alaska]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Arizona]	Solar[Arizona]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Arkansas]	Solar[Arkansas]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			

Emission_From_Solar[California]	Solar[California]*"CO2_Emissions_From_Solar_Power,_Per_kWh"		Ton/kWh	This shows the amount of CO2 emissions caused by the use of solar energy to generate 1kWh of electricity in each state.
Emission_From_Solar[Colorado]	Solar[Colorado]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Connecticut]	Solar[Connecticut]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Delaware]	Solar[Delaware]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Florida]	Solar[Florida]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Georgia]	Solar[Georgia]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Hawaii]	Solar[Hawaii]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Idaho]	Solar[Idaho]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Illinois]	Solar[Illinois]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Indiana]	Solar[Indiana]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Iowa]	Solar[Iowa]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Kansas]	Solar[Kansas]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Kentucky]	Solar[Kentucky]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Louisiana]	Solar[Louisiana]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Maine]	Solar[Maine]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Maryland]	Solar[Maryland]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Massachusetts]	Solar[Massachusetts]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Michigan]	Solar[Michigan]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Minnesota]	Solar[Minnesota]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Mississippi]	Solar[Mississippi]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Missouri]	Solar[Missouri]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Montana]	Solar[Montana]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Nebraska]	Solar[Nebraska]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			
Emission_From_Solar[Nevada]	Solar[Nevada]*"CO2_Emissions_From_Solar_Power,_Per_kWh"			

Emission_From_Solar[New_Hampshire]	Solar[New_Hampshire]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[New_Jersey]	Solar[New_Jersey]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[New_Mexico]	Solar[New_Mexico]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[New_York]	Solar[New_York]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[North_Carolina]	Solar[North_Carolina]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[North_Dakota]	Solar[South_Dakota]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Ohio]	Solar[Ohio]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Oklahoma]	Solar[Oklahoma]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Oregon]	Solar[Oregon]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Pennsylvania]	Solar[Pennsylvania]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Rhode_Island]	Solar[Rhode_Island]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[South_Carolina]	Solar[South_Carolina]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[South_Dakota]	Solar[South_Dakota]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Tennessee]	Solar[Tennessee]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Texas]	Solar[Texas]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Utah]	Solar[Utah]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Vermont]	Solar[Vermont]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Virginia]	Solar[Virginia]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Washington]	Solar[Washington]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[West_Virginia]	Solar[West_Virginia]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Wisconsin]	Solar[Wisconsin]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[Wyoming]	Solar[Wyoming]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Solar[National_Average]	Solar[National_Average]*"CO2_Emissions_From_Solar_Power,_Per_kWh"	
Emission_From_Wind[Alabama]	Wind[Alabama]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	

Emission_From_Wind[Alaska]	Wind[Alaska]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Arizona]	Wind[Arizona]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Arkansas]	Wind[Arkansas]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[California]	Wind[California]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Colorado]	Wind[Colorado]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Connecticut]	Wind[Connecticut]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Delaware]	Wind[Delaware]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Florida]	Wind[Florida]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Georgia]	Wind[Georgia]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Hawaii]	Wind[Hawaii]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Idaho]	Wind[Idaho]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Illinois]	Wind[Illinois]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Indiana]	Wind[Indiana]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Iowa]	Wind[Iowa]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Kansas]	Wind[Kansas]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Kentucky]	Wind[Kentucky]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Louisiana]	Wind[Louisiana]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Maine]	Wind[Maine]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Maryland]	Wind[Maryland]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Massachusetts]	Wind[Massachusetts]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Michigan]	Wind[Michigan]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Minnesota]	Wind[Minnesota]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Mississippi]	Wind[Mississippi]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	
Emission_From_Wind[Missouri]	Wind[Missouri]*"CO2_Emissions_From_Wind_Power,_Per_kWh"	

Emission_From_Wind[Montana]	Wind[Montana]*"CO2_Emissions_From_Wind_Power,_Per_kWh"		Ton/kWh	This shows the amount of CO2 emissions caused by the use of wind energy to generate 1kWh of electricity in each state.
Emission_From_Wind[Nebraska]	Wind[Nebraska]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Nevada]	Wind[Nevada]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[New_Hampshire]	Wind[New_Hampshire]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[New_Jersey]	Wind[New_Jersey]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[New_Mexico]	Wind[New_Mexico]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[New_York]	Wind[New_York]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[North_Carolina]	Wind[North_Carolina]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[North_Dakota]	Wind[North_Dakota]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Ohio]	Wind[Ohio]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Oklahoma]	Wind[Oklahoma]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Oregon]	Wind[Oregon]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Pennsylvania]	Wind[Pennsylvania]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Rhode_Island]	Wind[Rhode_Island]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[South_Carolina]	Wind[South_Carolina]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[South_Dakota]	Wind[North_Dakota]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Tennessee]	Wind[Tennessee]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Texas]	Wind[Texas]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Utah]	Wind[Utah]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Vermont]	Wind[Vermont]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Virginia]	Wind[Virginia]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Washington]	Wind[Washington]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[West_Virginia]	Wind[West_Virginia]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[Wisconsin]	Wind[Wisconsin]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			

Emission_From_Wind[Wyoming]	Wind[Wyoming]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Emission_From_Wind[National_Average]	Wind[National_Average]*"CO2_Emissions_From_Wind_Power,_Per_kWh"			
Geothermal[Alabama]	0		dmnl	The value of this variable represents the share of geothermal power in each state's overall electricity production.
Geothermal[Alaska]	0			
Geothermal[Arizona]	0			
Geothermal[Arkansas]	0			
Geothermal[California]	0.058			
Geothermal[Colorado]	0			
Geothermal[Connecticut]	0			
Geothermal[Delaware]	0			
Geothermal[Florida]	0			
Geothermal[Georgia]	0			
Geothermal[Hawaii]	0.018			
Geothermal[Idaho]	0.005			
Geothermal[Illinois]	0			
Geothermal[Indiana]	0			
Geothermal[Iowa]	0			
Geothermal[Kansas]	0			
Geothermal[Kentucky]	0			
Geothermal[Louisiana]	0			
Geothermal[Maine]	0			
Geothermal[Maryland]	0			
Geothermal[Massachusetts]	0			
Geothermal[Michigan]	0			
Geothermal[Minnesota]	0			
Geothermal[Mississippi]	0			
Geothermal[Missouri]	0			
Geothermal[Montana]	0			
Geothermal[Nebraska]	0			
Geothermal[Nevada]	0.094			
Geothermal[New_Hampshire]	0			
Geothermal[New_Jersey]	0			
Geothermal[New_Mexico]	0.001			
Geothermal[New_York]	0			
Geothermal[North_Carolina]	0			
Geothermal[North_Dakota]	0			
Geothermal[Ohio]	0			
Geothermal[Oklahoma]	0			
Geothermal[Oregon]	0.003			
Geothermal[Pennsylvania]	0			
Geothermal[Rhode_Island]	0			
Geothermal[South_Carolina]	0			
Geothermal[South_Dakota]	0			
Geothermal[Tennessee]	0			

Geothermal[Texas]	0			
Geothermal[Utah]	0.008			
Geothermal[Vermont]	0			
Geothermal[Virginia]	0			
Geothermal[Washington]	0			
Geothermal[West_Virginia]	0			
Geothermal[Wisconsin]	0			
Geothermal[Wyoming]	0			
Geothermal[National_Average]	0.004			
Hydro[Alabama]	0.088		dmnl	The value of this variable represents the share of hydro power in each state's overall electricity production.
Hydro[Alaska]	0.277			
Hydro[Arizona]	0.054			
Hydro[Arkansas]	0.073			
Hydro[California]	0.072			
Hydro[Colorado]	0.028			
Hydro[Connecticut]	0.007			
Hydro[Delaware]	0			
Hydro[Florida]	0.001			
Hydro[Georgia]	0.032			
Hydro[Hawaii]	0.012			
Hydro[Idaho]	0.51			
Hydro[Illinois]	0.001			
Hydro[Indiana]	0.003			
Hydro[Iowa]	0.014			
Hydro[Kansas]	0.001			
Hydro[Kentucky]	0.075			
Hydro[Louisiana]	0.012			
Hydro[Maine]	0.271			
Hydro[Maryland]	0.053			
Hydro[Massachusetts]	0.02			
Hydro[Michigan]	0.007			
Hydro[Minnesota]	0.015			
Hydro[Mississippi]	0			
Hydro[Missouri]	0.024			
Hydro[Montana]	0.4			
Hydro[Nebraska]	0.033			
Hydro[Nevada]	0.047			
Hydro[New_Hampshire]	0.067			
Hydro[New_Jersey]	0			
Hydro[New_Mexico]	0.005			
Hydro[New_York]	0.22			
Hydro[North_Carolina]	0.058			
Hydro[North_Dakota]	0.052			
Hydro[Ohio]	0.003			
Hydro[Oklahoma]	0.033			
Hydro[Oregon]	0.464			
Hydro[Pennsylvania]	0.008			

