Development and Update of Long-Term Energy and GHG Emission Macroeconomic Accounting Tool

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Argonne National Laboratory
2015 DOE Hydrogen Program and Vehicle Technologies Annual Merit Review
June 11, 2015

Project ID: VAN006

This presentation does not contain any proprietary, confidential, or otherwise restricted information

Project Overview

Timeline

Start Date: October 2014
End Date: Project continuation and direction determined annually by DOE

Barriers

- Constant advances in technology
- Computational models, design, and simulation methodologies
- Lack of quick analysis tools and lack of comprehensive historical database

Budget

Total Project Funding (DOE)
- FY14: $230,000
- FY15: $200,000

Partners

Interactions
- NAS, NPC, ACEEE, Universities, NESCAUM, and other users
- National Renewable Energy Lab
- TA Engineering, Inc.
- Energy Information Administration (EIA)

Relevance: Tools Provide Energy and GHG Analysis by Vehicle Technology, Freight Mode and Fuel Types, Relevant to EERE Interests, Answers to Key Questions

- What are the long-term energy and GHG emissions impacts of alternative technological, regulatory, and policy scenarios for both highway and non-highway transportation?
- What are the long-term energy and GHG emissions impacts of increased alternative fuels (such as electricity, biofuels) and LNG use by highway vehicles and freight modes?
- How much upstream energy, in production of feedstock and fuel, is consumed under alternative scenarios?
- How much reduction in petroleum consumption and GHG emission would be achieved under an alternative scenario?

Objectives: Develop Transparent, and User Friendly Spreadsheet Models That Estimate Energy Demand and GHG Emissions

VISION	NEAT
1. Construct transparent, flexible, and user friendly analytical tools for evaluation of alternative scenarios:	
Highway vehicle technologies and fuels	Freight demand, mode shares, energy intensities, and fuels
2. Consider full fuel cycle energy use and GHG emissions rates	
3. Allow user to specify own scenario:	
Light and heavy duty highway vehicles	Commodity level freight movement, mode shares, modal energy intensities, and alternative fuel use
4. Provide a comparison of alternative scenario results with Base Case results	
5. Set analysis horizon:	
2100	2050

Objectives (Cont'd): VISION Focus on Highway Technologies while NEAT Focus on Freight Movements

VISION		NEAT	
Annual Energy Outlook Economic Factors Population	Input	Freight Analysis Framework Annual Energy Outlook	Input
Vehicle Survival Age Dependent Usage On-Road Fuel Economy	Incorporate	Mode Shares	Incorporate
Feedstock and Fuel Production Pathway	Accommodate	Feedstock and Fuel Production Pathway	Accommodate
Vehicle sales, stock, fuel economy, annual use, energy use and GHG emissions	Develop	Freight ton-miles, energy intensities, energy use and GHG emissions	Develop

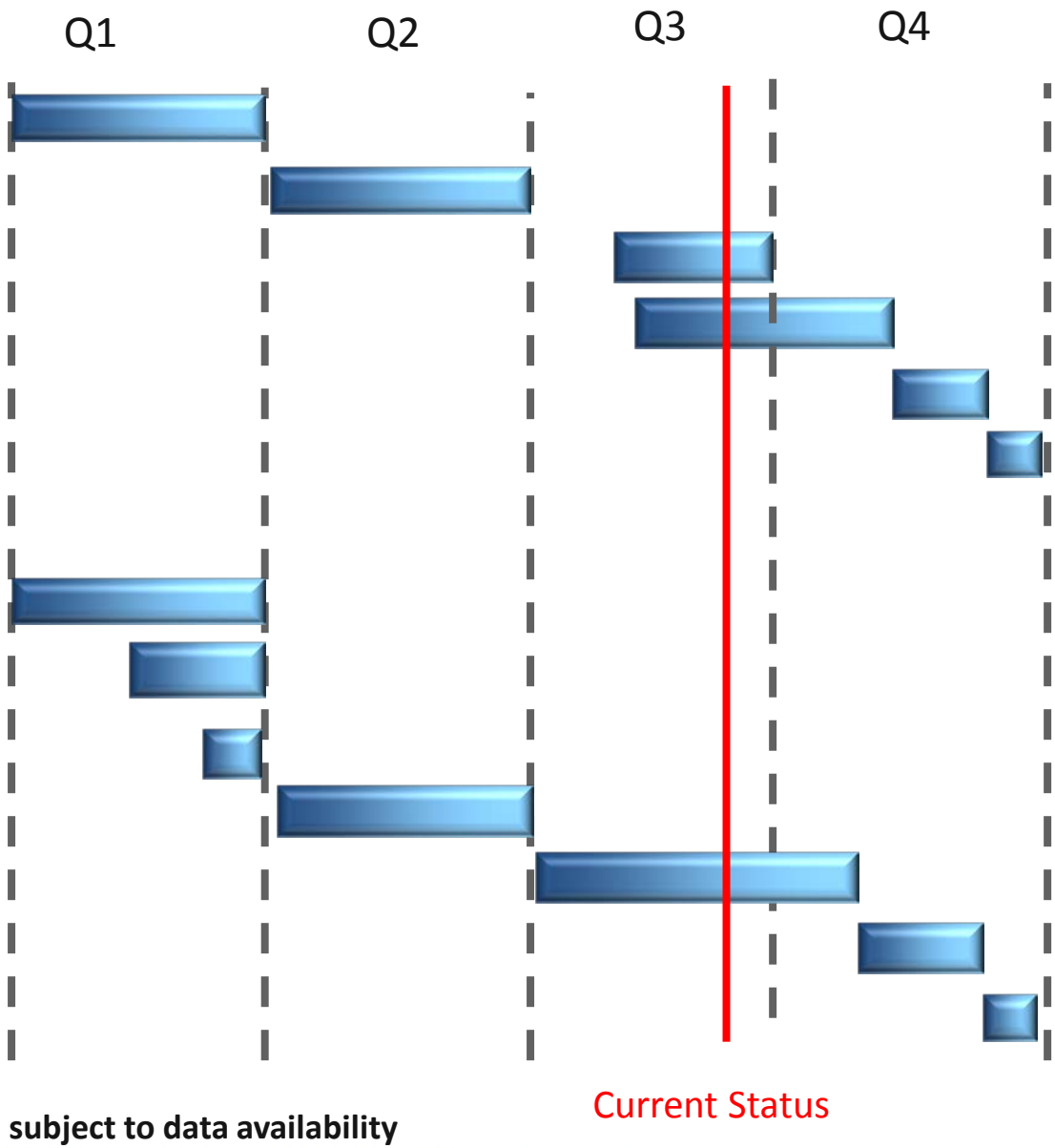
Milestones

VISION:

- Webinar
- Propose & Do Enhancements
- Collect needed data
- Develop Base Case
- Develop Extensions to 2100
- Update Website & Release

NEAT:

- Webinar
- Add LNG to Rail
- Add LNG to Marine
- Document internal procedure
- Develop Base Case
- Develop Extensions to 2100
- Update Website & Release



Note: Model update and release time is subject to data availability

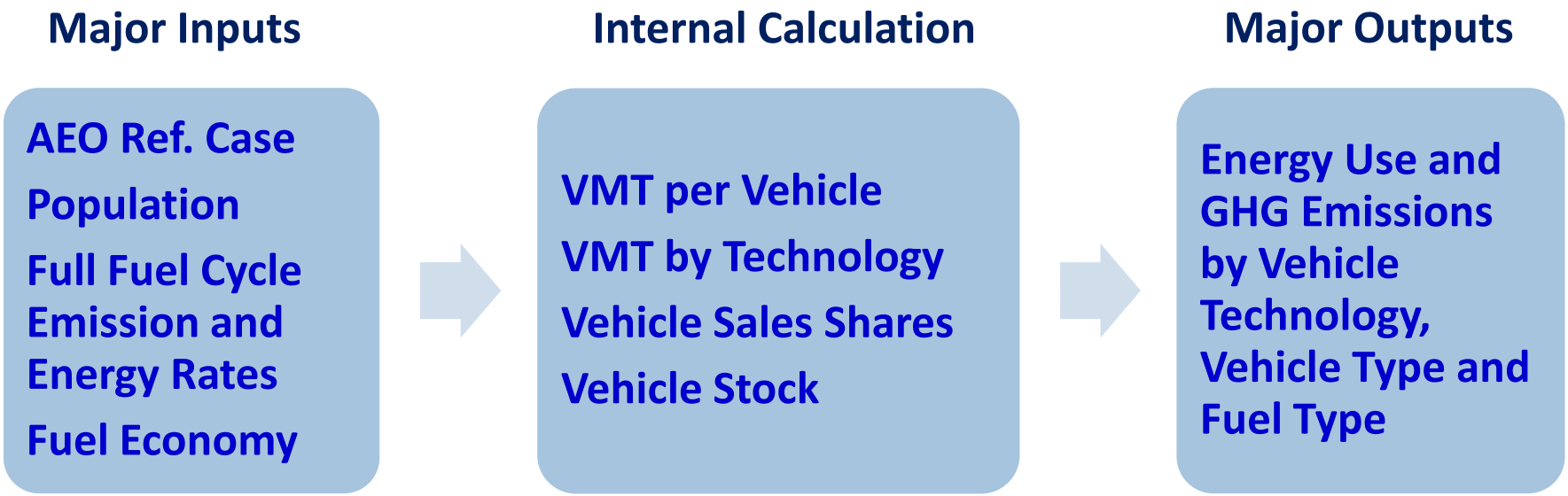
VISION: Highway Vehicle Technologies Energy and GHG Emission Accounting Tool