Hydro[Rhode_Island]	0.001			
Hydro[South_Carolina]	0.03			
Hydro[South_Dakota]	0.297			
Hydro[Tennessee]	0.151			
Hydro[Texas]	0.002			
Hydro[Utah]	0.018			
Hydro[Vermont]	0.5			
Hydro[Virginia]	0.008			
Hydro[Washington]	0.646			
Hydro[West_Virginia]	0.023			
Hydro[Wisconsin]	0.038			
Hydro[Wyoming]	0.023			
Hydro[National_Average]	0.061			
Natural_Gas[Alabama]	0.376		dmnl	The value of this variable represents the share of natural gas power in each state's overall electricity production.
Natural_Gas[Alaska]	0.41			
Natural_Gas[Arizona]	0.444			
Natural_Gas[Arkansas]	0.321			
Natural_Gas[California]	0.49			
Natural_Gas[Colorado]	0.255			
Natural_Gas[Connecticut]	0.556			
Natural_Gas[Delaware]	0.858			
Natural_Gas[Florida]	0.739			
Natural_Gas[Georgia]	0.463			
Natural_Gas[Hawaii]	0			
Natural_Gas[Idaho]	0.26			
Natural_Gas[Illinois]	0.116			
Natural_Gas[Indiana]	0.295			
Natural_Gas[Iowa]	0.09			
Natural_Gas[Kansas]	0.051			
Natural_Gas[Kentucky]	0.21			
Natural_Gas[Louisiana]	0.648			
Natural_Gas[Maine]	0.247			
Natural_Gas[Maryland]	0.371			
Natural_Gas[Massachusetts]	0.769			
Natural_Gas[Michigan]	0.266			
Natural_Gas[Minnesota]	0.206			
Natural_Gas[Mississippi]	0.721			
Natural_Gas[Missouri]	0.087			
Natural_Gas[Montana]	0.02			
Natural_Gas[Nebraska]	0.041			
Natural_Gas[Nevada]	0.625			
Natural_Gas[New_Hampshire]	0.256			
Natural_Gas[New_Jersey]	0.478			
Natural_Gas[New_Mexico]	0.284			
Natural_Gas[New_York]	0.456			
Natural_Gas[North_Carolina]	0.359			
Natural_Gas[North_Dakota]	0.034			

Natural_Gas[Ohio]	0.439			
Natural_Gas[Oklahoma]	0.408			
Natural_Gas[Oregon]	0.333			
Natural_Gas[Pennsylvania]	0.527			
Natural_Gas[Rhode_Island]	0.909			
Natural_Gas[South_Carolina]	0.233			
Natural_Gas[South_Dakota]	0.087			
Natural_Gas[Tennessee]	0.178			
Natural_Gas[Texas]	0.486			
Natural_Gas[Utah]	0.247			
Natural_Gas[Vermont]	0.001			
Natural_Gas[Virginia]	0.574			
Natural_Gas[Washington]	0.144			
Natural_Gas[West_Virginia]	0.041			
Natural_Gas[Wisconsin]	0.339			
Natural_Gas[Wyoming]	0.035			
Natural_Gas[National_Average]	0.369			
Nuclear[Alabama]	0.322		dmnl	The value of this variable represents the share of nuclear power in each state's overall electricity production.
Nuclear[Alaska]	0			
Nuclear[Arizona]	0.291			
Nuclear[Arkansas]	0.225			
Nuclear[California]	0.084			
Nuclear[Colorado]	0			
Nuclear[Connecticut]	0.39			
Nuclear[Delaware]	0			
Nuclear[Florida]	0			
Nuclear[Georgia]	0.115			
Nuclear[Hawaii]	0.268			
Nuclear[Idaho]	0			
Nuclear[Illinois]	0			
Nuclear[Indiana]	0.533			
Nuclear[Iowa]	0			
Nuclear[Kansas]	0			
Nuclear[Kentucky]	0.151			
Nuclear[Louisiana]	0			
Nuclear[Maine]	0.176			
Nuclear[Maryland]	0			
Nuclear[Massachusetts]	0.377			
Nuclear[Michigan]	0			
Nuclear[Minnesota]	0.296			
Nuclear[Mississippi]	0.237			
Nuclear[Missouri]	0.171			
Nuclear[Montana]	0.055			
Nuclear[Nebraska]	0			
Nuclear[Nevada]	0.178			
Nuclear[New_Hampshire]	0			
Nuclear[New_Jersey]	0.565			

Nuclear[New_Mexico]	0.458			
Nuclear[New_York]	0			
Nuclear[North_Carolina]	0.249			
Nuclear[North_Dakota]	0.328			
Nuclear[Ohio]	0			
Nuclear[Oklahoma]	0.142			
Nuclear[Oregon]	0			
Nuclear[Pennsylvania]	0			
Nuclear[Rhode_Island]	0.314			
Nuclear[South_Carolina]	0			
Nuclear[South_Dakota]	0.538			
Nuclear[Tennessee]	0			
Nuclear[Texas]	0.434			
Nuclear[Utah]	0.083			
Nuclear[Vermont]	0			
Nuclear[Virginia]	0			
Nuclear[Washington]	0.303			
Nuclear[West_Virginia]	0.078			
Nuclear[Wisconsin]	0			
Nuclear[Wyoming]	0.152			
Nuclear[National_Average]	0.194			
Petroleum[Alabama]	0		dmnl	The value of this variable represents the share of petroleum power in each state's overall electricity production.
Petroleum[Alaska]	0.149			
Petroleum[Arizona]	0			
Petroleum[Arkansas]	0.001			
Petroleum[California]	0			
Petroleum[Colorado]	0			
Petroleum[Connecticut]	0.002			
Petroleum[Delaware]	0.005			
Petroleum[Florida]	0.005			
Petroleum[Georgia]	0.002			
Petroleum[Hawaii]	0.654			
Petroleum[Idaho]	0			
Petroleum[Illinois]	0			
Petroleum[Indiana]	0.001			
Petroleum[Iowa]	0.001			
Petroleum[Kansas]	0.002			
Petroleum[Kentucky]	0.001			
Petroleum[Louisiana]	0.04			
Petroleum[Maine]	0.004			
Petroleum[Maryland]	0.002			
Petroleum[Massachusetts]	0.004			
Petroleum[Michigan]	0.01			
Petroleum[Minnesota]	0.001			
Petroleum[Mississippi]	0			
Petroleum[Missouri]	0.002			
Petroleum[Montana]	0.018			

Petroleum[Nebraska]	0.001	
Petroleum[Nevada]	0	
Petroleum[New_Hampshire]	0.004	
Petroleum[New_Jersey]	0.001	
Petroleum[New_Mexico]	0.001	
Petroleum[New_York]	0.007	
Petroleum[North_Carolina]	0.001	
Petroleum[North_Dakota]	0.001	
Petroleum[Ohio]	0.008	
Petroleum[Oklahoma]	0	
Petroleum[Oregon]	0	
Petroleum[Pennsylvania]	0.001	
Petroleum[Rhode_Island]	0.001	
Petroleum[South_Carolina]	0.001	
Petroleum[South_Dakota]	0.001	
Petroleum[Tennessee]	0.001	
Petroleum[Texas]	0	
Petroleum[Utah]	0.001	
Petroleum[Vermont]	0.002	
Petroleum[Virginia]	0.003	
Petroleum[Washington]	0	
Petroleum[West_Virginia]	0.003	
Petroleum[Wisconsin]	0.003	
Petroleum[Wyoming]	0.001	
Petroleum[National_Average]	0.0046	
Solar[Alabama]	0.003	
Solar[Alaska]	0	
Solar[Arizona]	0.062	
Solar[Arkansas]	0.008	
Solar[California]	0.174	
Solar[Colorado]	0.031	
Solar[Connecticut]	0.007	
Solar[Delaware]	0.015	
Solar[Florida]	0.037	
Solar[Georgia]	0.038	
Solar[Hawaii]	0.057	
Solar[Idaho]	0.033	
Solar[Illinois]	0.003	
Solar[Indiana]	0.007	
Solar[Iowa]	0.003	
Solar[Kansas]	0.001	
Solar[Kentucky]	0.001	
Solar[Louisiana]	0.002	
Solar[Maine]	0.016	
Solar[Maryland]	0.017	
Solar[Massachusetts]	0.092	
Solar[Michigan]	0.004	

Solar[Minnesota]	0.032		dmnl	The value of this variable represents the share of solar power in each state's overall electricity production.
Solar[Mississippi]	0.006			
Solar[Missouri]	0.002			
Solar[Montana]	0.001			
Solar[Nebraska]	0.001			
Solar[Nevada]	0.159			
Solar[New_Hampshire]	0			
Solar[New_Jersey]	0.025			
Solar[New_Mexico]	0.05			
Solar[New_York]	0.01			
Solar[North_Carolina]	0.076			
Solar[North_Dakota]	0			
Solar[Ohio]	0.005			
Solar[Oklahoma]	0.001			
Solar[Oregon]	0.025			
Solar[Pennsylvania]	0.001			
Solar[Rhode_Island]	0.042			
Solar[South_Carolina]	0.023			
Solar[South_Dakota]	0			
Solar[Tennessee]	0.004			
Solar[Texas]	0.029			
Solar[Utah]	0.081			
Solar[Vermont]	0.088			
Solar[Virginia]	0.036			
Solar[Washington]	0			
Solar[West_Virginia]	0			
Solar[Wisconsin]	0.006			
Solar[Wyoming]	0.004			
Solar[National_Average]	0.041			
Wind[Alabama]	0			
Wind[Alaska]	0.021			
Wind[Arizona]	0.015			
Wind[Arkansas]	0			
Wind[California]	0.079			
Wind[Colorado]	0.265			
Wind[Connecticut]	0			
Wind[Delaware]	0.001			
Wind[Florida]	0			
Wind[Georgia]	0			
Wind[Hawaii]	0.073			
Wind[Idaho]	0.157			
Wind[Illinois]	0.103			
Wind[Indiana]	0.084			
Wind[Iowa]	0.553			
Wind[Kansas]	0.452			
Wind[Kentucky]	0			
Wind[Louisiana]	0			