Approach: Evaluate Highway Vehicle Technologies

Vehicles	Technology & Fuel	Feedstock/Pathways
 Cars	4 ICE (Gasoline, Diesel, Ethanol, CNG) 3 HEV (Gasoline, E85/H2, Dsl) 3 PHEV (2 Gasoline, 1 Diesel) 1 Electric Vehicle 1 Fuel Cell Vehicle	Crude oil (Gasoline, Diesel) Nature gas (FT diesel, NG) Soybeans (Bio-diesel) Corn, corn stover, switchgrass, woody biomass, forest residue, sugarcane (Fuel ethanol) Coal, NG, Nuclear, Renewable (Electricity) NG, Coal, Biomass, Water (Electrolysis—low/high temp, Thermo-chem conversion) (Hydrogen*)
 Light Trucks		
 Class 3-6 Trucks	Gasoline ICE, Diesel ICE, CNG ICE, Diesel HEV	
 Class 7&8 Single Unit Trucks	Gasoline & Diesel ICE, CNG ICE, Diesel HEV	
 Class 7&8 Combination Trucks	Diesel ICE and LNG ICE	

*Could be produced centrally and/or at station.

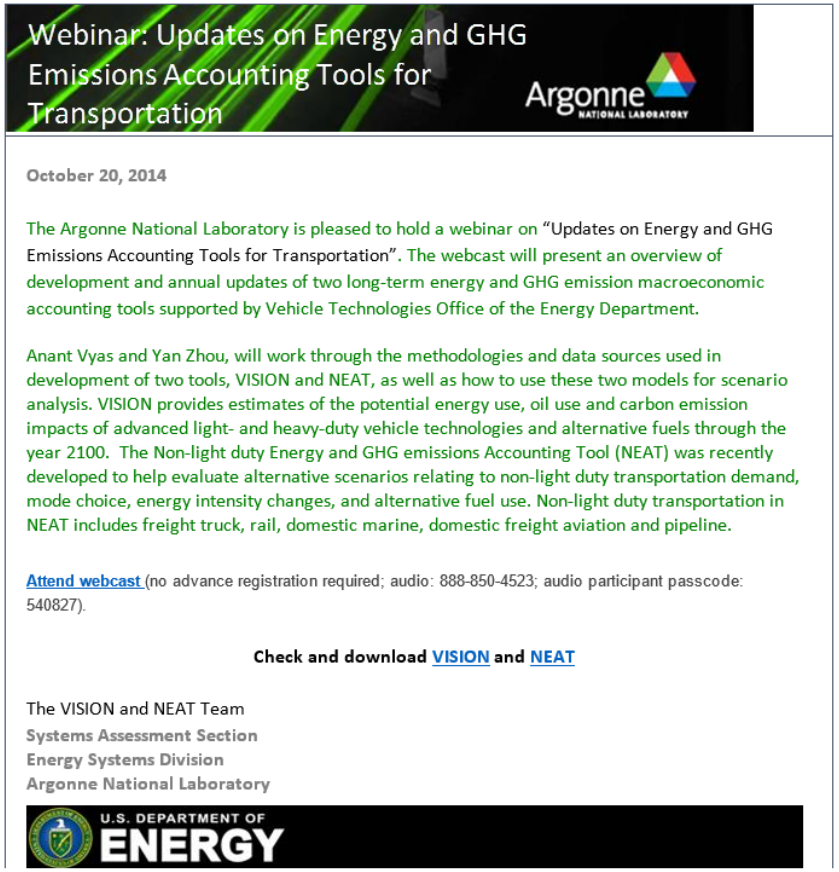
Approach: Create a Long Term Base Case



- Light Vehicles (Car and Light Truck)
- Heavy Vehicles (GVW Class 3-8)
  - Medium: Class 3-6 Truck
  - Heavy: Class 7-8 Single Unit and Combination Truck

VISION Accomplishment : EERE Webinar on Overview of Development and Annual Updates of VISION and NEAT

- Worked through the methodologies and data sources used in development of two tools, VISION and NEAT
- Explained how to use these two models for scenario analysis



Webinar: Updates on Energy and GHG Emissions Accounting Tools for Transportation

Argonne NATIONAL LABORATORY

October 20, 2014

The Argonne National Laboratory is pleased to hold a webinar on "Updates on Energy and GHG Emissions Accounting Tools for Transportation". The webcast will present an overview of development and annual updates of two long-term energy and GHG emission macroeconomic accounting tools supported by Vehicle Technologies Office of the Energy Department.

Anant Vyas and Yan Zhou, will work through the methodologies and data sources used in development of two tools, VISION and NEAT, as well as how to use these two models for scenario analysis. VISION provides estimates of the potential energy use, oil use and carbon emission impacts of advanced light- and heavy-duty vehicle technologies and alternative fuels through the year 2100. The Non-light duty Energy and GHG emissions Accounting Tool (NEAT) was recently developed to help evaluate alternative scenarios relating to non-light duty transportation demand, mode choice, energy intensity changes, and alternative fuel use. Non-light duty transportation in NEAT includes freight truck, rail, domestic marine, domestic freight aviation and pipeline.

Attend webcast (no advance registration required; audio: 888-850-4523; audio participant passcode: 540827).