Wind[Maine]	0.233		dmnl	The value of this variable represents the share of wind power in each state's overall electricity production.
Wind[Maryland]	0.013			
Wind[Massachusetts]	0.011			
Wind[Michigan]	0.067			
Wind[Minnesota]	0.217			
Wind[Mississippi]	0			
Wind[Missouri]	0.085			
Wind[Montana]	0.115			
Wind[Nebraska]	0.252			
Wind[Nevada]	0.008			
Wind[New_Hampshire]	0.029			
Wind[New_Jersey]	0			
Wind[New_Mexico]	0.302			
Wind[New_York]	0.035			
Wind[North_Carolina]	0.004			
Wind[North_Dakota]	0.341			
Wind[Ohio]	0.021			
Wind[Oklahoma]	0.414			
Wind[Oregon]	0.157			
Wind[Pennsylvania]	0.015			
Wind[Rhode_Island]	0.022			
Wind[South_Carolina]	0			
Wind[South_Dakota]	0.523			
Wind[Tennessee]	0.001			
Wind[Texas]	0.207			
Wind[Utah]	0.019			
Wind[Vermont]	0.157			
Wind[Virginia]	0.001			
Wind[Washington]	0.087			
Wind[West_Virginia]	0.025			
Wind[Wisconsin]	0.025			
Wind[Wyoming]	0.194			
Wind[National_Average]	0.094			
EV_Emission:				
Average_Manufacturing_Time_for_an_EV	0.08		Year	The average amount of time it takes to produce an electric car is represented by this variable.
CO2_Emission_from_disposal_of_EV	CO2_Emission_from_disposal_of_EV_Battery+"CO2_Emission_from_disposal_of_EV_-_without_battery"		Ton/Vehicle	This parameter represents the CO2 emissions caused by the disposal of an EV.
"CO2_Emission_from_disposal_of_EV_-_without_battery"	4.6		Ton/Vehicle	This parameter represents the CO2 emissions caused by the disposal of an EV - without battery. The CO2 emission is similar as a Non-EV.
CO2_Emission_from_disposal_of_EV_Battery	Emission_to_Dispose_Per_kWh_Battery*Battery_Per_EV*Battery_Capacity		Ton/Vehicle	This parameter represents the CO2 emissions caused by the disposal of an total battery used in 1 EV .
CO2_Emission_per_car_per_year_from_Charging[Alabama]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Alabama]			

CO2_Emission_per_car_per_year_from_Charging[Alaska]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Alaska]	
CO2_Emission_per_car_per_year_from_Charging[Arizona]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Arizona]	
CO2_Emission_per_car_per_year_from_Charging[Arkansas]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Arkansas]	
CO2_Emission_per_car_per_year_from_Charging[California]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[California]	
CO2_Emission_per_car_per_year_from_Charging[Colorado]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Colorado]	
CO2_Emission_per_car_per_year_from_Charging[Connecticut]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Connecticut]	
CO2_Emission_per_car_per_year_from_Charging[Delaware]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Delaware]	
CO2_Emission_per_car_per_year_from_Charging[Florida]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Florida]	
CO2_Emission_per_car_per_year_from_Charging[Georgia]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Georgia]	
CO2_Emission_per_car_per_year_from_Charging[Hawaii]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Hawaii]	
CO2_Emission_per_car_per_year_from_Charging[Idaho]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Idaho]	
CO2_Emission_per_car_per_year_from_Charging[Illinois]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Illinois]	
CO2_Emission_per_car_per_year_from_Charging[Indiana]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Indiana]	
CO2_Emission_per_car_per_year_from_Charging[Iowa]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Iowa]	
CO2_Emission_per_car_per_year_from_Charging[Kansas]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Kansas]	
CO2_Emission_per_car_per_year_from_Charging[Kentucky]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Kentucky]	

CO2_Emission_per_car_per_year_from_Charging[Louisiana]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Louisiana]		Ton/Year/Vehicle	This variable computes the total emissions from charging an electric vehicle for one year.
CO2_Emission_per_car_per_year_from_Charging[Maine]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Maine]			
CO2_Emission_per_car_per_year_from_Charging[Maryland]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Maryland]			
CO2_Emission_per_car_per_year_from_Charging[Massachusetts]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Massachusetts]			
CO2_Emission_per_car_per_year_from_Charging[Michigan]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Michigan]			
CO2_Emission_per_car_per_year_from_Charging[Minnesota]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Minnesota]			
CO2_Emission_per_car_per_year_from_Charging[Mississippi]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Mississippi]			
CO2_Emission_per_car_per_year_from_Charging[Missouri]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Missouri]			
CO2_Emission_per_car_per_year_from_Charging[Montana]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Montana]			
CO2_Emission_per_car_per_year_from_Charging[Nebraska]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Nebraska]			
CO2_Emission_per_car_per_year_from_Charging[Nevada]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Nevada]			
CO2_Emission_per_car_per_year_from_Charging[New_Hampshire]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[New_Hampshire]			
CO2_Emission_per_car_per_year_from_Charging[New_Jersey]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[New_Jersey]			
CO2_Emission_per_car_per_year_from_Charging[New_Mexico]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[New_Mexico]			
CO2_Emission_per_car_per_year_from_Charging[New_York]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[New_York]			

CO2_Emission_per_car_per_year_from_Charging[North_Carolina]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[North_Carolina]	
CO2_Emission_per_car_per_year_from_Charging[North_Dakota]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[North_Dakota]	
CO2_Emission_per_car_per_year_from_Charging[Ohio]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Ohio]	
CO2_Emission_per_car_per_year_from_Charging[Oklahoma]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Oklahoma]	
CO2_Emission_per_car_per_year_from_Charging[Oregon]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Oregon]	
CO2_Emission_per_car_per_year_from_Charging[Pennsylvania]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Pennsylvania]	
CO2_Emission_per_car_per_year_from_Charging[Rhode_Island]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Rhode_Island]	
CO2_Emission_per_car_per_year_from_Charging[South_Carolina]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[South_Carolina]	
CO2_Emission_per_car_per_year_from_Charging[South_Dakota]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[South_Dakota]	
CO2_Emission_per_car_per_year_from_Charging[Tennessee]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Tennessee]	
CO2_Emission_per_car_per_year_from_Charging[Texas]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Texas]	
CO2_Emission_per_car_per_year_from_Charging[Utah]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Utah]	
CO2_Emission_per_car_per_year_from_Charging[Vermont]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Vermont]	
CO2_Emission_per_car_per_year_from_Charging[Virginia]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Virginia]	
CO2_Emission_per_car_per_year_from_Charging[Washington]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Washington]	
CO2_Emission_per_car_per_year_from_Charging[West_Virginia]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[West_Virginia]	

CO2_Emission_per_car_per_year_from_Charging[Wisconsin]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Wisconsin]			
CO2_Emission_per_car_per_year_from_Charging[Wyoming]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[Wyoming]			
CO2_Emission_per_car_per_year_from_Charging[National_Average]	Average_Distance_Travelled_Per_year*Electricity_Energy_Consumption_per_KM*CO2_Emission_For_Each_kWh_Energy_Generation[National_Average]			
CO2_emission_Per_EV_Production	9.75		Ton/Vehicle	A study published in the Journal of Industrial Ecology in 2015 estimated that the production phase of an average mid-sized gasoline-powered car emitted approximately 5.6 metric tons of CO2. Another study conducted by the International Council on Clean Transportation (ICCT) in 2017 found that the average production emissions for a compact gasoline vehicle were around 6.5 metric tons of CO2.
Disposal_of_EV	EV_Stock/Average_Time_of_Ownership		Vehicle/Year	This is an outflow of the EV Stock following the end of the vehicle's useful existence, which is represented in the model as disposal. This is calculated by dividing the EV Stock by the average length of vehicle ownership.
Emission_from_Disposal_of_EV	Disposal_of_EV *CO2_Emission_from_disposal_of_EV		Ton/Year	Total emissions from EV disposal are determined by this variable.
Emission_From_Vehicle_Usage[Alabama]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Alabama]			
Emission_From_Vehicle_Usage[Alaska]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Alaska]			
Emission_From_Vehicle_Usage[Arizona]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Arizona]			
Emission_From_Vehicle_Usage[Arkansas]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Arkansas]			
Emission_From_Vehicle_Usage[California]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[California]			
Emission_From_Vehicle_Usage[Colorado]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Colorado]			
Emission_From_Vehicle_Usage[Connecticut]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Connecticut]			
Emission_From_Vehicle_Usage[Delaware]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Delaware]			
Emission_From_Vehicle_Usage[Florida]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Florida]			
Emission_From_Vehicle_Usage[Georgia]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Georgia]			
Emission_From_Vehicle_Usage[Hawaii]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Hawaii]			
Emission_From_Vehicle_Usage[Idaho]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Idaho]			
Emission_From_Vehicle_Usage[Illinois]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Illinois]			