Check and download VISION and NEAT

The VISION and NEAT Team
Systems Assessment Section
Energy Systems Division
Argonne National Laboratory

U.S. DEPARTMENT OF ENERGY

VISION Accomplishment: Upgraded to handle two types of EV with different certification ranges

- ❑ **In Base Case, EV A and EV B represent EV100 and EV 200 of AEO, respectively.**
- ❑ **Added "Check" function reminding users to define the first year of change and avoid erroneous results**

Auto (Car) Market Penetration

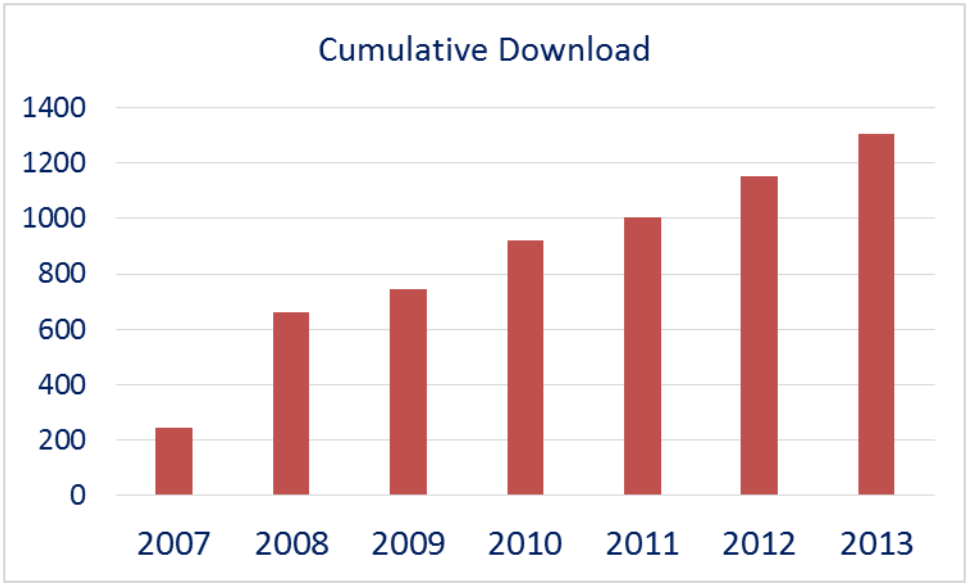
Enter each technology's share of new vehicles market

MUST specify "1st Year" and "1st Yr Shr" for the technology for which either market share or fuel economy change is desired.

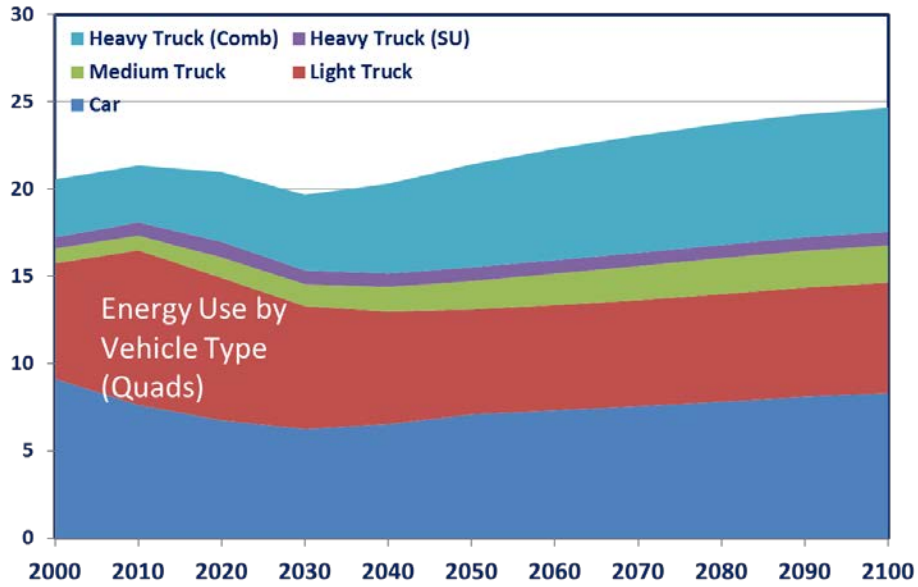
Technology	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	1st Year	1st Yr Shr	Check
EV A	0.01%	0.00%	0.17%	0.71%	1.04%	1.28%	1.47%	1.61%	1.69%	1.75%	1.78%	0	0.0%	
EV B	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0	0.0%	
E-85 FFV	0.85%	5.18%	4.71%	4.52%	4.24%	4.24%	4.24%	4.24%	4.24%	4.24%	4.24%	0	0.0%	
Diesel	0.26%	1.02%	3.98%	6.29%	6.38%	6.69%	6.89%	6.89%	6.89%	6.89%	6.89%	0	0.0%	
CNG	0.39%	0.01%	0.19%	0.20%	0.21%	0.22%	0.22%	0.23%	0.23%	0.23%	0.23%	0	0.0%	
SI HEV on Gasoline	0.10%	6.10%	4.94%	7.14%	7.70%	7.96%	8.14%	8.29%	8.41%	8.45%	8.46%	0	0.0%	
SI HEV on E85/H2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0.0%	
Diesel HEV	0.00%	0.00%	0.01%	0.29%	0.36%	0.36%	0.36%	0.36%	0.36%	0.36%	0.36%	0	0.0%	
SI PHEV A (1)	0.00%	0.00%	0.28%	0.55%	0.74%	0.90%	1.02%	1.11%	1.17%	1.21%	1.23%	0	0.0%	
SI PHEV B (2)	0.00%	0.00%	0.60%	1.15%	1.26%	1.24%	1.22%	1.20%	1.20%	1.19%	1.19%	0	0.0%	
Diesel PHEV	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0	0.0%	
Fuel Cell	0.00%	0.00%	0.04%	0.04%	0.04%	0.05%	0.06%	0.06%	0.06%	0.06%	0.06%	0	0.0%	
Conventional	98.39%	87.69%	85.07%	79.10%	78.01%	77.06%	76.37%	76.00%	75.74%	75.60%	75.54%	0	0.0%	
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%			