Emission_From_Vehicle_Usage[Indiana]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Indiana]		Ton/Year	This variable computes the cumulative emissions from all phases of vehicle usage.
Emission_From_Vehicle_Usage[Iowa]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Iowa]			
Emission_From_Vehicle_Usage[Kansas]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Kansas]			
Emission_From_Vehicle_Usage[Kentucky]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Kentucky]			
Emission_From_Vehicle_Usage[Louisiana]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Louisiana]			
Emission_From_Vehicle_Usage[Maine]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Maine]			
Emission_From_Vehicle_Usage[Maryland]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Maryland]			
Emission_From_Vehicle_Usage[Massachusetts]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Massachusetts]			
Emission_From_Vehicle_Usage[Michigan]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Michigan]			
Emission_From_Vehicle_Usage[Minnesota]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Minnesota]			
Emission_From_Vehicle_Usage[Mississippi]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Mississippi]			
Emission_From_Vehicle_Usage[Missouri]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Missouri]			
Emission_From_Vehicle_Usage[Montana]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Montana]			
Emission_From_Vehicle_Usage[Nebraska]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Nebraska]			
Emission_From_Vehicle_Usage[Nevada]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Nevada]			
Emission_From_Vehicle_Usage[New_Hampshire]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[New_Hampshire]			
Emission_From_Vehicle_Usage[New_Jersey]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[New_Jersey]			
Emission_From_Vehicle_Usage[New_Mexico]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[New_Mexico]			
Emission_From_Vehicle_Usage[New_York]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[New_York]			
Emission_From_Vehicle_Usage[North_Carolina]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[North_Carolina]			
Emission_From_Vehicle_Usage[North_Dakota]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[North_Dakota]			
Emission_From_Vehicle_Usage[Ohio]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Ohio]			
Emission_From_Vehicle_Usage[Oklahoma]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Oklahoma]			
Emission_From_Vehicle_Usage[Oregon]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Oregon]			

Emission_From_Vehicle_Usage[Pennsylvania]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Pennsylvania]			
Emission_From_Vehicle_Usage[Rhode_Island]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Rhode_Island]			
Emission_From_Vehicle_Usage[South_Carolina]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[South_Carolina]			
Emission_From_Vehicle_Usage[South_Dakota]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[South_Dakota]			
Emission_From_Vehicle_Usage[Tennessee]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Tennessee]			
Emission_From_Vehicle_Usage[Texas]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Texas]			
Emission_From_Vehicle_Usage[Utah]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Utah]			
Emission_From_Vehicle_Usage[Vermont]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Vermont]			
Emission_From_Vehicle_Usage[Virginia]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Virginia]			
Emission_From_Vehicle_Usage[Washington]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Washington]			
Emission_From_Vehicle_Usage[West_Virginia]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[West_Virginia]			
Emission_From_Vehicle_Usage[Wisconsin]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Wisconsin]			
Emission_From_Vehicle_Usage[Wyoming]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[Wyoming]			
Emission_From_Vehicle_Usage[National_Average]	EV_Stock*CO2_Emission_per_car_per_year_from_Charging[National_Average]			
Emission_to_Dispose_Per_kWh_Battery	0.1		Ton/kWh	The variable represents the value of CO2 emission from each kWh of battery disposal. Harper, G., Sommerville, R., Kendrick, E. et al. Recycling lithium-ion batteries from electric vehicles. Nature 575, 75–86 (2019). https://doi.org/10.1038/s41586-019-1682-5
"EV_Sales_-_Existing_Customer"	Disposal_of_EV		Vehicle/Year	This variable represents the replacement requirements of the existing EV customer base.
EV_Stock(t)	EV_Stock(t - dt) + (Manufacturing_of_EV - Disposal_of_EV) * dt	INIT EV_Stock = Historical_EV_Stock	Vehicle	The entire amount of EV stocks in the USA are represented by this stock.
EV_Well_to_Tail_Emission	Manufacturing_of_EV * CO2_emission_Per_EV_Production		Tons/Years	Total emissions from EV production are determined by this parameter.
Historical_EV_Stock	GRAPH(TIME) Points: (2010.00, 0), (2012.00, 49610), (2014.00, 108200), (2016.00, 177400), (2018.00, 259200), (2020.00, 355900), (2022.00, 470000)		Vehicle	Historical Value of EV Stock in USA Global EV Data Explorer – Data Tools - IEA
Lifetime_CO2_Emission_of_EV[State]	EV_Well_to_Tail_Emission+Emission_From_Vehicle_Usage+Emission_from_Disposal_of_EV+Net_Increase_of_CO2_Emission_from_Mining+Average_Emission_from_Battery_Manufacturing_Per_Year		Tons/Years	An increase in EV Stock Lifecycle CO2 Emissions. This input is used to derive the overall lifespan emission.

Manufacturing_of_EV	DELAYN(("EV_Sales_-_New_Customer"*Effect_of_Demand_Coverage_on_Manufacturing), Average_Manufacturing_Time_for_an_EV, 0.00)+"EV_Sales_-_Existing_Customer"		Vehicle/Year	This is a contribution to the EV Stock. This is the manufacturing of electric vehicles. A delay function is utilized to signify manufacturing process delay.
Total_CO2_Emission_from_EV[Alabama](t)	Total_CO2_Emission_from_EV[Alabama](t - dt) + (Lifetime_CO2_Emission_of_EV[Alabama]) * dt	INIT Total_CO2_Emission_from_EV[Alabama] = 0		
Total_CO2_Emission_from_EV[Alaska](t)	Total_CO2_Emission_from_EV[Alaska](t - dt) + (Lifetime_CO2_Emission_of_EV[Alaska]) * dt	INIT Total_CO2_Emission_from_EV[Alaska] = 0		
Total_CO2_Emission_from_EV[Arizona](t)	Total_CO2_Emission_from_EV[Arizona](t - dt) + (Lifetime_CO2_Emission_of_EV[Arizona]) * dt	INIT Total_CO2_Emission_from_EV[Arizona] = 0		
Total_CO2_Emission_from_EV[Arkansas](t)	Total_CO2_Emission_from_EV[Arkansas](t - dt) + (Lifetime_CO2_Emission_of_EV[Arkansas]) * dt	INIT Total_CO2_Emission_from_EV[Arkansas] = 0		
Total_CO2_Emission_from_EV[California](t)	Total_CO2_Emission_from_EV[California](t - dt) + (Lifetime_CO2_Emission_of_EV[California]) * dt	INIT Total_CO2_Emission_from_EV[California] = 0		
Total_CO2_Emission_from_EV[Colorado](t)	Total_CO2_Emission_from_EV[Colorado](t - dt) + (Lifetime_CO2_Emission_of_EV[Colorado]) * dt	INIT Total_CO2_Emission_from_EV[Colorado] = 0		
Total_CO2_Emission_from_EV[Connecticut](t)	Total_CO2_Emission_from_EV[Connecticut](t - dt) + (Lifetime_CO2_Emission_of_EV[Connecticut]) * dt	INIT Total_CO2_Emission_from_EV[Connecticut] = 0		
Total_CO2_Emission_from_EV[Delaware](t)	Total_CO2_Emission_from_EV[Delaware](t - dt) + (Lifetime_CO2_Emission_of_EV[Delaware]) * dt	INIT Total_CO2_Emission_from_EV[Delaware] = 0		
Total_CO2_Emission_from_EV[Florida](t)	Total_CO2_Emission_from_EV[Florida](t - dt) + (Lifetime_CO2_Emission_of_EV[Florida]) * dt	INIT Total_CO2_Emission_from_EV[Florida] = 0		
Total_CO2_Emission_from_EV[Georgia](t)	Total_CO2_Emission_from_EV[Georgia](t - dt) + (Lifetime_CO2_Emission_of_EV[Georgia]) * dt	INIT Total_CO2_Emission_from_EV[Georgia] = 0		

Total_CO2_Emission_from_EV[Hawaii](t)	Total_CO2_Emission_from_EV[Hawaii](t - dt) + (Lifetime_CO2_Emission_of_EV[Hawaii]) * dt	INIT Total_CO2_Emission_from_EV[Hawaii] = 0
Total_CO2_Emission_from_EV[Idaho](t)	Total_CO2_Emission_from_EV[Idaho](t - dt) + (Lifetime_CO2_Emission_of_EV[Idaho]) * dt	INIT Total_CO2_Emission_from_EV[Idaho] = 0
Total_CO2_Emission_from_EV[Illinois](t)	Total_CO2_Emission_from_EV[Illinois](t - dt) + (Lifetime_CO2_Emission_of_EV[Illinois]) * dt	INIT Total_CO2_Emission_from_EV[Illinois] = 0
Total_CO2_Emission_from_EV[Indiana](t)	Total_CO2_Emission_from_EV[Indiana](t - dt) + (Lifetime_CO2_Emission_of_EV[Indiana]) * dt	INIT Total_CO2_Emission_from_EV[Indiana] = 0
Total_CO2_Emission_from_EV[Iowa](t)	Total_CO2_Emission_from_EV[Iowa](t - dt) + (Lifetime_CO2_Emission_of_EV[Iowa]) * dt	INIT Total_CO2_Emission_from_EV[Iowa] = 0
Total_CO2_Emission_from_EV[Kansas](t)	Total_CO2_Emission_from_EV[Kansas](t - dt) + (Lifetime_CO2_Emission_of_EV[Kansas]) * dt	INIT Total_CO2_Emission_from_EV[Kansas] = 0
Total_CO2_Emission_from_EV[Kentucky](t)	Total_CO2_Emission_from_EV[Kentucky](t - dt) + (Lifetime_CO2_Emission_of_EV[Kentucky]) * dt	INIT Total_CO2_Emission_from_EV[Kentucky] = 0
Total_CO2_Emission_from_EV[Louisiana](t)	Total_CO2_Emission_from_EV[Louisiana](t - dt) + (Lifetime_CO2_Emission_of_EV[Louisiana]) * dt	INIT Total_CO2_Emission_from_EV[Louisiana] = 0
Total_CO2_Emission_from_EV[Maine](t)	Total_CO2_Emission_from_EV[Maine](t - dt) + (Lifetime_CO2_Emission_of_EV[Maine]) * dt	INIT Total_CO2_Emission_from_EV[Maine] = 0
Total_CO2_Emission_from_EV[Maryland](t)	Total_CO2_Emission_from_EV[Maryland](t - dt) + (Lifetime_CO2_Emission_of_EV[Maryland]) * dt	INIT Total_CO2_Emission_from_EV[Maryland] = 0
Total_CO2_Emission_from_EV[Massachusetts](t)	Total_CO2_Emission_from_EV[Massachusetts](t - dt) + (Lifetime_CO2_Emission_of_EV[Massachusetts]) * dt	INIT Total_CO2_Emission_from_EV[Massachusetts] = 0
Total_CO2_Emission_from_EV[Michigan](t)	Total_CO2_Emission_from_EV[Michigan](t - dt) + (Lifetime_CO2_Emission_of_EV[Michigan]) * dt	INIT Total_CO2_Emission_from_EV[Michigan] = 0

Total_CO2_Emission_from_EV[Minnesota](t)	Total_CO2_Emission_from_EV[Minnesota](t - dt) + (Lifetime_CO2_Emission_of_EV[Minnesota]) * dt	INIT Total_CO2_Emission_from_EV[Minnesota] = 0	Ton	Stocks representing the accumulated CO2 footprint of EVs over their lifetimes.
Total_CO2_Emission_from_EV[Mississippi](t)	Total_CO2_Emission_from_EV[Mississippi](t - dt) + (Lifetime_CO2_Emission_of_EV[Mississippi]) * dt	INIT Total_CO2_Emission_from_EV[Mississippi] = 0		
Total_CO2_Emission_from_EV[Missouri](t)	Total_CO2_Emission_from_EV[Missouri](t - dt) + (Lifetime_CO2_Emission_of_EV[Missouri]) * dt	INIT Total_CO2_Emission_from_EV[Missouri] = 0		
Total_CO2_Emission_from_EV[Montana](t)	Total_CO2_Emission_from_EV[Montana](t - dt) + (Lifetime_CO2_Emission_of_EV[Montana]) * dt	INIT Total_CO2_Emission_from_EV[Montana] = 0		
Total_CO2_Emission_from_EV[Nebraska](t)	Total_CO2_Emission_from_EV[Nebraska](t - dt) + (Lifetime_CO2_Emission_of_EV[Nebraska]) * dt	INIT Total_CO2_Emission_from_EV[Nebraska] = 0		
Total_CO2_Emission_from_EV[Nevada](t)	Total_CO2_Emission_from_EV[Nevada](t - dt) + (Lifetime_CO2_Emission_of_EV[Nevada]) * dt	INIT Total_CO2_Emission_from_EV[Nevada] = 0		
Total_CO2_Emission_from_EV[New_Hampshire](t)	Total_CO2_Emission_from_EV[New_Hampshire](t - dt) + (Lifetime_CO2_Emission_of_EV[New_Hampshire]) * dt	INIT Total_CO2_Emission_from_EV[New_Hampshire] = 0		
Total_CO2_Emission_from_EV[New_Jersey](t)	Total_CO2_Emission_from_EV[New_Jersey](t - dt) + (Lifetime_CO2_Emission_of_EV[New_Jersey]) * dt	INIT Total_CO2_Emission_from_EV[New_Jersey] = 0		
Total_CO2_Emission_from_EV[New_Mexico](t)	Total_CO2_Emission_from_EV[New_Mexico](t - dt) + (Lifetime_CO2_Emission_of_EV[New_Mexico]) * dt	INIT Total_CO2_Emission_from_EV[New_Mexico] = 0		
Total_CO2_Emission_from_EV[New_York](t)	Total_CO2_Emission_from_EV[New_York](t - dt) + (Lifetime_CO2_Emission_of_EV[New_York]) * dt	INIT Total_CO2_Emission_from_EV[New_York] = 0		
Total_CO2_Emission_from_EV[North_Carolina](t)	Total_CO2_Emission_from_EV[North_Carolina](t - dt) + (Lifetime_CO2_Emission_of_EV[North_Carolina]) * dt	INIT Total_CO2_Emission_from_EV[North_Carolina] = 0		
Total_CO2_Emission_from_EV[North_Dakota](t)	Total_CO2_Emission_from_EV[North_Dakota](t - dt) + (Lifetime_CO2_Emission_of_EV[North_Dakota]) * dt	INIT Total_CO2_Emission_from_EV[North_Dakota] = 0		

Total_CO2_Emission_from_EV[Ohio](t)	Total_CO2_Emission_from_EV[Ohio](t - dt) + (Lifetime_CO2_Emission_of_EV[Ohio]) * dt	INIT Total_CO2_Emission_from_EV[Ohio] = 0	
Total_CO2_Emission_from_EV[Oklahoma](t)	Total_CO2_Emission_from_EV[Oklahoma](t - dt) + (Lifetime_CO2_Emission_of_EV[Oklahoma]) * dt	INIT Total_CO2_Emission_from_EV[Oklahoma] = 0	
Total_CO2_Emission_from_EV[Oregon](t)	Total_CO2_Emission_from_EV[Oregon](t - dt) + (Lifetime_CO2_Emission_of_EV[Oregon]) * dt	INIT Total_CO2_Emission_from_EV[Oregon] = 0	
Total_CO2_Emission_from_EV[Pennsylvania](t)	Total_CO2_Emission_from_EV[Pennsylvania](t - dt) + (Lifetime_CO2_Emission_of_EV[Pennsylvania]) * dt	INIT Total_CO2_Emission_from_EV[Pennsylvania] = 0	
Total_CO2_Emission_from_EV[Rhode_Island](t)	Total_CO2_Emission_from_EV[Rhode_Island](t - dt) + (Lifetime_CO2_Emission_of_EV[Rhode_Island]) * dt	INIT Total_CO2_Emission_from_EV[Rhode_Island] = 0	
Total_CO2_Emission_from_EV[South_Carolina](t)	Total_CO2_Emission_from_EV[South_Carolina](t - dt) + (Lifetime_CO2_Emission_of_EV[South_Carolina]) * dt	INIT Total_CO2_Emission_from_EV[South_Carolina] = 0	
Total_CO2_Emission_from_EV[South_Dakota](t)	Total_CO2_Emission_from_EV[South_Dakota](t - dt) + (Lifetime_CO2_Emission_of_EV[South_Dakota]) * dt	INIT Total_CO2_Emission_from_EV[South_Dakota] = 0	
Total_CO2_Emission_from_EV[Tennessee](t)	Total_CO2_Emission_from_EV[Tennessee](t - dt) + (Lifetime_CO2_Emission_of_EV[Tennessee]) * dt	INIT Total_CO2_Emission_from_EV[Tennessee] = 0	
Total_CO2_Emission_from_EV[Texas](t)	Total_CO2_Emission_from_EV[Texas](t - dt) + (Lifetime_CO2_Emission_of_EV[Texas]) * dt	INIT Total_CO2_Emission_from_EV[Texas] = 0	
Total_CO2_Emission_from_EV[Utah](t)	Total_CO2_Emission_from_EV[Utah](t - dt) + (Lifetime_CO2_Emission_of_EV[Utah]) * dt	INIT Total_CO2_Emission_from_EV[Utah] = 0	
Total_CO2_Emission_from_EV[Vermont](t)	Total_CO2_Emission_from_EV[Vermont](t - dt) + (Lifetime_CO2_Emission_of_EV[Vermont]) * dt	INIT Total_CO2_Emission_from_EV[Vermont] = 0	
Total_CO2_Emission_from_EV[Virginia](t)	Total_CO2_Emission_from_EV[Virginia](t - dt) + (Lifetime_CO2_Emission_of_EV[Virginia]) * dt	INIT Total_CO2_Emission_from_EV[Virginia] = 0	