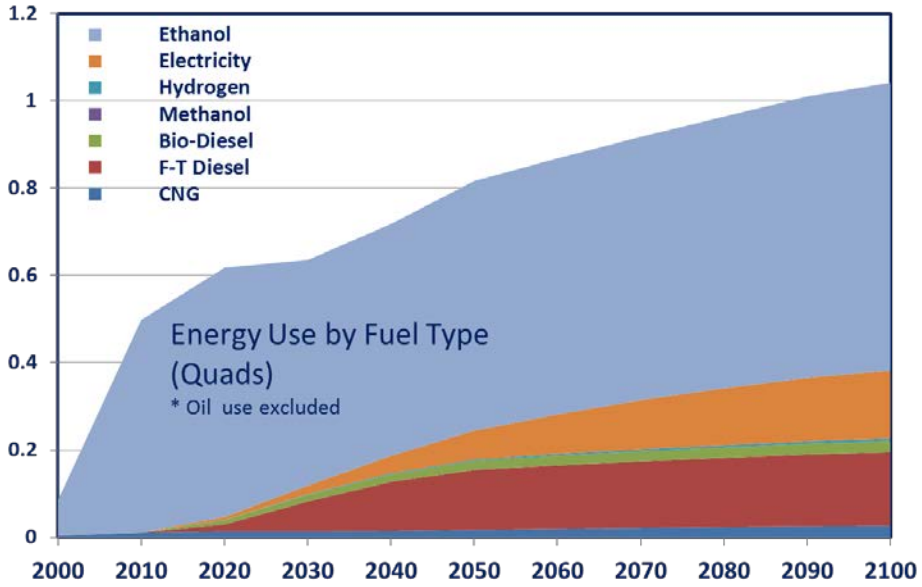
VISION Accomplishment: Helped users in their own use of VISION model in scenario analysis

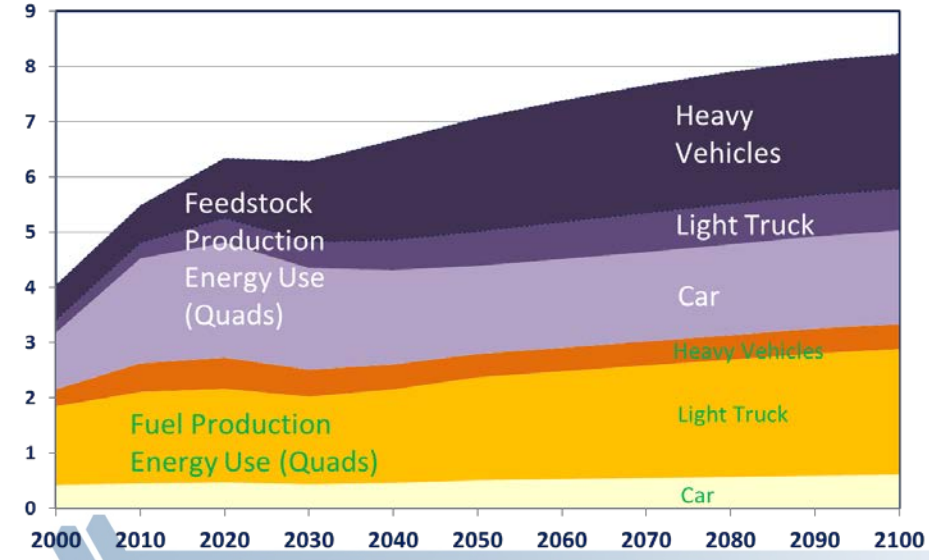
- **DOE Vehicle Technology Program : Annual use in VT program performance analysis**
- **State Agencies: Customized VISION version for state level evaluation of alternative fuel policies (eg. Oregon, Washington, etc.)**