Total_CO2_Emission_from_EV[Washington](t)	Total_CO2_Emission_from_EV[Washington](t - dt) + (Lifetime_CO2_Emission_of_EV[Washington]) * dt	INIT Total_CO2_Emission_from_EV[Washington] = 0		
Total_CO2_Emission_from_EV[West_Virginia](t)	Total_CO2_Emission_from_EV[West_Virginia](t - dt) + (Lifetime_CO2_Emission_of_EV[West_Virginia]) * dt	INIT Total_CO2_Emission_from_EV[West_Virginia] = 0		
Total_CO2_Emission_from_EV[Wisconsin](t)	Total_CO2_Emission_from_EV[Wisconsin](t - dt) + (Lifetime_CO2_Emission_of_EV[Wisconsin]) * dt	INIT Total_CO2_Emission_from_EV[Wisconsin] = 0		
Total_CO2_Emission_from_EV[Wyoming](t)	Total_CO2_Emission_from_EV[Wyoming](t - dt) + (Lifetime_CO2_Emission_of_EV[Wyoming]) * dt	INIT Total_CO2_Emission_from_EV[Wyoming] = 0		
Total_CO2_Emission_from_EV[National_Average](t)	Total_CO2_Emission_from_EV[National_Average](t - dt) + (Lifetime_CO2_Emission_of_EV[National_Average]) * dt	INIT Total_CO2_Emission_from_EV[National_Average] = 0		
"Non-EV_Emission":				
Average_CO2_Emission_Per_Car_Manufactured	5.6		Ton/Vehicle	The variable denotes the CO2 emissions per vehicle built. https://www.autoexpress.co.uk/sustainability/358628/car-pollution-production-disposal-what-impact-do-our-cars-have-planet#:~:text=How%20many%20CO2s%20are%20released,the%20steel%20body%20in%20white.
Average_Manufacturing_Time	0.08		Year	This variable represents the average manufacturing time for non-electric vehicles.
Carbon_Footprint_Per_Litre	0.0026		Ton/litre	The carbon footprint per liter of gasoline burned in a non-electric vehicle is represented by this metric. To get a car going, an internal combustion engine has to take the chemical energy held in the gasoline and turn it into mechanical energy to turn the wheels. The byproduct of this procedure is carbon dioxide (CO2). About 2.3 kilograms (or 0.0026 ton) of carbon dioxide are released when 1 liter of gasoline is burned. https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle#:~:text=Every%20gallon%20of%20gasoline%20burned%20creates%20about%208%2C887%20grams%20of%20CO2.
CO2_Emission_from_Disposal	4.6		Ton/Vehicle	The value of this attribute indicates the CO2 output associated with a vehicle's final disposal.
CO2_Emission_per_car_per_year	Carbon_Footprint_Per_Litre * Average_Fuel_Consumption_Per_km * Average_Distance_Travelled_Per_year		Ton/Year/Vehicle	The annualized rate of carbon dioxide (CO2) emissions from a vehicle.

"Disposal_Emission_of_Non-EV"	"Disposal_of_Non-EV"*CO2_Emission_from_Disposal		Ton/Year	The overall amount of CO2 emissions from disposal are determined by this variable.
"Disposal_of_Non-EV"	"Non-EV_Stock"/Average_Time_of_Ownership		Vehicle/Year	In the model, this is represented as a disposal outflow of the non-EV Stock at the end of the vehicle's useful life. To determine this, we divide the total number of non-EV vehicles in circulation by the typical vehicle ownership period.
"Lifetime_CO2_Emission_of_Non-EV"	"Non-EV_Well_to_Tail_Emission"+"Non-EV_Tail_to_Wheel_Emission"+"Disposal_Emission_of_Non-EV"		Tons/Years	This is a contribution to Non-EV Stock's Lifecycle CO2 emissions. The whole lifecycle emission was computed using this input.
"Manufacturing_of_Non-EV"	DELAYN("Non-EV_Sales", Average_Manufacturing_Time, 3)		Vehicle/Year	This represents an influx into the Non-EV Stock. This represents the production of non-electric vehicles. A delay function is utilized to signify manufacturing process delay.
"Non-EV_Stock"(t)	"Non-EV_Stock"(t - dt) + ("Manufacturing_of_Non-EV" - "Disposal_of_Non-EV") * dt	INIT "Non-EV_Stock" = 5000000	Vehicle	This stock accounts for the sum of all Non-EV vehicles currently on the road. The value is calculated by considering the trend of increasing rate of vehicles in US states. https://www.statista.com/topics/4578/vehicles-in-use-in-the-us/#topicOverview
"Non-EV_Tail_to_Wheel_Emission"	CO2_Emission_per_car_per_year*"Non-EV_Stock"		Ton/Year	This variable computes the overall emission from the vehicle's various stages of operation.
"Non-EV_Well_to_Tail_Emission"	"Manufacturing_of_Non-EV" * Average_CO2_Emission_Per_Car_Manufactured		Ton/Year	Total emissions from production are determined by this parameter.
"Total_CO2_Emission_from_Non-EV"(t)	"Total_CO2_Emission_from_Non-EV"(t - dt) + ("Lifetime_CO2_Emission_of_Non-EV") * dt	INIT "Total_CO2_Emission_from_Non-EV" = 0	Ton	The stock represents the cumulative Lifecycle CO2 footprint of Non-EV automobiles.
"Non-EV_to_EV_Conversion":				
Actual_Cost_of_Battery	Approximate_Cost_of_Battery*(1+Effect_of_Mining_on_Cost_of_Battery)		USD/Battery	This is a battery cost variable that takes into account both the initial purchase price and the effect of mining cost.
Ad_Budget	33000000		USD/Year	Due of a lack of precise data, we utilized the marketing spend of EV firms in 2020 as a benchmark. https://mediaradar.com/blog/electric-vehicle-push-top-advertisers/#:~:text=Electric%20vehicle%20ad%20spending%20has,in%202020%20was%20almost%20nonexistent.
Adoption_Fraction	0.008		dmnl	This variable represents the percentage of persons that may adopt an EV based on the total contact rate.
Adoption_from_Ad	(Ad_Budget/Avg_Cost_per_Ad)* Conversion_Rate*"People_Considering_Non-EV"		People/Year	This metric measures the overall interest in purchasing an EV as a result of marketing efforts. This is figured out by dividing the total advertising expenditures by the cost each advertisement. That tells us how many ads are shown annually. In order to get an accurate number, we multiply this by both the "People Considering Non-EV" and the "People Conversion Rate Per Advertisement" numbers.
Adoption_from_Word_of_mouth	Adoption_Fraction*Total_Contact_Rate		People/Year	This is a variable that counts the total number of persons who have been persuaded to consider purchasing an EV due to word of mouth.

Approximate_Cost_of_Battery	GRAPH(TIME) Points: (2010.00, 1100.0), (2011.00, 804.9), (2012.00, 599.8), (2013.00, 457.2), (2014.00, 358.0), (2015.00, 289.1), (2016.00, 241.2), (2017.00, 207.9), (2018.00, 184.8), (2019.00, 168.7), (2020.00, 157.5), (2021.00, 149.7)		USD/Battery	The approximate price per battery is represented by this variable.
Average_Battery_Price	IF Test_Switch_1=1 THEN Historical_Battery_Price ELSE Actual_Cost_of_Battery		USD/Battery	This variable denotes the typical cost of the batteries used in an EV.
Average_Car_per_People	GRAPH(TIME) Points: (2010.00, 0.9000), (2011.10, 0.8473), (2012.20, 0.8119), (2013.30, 0.7882), (2014.40, 0.7723), (2015.50, 0.7617), (2016.60, 0.7545), (2017.70, 0.7497), (2018.80, 0.7465), (2019.90, 0.7444), (2021.00, 0.7429)		Vehicle/People	This statistic depicts the average automobile per person in the United States through time. The figure is calculated by dividing the number of automobiles owned by households by the number of people in each household. https://css.umich.edu/publications/factsheets/mobility/personal-transportation-factsheet
Average_Charging_Cost	GRAPH(TIME) Points: (2010.00, 0.115), (2011.00, 0.117), (2012.00, 0.119), (2013.00, 0.121), (2014.00, 0.125), (2015.00, 0.127), (2016.00, 0.126), (2017.00, 0.129), (2018.00, 0.129), (2019.00, 0.13), (2020.00, 0.131), (2021.00, 0.137)		USD/kWh	This variable reflects the average national price per kilowatt hour (kWh) of electricity in the United States from 2010 through 2021. Source: United States; EIA; 1975 to 2022 https://www.statista.com/statistics/200199/residential-sector-electricity-prices-in-the-us-since-1975/
Average_cost_excluding_battery_price	GRAPH(TIME) Points: (2010.000, 54100), (2011.000, 43790), (2012.000, 44300), (2013.000, 47840), (2014.000, 38240), (2015.000, 36210), (2016.000, 39660), (2017.000, 38390), (2018.000, 35510),		USD/Vehicle	This variable represents the typical retail price of electric vehicles excluding the cost of the battery. Source: International Energy Agency database
Average_Distance_Travelled_Per_year	18500		km/Year/Vehicle	This value is a metric that reflects the typical annual mileage traveled by a vehicle. https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle
"Average_Driving_Population_in_States_(Year_2010)"	0.8*"Average_Population_in_States_(Year_2010)"		People	This variable represents average driving license holder population in each USA state in year 2010. The value is calculated by multiplying the population and the % of driving license against the population.
"Average_Fixed_Cost_of_Non-EV"	GRAPH(TIME) Points: (2016.000, 34450), (2017.000, 34670), (2018.000, 35610), (2019.000, 36820), (2020.000, 38960), (2021.000, 42380)		USD/Vehicle	This is a value that shows the average cost of a standard automobile. https://www.nada.org/nada/research-and-data/nada-data?id=21474861098 https://www.statista.com/statistics/274927/new-vehicle-average-selling-price-in-the-united-states/
Average_Fuel_Consumption_Per_km	0.086		litre/km	This is a metric that displays the average fuel usage per kilometer traveled by a non-EV. https://www.iea.org/articles/fuel-economy-in-the-united-states
Average_Fuel_Cost	GRAPH(TIME) Points: (2010.00, 0.7340), (2011.00, 0.9300), (2012.00, 0.9560), (2013.00, 0.9270), (2014.00, 0.8880), (2015.00, 0.6420), (2016.00, 0.5650), (2017.00, 0.6390), (2018.00, 0.7190), (2019.00, 0.6870), (2020.00, 0.5730), (2021.00, 0.7950)		USD/litre	This is a parameter representing the annual average gasoline price per liter in the United States from 2010 to 2021. This model uses the extrapolation table function to map the impact of price changes beyond 2021. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPMR_PTE_NUS_DPG&f=A

Average_Lifetime_Distance_by_Vehicle	Average_Distance_Travelled_Per_year * Average_Time_of_Ownership		km/Vehicle	This is a variable that reflects the overall distance traveled by a vehicle over the course of its whole operational life.
Average_Maintenance_&_Repair_Cost_for_EV	GRAPH(TIME) Points: (2010.00, 0.027), (2011.00, 0.028), (2012.00, 0.029), (2013.00, 0.03), (2014.00, 0.031), (2015.00, 0.032), (2016.00, 0.033), (2017.00, 0.034), (2018.00, 0.035), (2019.00, 0.036), (2020.00, 0.037), (2021.00, 0.038)		USD/km	An EV's average maintenance cost per kilometer is represented by this variable. Light-duty EVs have an estimated planned average maintenance cost of $ 0.03 per km, according to a research by the U.S. Department of Energy's Office of Scientific and Technical Information. Another study found that the annual rise in car maintenance costs averaged 3-5%. Our model assumes an annual maintenance cost growth rate of 3%. So,a graph is constructed to show how things will change from 2010 to 2021, assuming a compound annual growth rate of 3%. https://cleantechnica.com/2021/06/29/electric-vehicles-have-much-lower-maintenance-costs/
"Average_Maintenance_&_Repair_Cost_for_Non-EV"	GRAPH(TIME) Points: (2010.00, 0.04263), (2011.00, 0.044), (2012.00, 0.04553), (2013.00, 0.047), (2014.00, 0.048), (2015.00, 0.05), (2016.00, 0.052), (2017.00, 0.053), (2018.00, 0.055), (2019.00, 0.056), (2020.00, 0.058), (2021.00, 0.06)		USD/km	This metric measures the typical cost per kilometer spent on upkeep for a vehicle powered by an internal combustion engine rather than electricity. The projected planned maintenance cost for a light-duty conventional internal combustion engine vehicle (Non-EV) is $ 0.06 per km, according to a research by the U.S. Department of Energy's Office of Scientific and Technical Information. Another study found that the annual rise in car maintenance costs averaged 3-5%. We assume yearly inflation of 3% for the cost of maintenance in our model. As a result, we developed a visual extrapolation plot that extrapolated data from 2010 to 2021, with an annual growth of 3%. https://www.globalfleetmanagement.com/10154772/preventative-maintenance-costs-increase-3-5-in-2021
"Average_Population_in_States_(Year_2010)"	6186000		People	This variable represents average population in each USA state in year 2010. https://datacommons.org/place/country/USA/?utm_medium=explore&mprop=count&popt=Person&hl=en
Average_Time_of_Ownership	8		Year	This is a metric that indicates the typical length of time an individual has owned a car. https://www.thezebra.com/resources/driving/average-length-of-car-ownership/
Average_Total_Ownership_Cost_of_EV	Average_cost_excluding_battery_price +(Average_Battery_Price*Battery_Per_EV)		USD/Vehicle	This variable represents the Total Ownership Cost of an electric vehicle. This doses not take regular operating cost in the calculation.
Avg_Cost_per_Ad	500000		USD/Ad	The price of an advertising is represented by this attribute. We have solely taken into account the pricing based on conventional media advertisements. The starting cost of a conventional media campaign is estimated to be $50000 based on research into various historical advertisements.
Avgerage_Operating_Cost_of_EV	Charging_Cost_for_Vehicle_lifetime + Lifetime_Maintenance_and_Repair_Cost_for_EV		USD/Vehicle	This variable computes the overall average cost of fuel, maintenance, and repairs for an EV throughout the course of its lifespan.
"Avgerage_Operating_Cost_of_Non-EV"	"Lifetime_Maintenance_and_Repair_Cost_for_Non-EV" + Lifetime_Fuel_Cost		USD/Vehicle	This is a variable that computes the total cost of fuel, maintenance, and repairs for a Non-EV during its lifespan.
Battery_Per_EV	2		Battery/Vehicle	This is a measure that shows that, on average, an electric car will have a certain number of batteries, each with its own function.
Carbon_Tax	0		USD/Vehicle	This variable indicates to the carbon tax imposed on the Non-EV buyers. https://www.weforum.org/agenda/2022/07/carbon-tax-emissions-countries/

Change_in_Total_Cost_of_EV	(Total_Ownership_Cost_of_EV-Total_Cost_of_EV)/Cost_Adjustment_Time		USD/Vehicle/Year	This inflow estimates the total price of EV ownership.
"Change_in_Total_Cost_of_Non-EV"	("Total_Ownership_Cost_of_Non-EV"-"Total_Cost_of_Non-EV")/Cost_Adjustment_Time		USD/Vehicle/Year	This Inflow computes the perceived Total cost of non-ev over time.
Charging_Cost_for_Vehicle_lifetime	Average_Lifetime_Distance_by_Vehicle * Average_Charging_Cost*Electricity_Energy_Consumption_per_KM		USD/Vehicle	The overall cost of charging an EV during its lifespan is determined using this variable.
Comparative_Cost	Total_Cost_of_EV//"Total_Cost_of_Non-EV"		dmnl	This variable represents the ratio of Perceived Total cost of EV to Perceived Total cost of Non-EV If the value is =1, EV and Non-EV have similar value of cost advantage. If the value is >1, EV have higher cost factor advantage over Non-EV If the value is <1, Non-EV have higher cost factor advantage over EV
Contact_Frequency	20		People/People/Year	The number of new people an individual encounters each year is a measurable quantity.
Conversion_Rate	0.0001		People/People/Ad	The conversion rate is represented by this variable. This rate translates the percentage of those exposed to the marketing each year who wish to think about buying an EV. This fractional rate is comparatively quite low because the infrastructure, cost, government incentive, and support for EVs are not yet particularly strong.
Cost_Adjustment_Time	0.5		year	
Effect_of_Cost_Factor_on_Adoption	GRAPH(Comparative_Cost) Points: (0.500, 1.202), (0.583333333333, 0.996), (0.666666666667, 0.846), (0.750, 0.768), (0.833333333333, 0.697), (0.916666666667, 0.640), (1.000, 0.623), (1.08333333333, 0.601), (1.16666666667, 0.583), (1.250, 0.570), (1.33333333333, 0.561), (1.41666666667, 0.561), (1.500, 0.526)		dmnl	Using the relative annual cost, this graphical function estimates the impact of the cost element on the net change. According to the range of their graphs, the impact will be greater for larger comparative cost factors and vice versa.
Electricity_Energy_Consumption_per_KM	0.2		kWh/km	This metric indicates the typical amount of power used by an EV per kilometer traveled. An electric vehicle's typical energy usage is 0.20 kWh/km. Under ideal conditions, this figure can drop below 0.15 kWh/km. Electric vehicle models and other factors like driving style, topography, and weather can affect the amount of energy needed to travel one mile. https://www.virta.global/blog/ev-charging-101-how-much-electricity-does-an-electric-car-use
"EV_Sales_-_New_Customer"	Net_change*Average_Car_per_People		Vehicle/Year	The full extent of the market for EVs is represented by this metric. Multiplying "net change" by "average car per people" yields this result.
Historic_sales_price_of_an_electric_vehicle	GRAPH(TIME) Points: (2010.000, 55200), (2011.000, 44600), (2012.000, 44900), (2013.000, 48300), (2014.000, 38600), (2015.000, 36500), (2016.000, 39900), (2017.000, 38600), (2018.000, 35700), (2019.000, 36900)		USD/Vehicle	From 2010 to 2019, this variable represents the average selling price of electric automobiles. https://www.iea.org/data-and-statistics/charts/average-price-and-driving-range-of-bevs-2010-2019