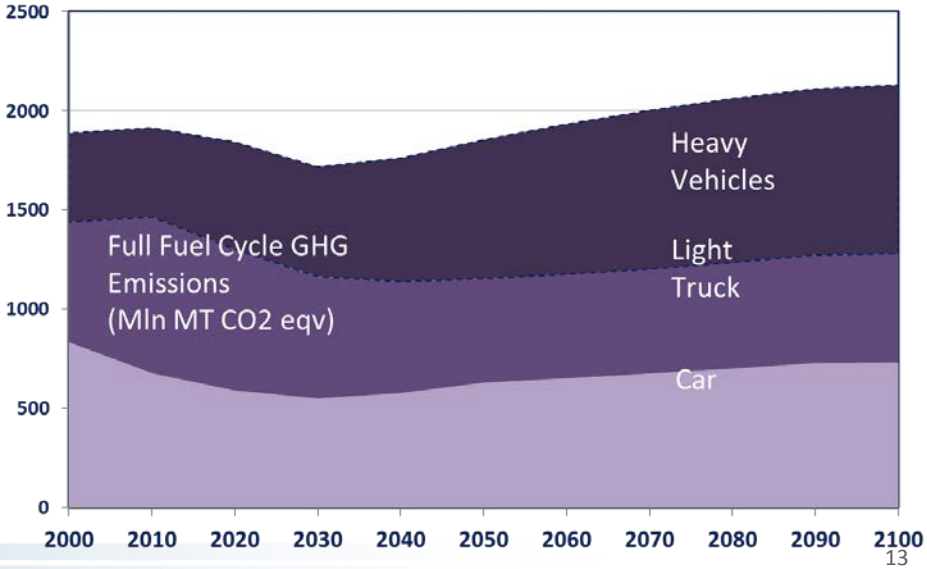


VISION Accomplishment 4: Long Term Base Case for Both Light and Heavy Vehicles by Fuel Type and Vehicle Type







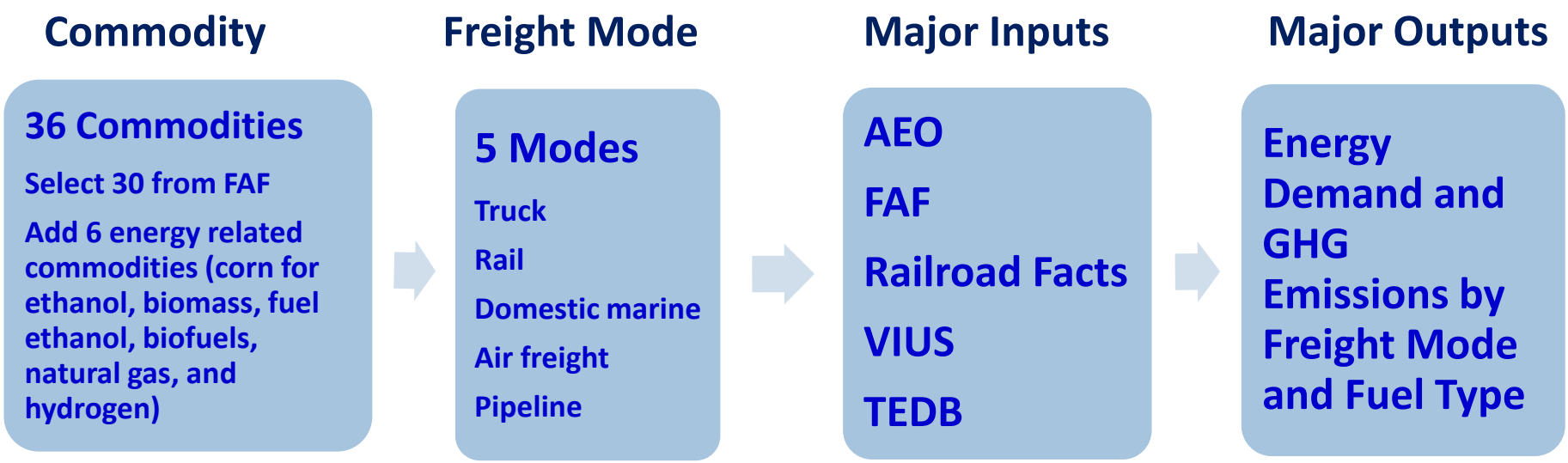


Accomplishment 5: VISION Has Been Widely Used by Government Agencies and Research Institutes

- DOE Vehicle Technology Program : Annual use in VT program performance analysis (Government Performance and Results Act)
- DOE Hydrogen and Fuel Cells Program:
  - Potential Transportation Oil Savings with FCVs
  - Impact of proposed FreedomCAR and Fuel Cell Initiative
- DOE Policy Office: Demand estimates for DOE's study of premium diesel fuel availability issues
- Other Agencies Include DOE Biofuels Program, EERE/Office of Weatherization and Intergovernmental Program, Energy Information Administration
- DOT – NHTSA:
  - How to reduce LDV fuel use by 5% in 2010
  - Estimate the LDV MPG that would be required to save 1 million barrels per day (mbpd) by 2015
- We coordinated with the following agencies in their own use of VISION model in scenario analysis
  - CBO, GSA, White House – Economic Council and Technology Office
  - National Academies: Transitions to Alternative Vehicles and Fuels
  - National Petroleum Council: Advancing Technology for America's Transportation Future

NEAT: Non-Highway Energy & GHG Emissions Accounting Tool for Long-Term Energy and GHG Impacts Evaluation

Approach: Develop a Base Case of 36 Commodity Sectors and 5 Modes



FAF = Freight Analysis Framework (USDOT)
VIUS = Vehicle Inventory and Use Survey (Census)
TEDB = Transportation Energy Data Book (EERE/ORNL)

Approach: Use Full Fuel Cycle Energy Use and GHG Emissions Rates for 11 Fuels and 5 Modes from GREET 2013

Mode	Fuel
 Truck	Petroleum diesel, Bio-diesel, F-T diesel, Pyrolysis diesel, Liquefied natural gas – LNG
 Domestic Marine	Petroleum diesel, F-T diesel, Pyrolysis diesel, Residual fuel oil, LNG
 Rail	Petroleum diesel, F-T diesel, Pyrolysis diesel, LNG
 Air Freight	Petroleum jet fuel, HR/F-T jet fuel, Pyrolysis jet fuel
 Pipeline	Natural gas, Electricity by primary fuel

Estimate GHG emissions and upstream energy use

- Compute upstream energy and GHG emissions
- Compute exhaust GHG emissions

NEAT Accomplishment: Research Pipeline Energy Use

- **The equation to estimate electricity use by natural gas pipelines was developed in 1981 (Hooker et al.)**

Electric Btu = 0.015 × natural gas Btu used by Pipeline compressors

The factor 0.015 is computed as [(electric hp share=0.06)/ (natural gas hp share=0.94)] × [(natural gas ICE efficiency=0.2115)/ (electric motor efficiency=0.9)]

- **No current reliable electric hp and total hp data of natural gas pipeline compressors hp since 1980**
- **Used 2010 natural gas pipeline energy use estimates from Transportation Energy Data Book (TEDB), 2010 natural gas ton-miles estimated earlier and estimated the 2010 natural gas pipeline energy intensity**
- **Developed energy intensity values such that the 2010 total energy use by pipelines other than natural gas pipelines matches with the constant value reported in TEDB**

NEAT Accomplishment: Revised Electricity GHG Emission

- Tool contains four predefined electricity generation mixes
- Users can either select from 4 predefined mixes or specify their own

ELECTRICITY GENERATION FUEL SCENARIO (% kWh/Fuel): Four scenarios for electricity generation fuel shares are available, as listed below. The default scenario represents "Reference Case" in the latest Annual Energy Outlook extended to 2050 in which coal has the largest share. The "Natural Gas Scenario" assigns increasing shares to natural gas generation, making it the dominant fuel by 2020. The "Nuclear Scenario" assigns increasing shares to nuclear generation, making it the dominant fuel by 2030. The "Renewable Scenario" assigns increasing shares to renewable sources, making them dominant by 2025. To see electricity generation fuel shares within a scenario, select a scenario. After selecting one of these scenarios, you will be allowed to make changes to your liking.

Enter the number for the scenario of interest (1, 2, 3, or 4)	1	1 = AEO Reference Case
		2 = Natural Gas Scenario
		3 = Nuclear Scenario
		4 = Renewable Scenario

FUEL SHARES FOR THE SELECTED ELECTRICITY GENERATION SCENARIO: The model is populated with the fuel shares (% kWh generated by fuel) for the scenario you selected. These shares are shown below. You may either accept these values or specify your own. Please type the first year in which the fuel shares will change from model's internal database for each fuel source in column L and the corresponding value in column M. New values for subsequent years ending in zero and five should be entered in columns D through K as applicable.

Electricity Generation Fuel Type	Mode	2010	2015	2020	2025	2030	2035	2040	2045	2050	1st Yr of change	1st Yr Share
Coal (1)	Pipeline	44.9%	38.7%	37.7%	37.6%	37.0%	36.3%	35.1%	34.0%	33.0%		
Petroleum		0.9%	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%		
Natural Gas		23.6%	27.2%	27.0%	27.3%	28.9%	30.5%	30.4%	30.2%	30.1%		
Nuclear		19.6%	19.7%	20.2%	19.9%	19.0%	17.6%	17.3%	17.1%	16.9%		
Renewable Sources		10.9%	13.9%	14.7%	14.8%	14.8%	15.3%	16.9%	18.3%	19.7%		

(1) Computed internally as 100 minus the sum of other fuels; cannot be changed by the user.