Historical_Battery_Price	GRAPH(TIME) Points: (2010.00, 1100.0), (2011.00, 804.9), (2012.00, 599.8), (2013.00, 457.2), (2014.00, 358.0), (2015.00, 289.1), (2016.00, 241.2), (2017.00, 207.9), (2018.00, 184.8), (2019.00, 168.7), (2020.00, 157.5), (2021.00, 149.7)		USD/Battery	To illustrate how much batteries have fluctuated in cost over time, this parameter is provided. According to Bloomberg NEF's 2021 Battery Price Survey, the average price of a lithium-ion battery pack was $137/kWh in 2020, down from $1,100/kWh in 2010.
Historical_EV_Sales	GRAPH(TIME) Points: (2010.00, 14000), (2011.00, 16820), (2012.00, 19920), (2013.00, 24000), (2014.00, 27020), (2015.00, 31300), (2016.00, 33200), (2017.00,		car/year	Historical Sales Figures of EV Sales. Source : IEA, Global electric car stock, 2010-2019
"Increase_rate_of_Non-EV_Population"	Net_change_in_population * Share_of_Driving_Population_in_Total_Population		people/year	This is a flow that estimates the growing rate of Non-EV Population as the driving population grows in the United States.
Lifetime_Fuel_Cost	Average_Lifetime_Distance_by_Vehicle * Average_Fuel_Cost*Average_Fuel_Consumption_Per_km		USD/Vehicle	This is a factor that determined the total fuel expenditure for a Non-EV.
Lifetime_Maintenance_and_Repair_Cost_for_EV	(Average_Lifetime_Distance_by_Vehicle * Average_Maintenance_&_Repair_Cost_for_EV)		USD/Vehicle	The cost of maintaining an electric vehicle (EV) during its expected lifespan is captured by this variable.
"Lifetime_Maintenance_and_Repair_Cost_for_Non-EV"	"Average_Maintenance_&_Repair_Cost_for_Non-EV" * Average_Lifetime_Distance_by_Vehicle		USD/Vehicle	Non-electric vehicle maintenance costs are represented by this variable.
Net_change	(Adoption_from_Ad +Adoption_from_Word_of_mouth) *Effect_of_Cost_Factor_on_Adoption		people/year	This flow depicts the total number of individuals who switched from contemplating Non-EV to considering EV. This represents the annual net change. Adoption through advertising and adoption from word of mouth are added up to determine this. The Effect of Cost Factor on Adoption of EV is multiplied by the total.
Net_change_in_population	Yearly_Growth*Total_Population		people/year	This flow shows the net change in the overall population stock.
"Non-EV_Sales"	"Increase_rate_of_Non-EV_Population"*Average_Car_per_People		Vehicle/Year	Non-electric car demand as a whole is represented here. Multiplying "Increase rate of non-EV Population" by "average car per people" yields the result.
People_Considering_EV(t)	People_Considering_EV(t - dt) + (Net_change) * dt	INIT People_Considering_EV = 400	People	This stock shows the total number of drivers who now use or are contemplating utilizing an electric car. Approximately 20000 electric vehicles were in stock in 2010, according to IEA statistics.To make the calculation easier the number of vehicles are divided among all the states equally.
"People_Considering_Non-EV"(t)	"People_Considering_Non-EV"(t - dt) + ("Increase_rate_of_Non-EV_Population" - Net_change) * dt	INIT "People_Considering_Non-EV" = "Average_Driving_Population_in_States_(Year_2010)"	People	This stock shows the total number of drivers that use or are contemplating utilizing a Non-EV.
People_Not_Considering_EV_Concentration	"People_Considering_Non-EV"/Total_Driving_Population		dmnl	This is a ratio used to compute the proportion of individuals who are contemplating non-electric vehicles relative to the total population of drivers. This ratio will increase as the number of people interested in non-electric stock increases, and vice versa.
Share_of_Driving_Population_in_Total_Population	GRAPH(TIME) Points: (2010.00, 0.8), (2011.00, 0.8155), (2012.00, 0.8263), (2013.00, 0.8338), (2014.00, 0.839), (2015.00, 0.8427), (2016.00, 0.8452), (2017.00, 0.8469), (2018.00, 0.8482), (2019.00, 0.849), (2020.00, 0.8496),		dmnl	The parameter represents the fraction of the population across all ages that possesses a valid driver's license. https://www.fhwa.dot.gov/policyinformation/statistics/2021/dl22.cfm
Tax_credit	7500		USD/Vehicle	This variable indicates the tax credits for EVs offered by the federal government.
Test_Switch_1	0		dmnl	To switch between historic battery price and calculated battery price.

Total_Contact	People_Considering_EV*Contact_Frequency		People/Year	In a given year, this variable captures the number of times potential EV buyers interact with others.
Total_Contact_Rate	Total_Contact*People_Not_Considering_EV_Concentration		People/Year	This variable calculates the rate at which the number of individuals contemplating an EV meets the number of individuals considering a Non-EV.
Total_Cost_of_EV(t)	Total_Cost_of_EV(t - dt) + (Change_in_Total_Cost_of_EV) * dt	INIT Total_Cost_of_EV = Historic_sales_price_of_an_electric_vehicle	USD/Vehicle	This is a stock that symbolizes people's perceptions on the whole cost of an EV car. The starting amount is used as the FIXED COST of the EV.
"Total_Cost_of_Non-EV"(t)	"Total_Cost_of_Non-EV"(t - dt) + ("Change_in_Total_Cost_of_Non-EV") * dt	INIT "Total_Cost_of_Non-EV" = "Average_Fixed_Cost_of_Non-EV"	USD/Vehicle	This is a stock that symbolizes people's perceptions on the whole cost of an Non-EV car. The starting amount is used as the FIXED COST of the Non-EV.
Total_Driving_Population	People_Considering_EV+"People_Considering_Non-EV"		People	The sum of "People Considering non-EV" and "People Considering EV" stocks are added to this variable, which then returns the number of drivers.
Total_Ownership_Cost_of_EV	Average_Total_Ownership_Cost_of_EV+Avgerage_Operating_Cost_of_EV-Tax_credit		USD/Vehicle	This is a variable that estimates an EV's Total Ownership Cost during its lifespan. Total Ownership Cost is computed by adding together Operating Cost and Fixed Cost.
"Total_Ownership_Cost_of_Non-EV"	"Average_Fixed_Cost_of_Non-EV"+"Avgerage_Operating_Cost_of_Non-EV"+Carbon_Tax		USD/Vehicle	This is a variable that estimates the Total Ownership Cost of a Non-EV throughout the course of its life. The total ownership cost is computed by adding the operating and fixed costs.
Total_Population(t)	Total_Population(t - dt) + (Net_change_in_population) * dt	INIT Total_Population = "Average_Population_in_States_(Year_2010)"	People	This is a stock which represents average population in each USA state. The initial value is taken as of 2010. https://datacommons.org/place/country/USA/?utm_medium=explore&mprop=count&popt=Person&hl=en
Yearly_Growth	GRAPH(TIME) Points: (2010.00, 0.0087), (2011.00, 0.0087), (2012.00, 0.0088), (2013.00, 0.0086), (2014.00, 0.0083), (2015.00, 0.008), (2016.00, 0.008), (2017.00, 0.0079), (2018.00, 0.0071), (2019.00, 0.0069), (2020.00, 0.0049), (2021.00, 0.0031)		dmnl/Year	This variable represents the rate of increase in the United States' populace between 2010 and 2021. https://www.macrotrends.net/countries/USA/united-states/population-growth-rate

Run Specs	
Start Time	2010
Stop Time	2050
DT	4-Jan
Fractional DT	TRUE
Save Interval	0.25
Sim Duration	1
Time Units	Year
Pause Interval	0
Integration Method	Euler
Keep all variable results	TRUE
Run By	Run
Calculate loop dominance information	TRUE
Exhaustive Search Threshold	1000

Array Dimension	Indexed by	Elements
State	Label (51)	Alabama
		Alaska
		Arizona
		Arkansas
		California
		Colorado
		Connecticut
		Delaware
		Florida
		Georgia
		Hawaii
		Idaho
		Illinois
		Indiana
		Iowa
		Kansas
		Kentucky
		Louisiana
		Maine
		Maryland
		Massachusetts
		Michigan
		Minnesota
		Mississippi
		Missouri
		Montana
		Nebraska
		Nevada
		New_Hampshire
		New_Jersey
		New_Mexico
		New_York
		North_Carolina
		North_Dakota
		Ohio
		Oklahoma
		Oregon
		Pennsylvania
		Rhode_Island
		South_Carolina
		South_Dakota
		Tennessee
		Texas
		Utah
		Vermont

		Virginia
		Washington
		West_Virginia
		Wisconsin
		Wyoming
		National_Average
Custom Unit	Aliases	Equation
$	dollar	
	dollars	
kilowatt hours per day		kWh/day
kilowatts	kilowatt	kW
Dimensionless	dmnl	1
	unitless	
site	sites	
Per Year		1/year
euros per year per person		EUR/(person-year)