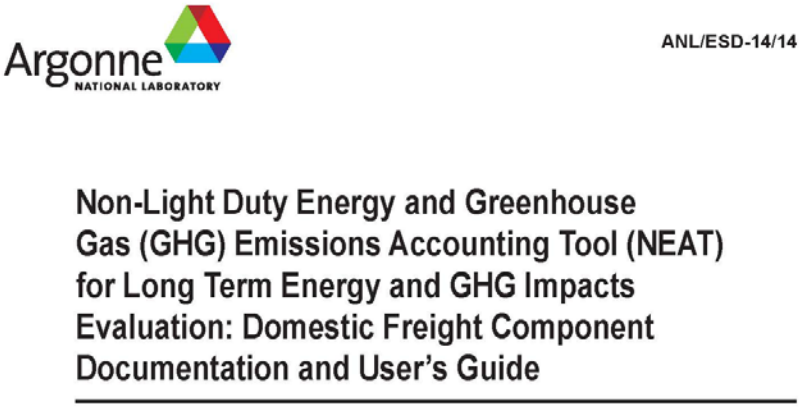
NEAT Accomplishment: Revised GHG Emissions Calculation Procedure

- Tool estimates GHG emissions from exhaust, fuel production and feedstock production
- Traditional method uses one rate for each fuel type, regardless of the mode type, to estimate exhaust emissions
- NEAT estimated exhaust GHG emissions using different rates for fuel used in each mode

SCENARIO CASE GREENHOUSE GAS EMISSIONS SUMMARY										
SCENARIO CASE Name: 2013 Non-Light Duty Energy Accounting Tool -- Working File										
Mode	Fuel	2010	2015	2020	2025	2030	2035	2040	2045	2050
FULL FUEL CYCLE EMISSIONS BY FUEL TYPE WITHIN MODE (MILLION METRIC TONS CARBON EQUIVALENT)										
Truck	Diesel	100.7	113.0	119.1	125.9	130.2	128.6	119.6	106.0	86.7
	Bio-Diesel	0.2	0.8	0.7	0.8	0.8	0.8	0.8	0.9	1.0
	Renewable (F-T) Diesel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
	Pyrolysis Diesel	0.0	0.0	0.1	0.3	0.6	1.8	5.0	9.0	13.9
	Liquefied Natural Gas (LNG)	0.0	0.2	0.4	1.0	3.9	11.4	22.1	35.4	51.4
	TOTAL TRUCK	**100.9**	**114.1**	**120.4**	**128.0**	**135.5**	**142.6**	**147.6**	**151.4**	**153.2**
Rail	Diesel	12.3	13.9	15.8	18.0	20.3	22.6	25.1	26.4	27.5
	Renewable (F-T) Diesel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Pyrolysis Diesel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5
	TOTAL RAIL	**12.3**	**13.9**	**15.8**	**18.0**	**20.3**	**22.6**	**25.1**	**26.7**	**28.1**
Domestic Marine	Diesel (Marine)	4.1	4.6	4.9	5.1	5.1	5.3	5.5	5.6	5.7
	Renewable (F-T) Diesel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Pyrolysis Diesel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
	Residual Fuel Oil	1.7	1.9	2.0	2.1	2.2	2.2	2.3	2.3	2.4
	TOTAL WATER	**5.8**	**6.4**	**6.9**	**7.2**	**7.3**	**7.5**	**7.9**	**8.0**	**8.2**
Air Freight	Jet Fuel	3.8	4.8	5.9	7.1	8.3	9.3	10.6	11.6	12.6
	HR/FT Jet Fuel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Pyrolysis Jet Fuel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
	TOTAL AIR CARGO	**3.8**	**4.8**	**5.9**	**7.1**	**8.3**	**9.3**	**10.6**	**11.6**	**12.8**
Pipeline	Natural Gas	17.1	16.5	16.9	18.3	18.5	18.8	19.6	20.8	22.0
	Electricity	5.0	5.2	4.9	4.6	3.9	3.6	3.3	3.2	3.2
	TOTAL PIPELINE	**22.1**	**21.6**	**21.8**	**22.9**	**22.5**	**22.4**	**22.9**	**24.0**	**25.2**
ALL	TOTAL ENERGY	144.9	160.9	170.8	183.2	194.0	204.5	214.0	221.7	227.5
FULL FUEL CYCLE EMISSIONS BY FUEL TYPE (MILLION METRIC TONS CARBON EQUIVALENT)										
ALL	Diesel	117.0	131.5	139.8	149.0	155.6	156.5	150.2	138.0	119.9
	Jet Fuel	3.8	4.8	5.9	7.1	8.3	9.3	10.6	11.6	12.6
	Residual Fuel Oil	1.7	1.9	2.0	2.1	2.2	2.2	2.3	2.3	2.4
	SUM OF PETROLEUM FUELS	**122.5**	**138.2**	**147.7**	**158.2**	**166.1**	**168.1**	**163.1**	**151.9**	**134.9**
	Bio Diesel	0.2	0.8	0.7	0.8	0.8	0.8	0.8	0.9	1.0
	Renewable (F-T) Diesel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
	HR/FT Jet Fuel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Pyrolysis Diesel	0.0	0.0	0.1	0.3	0.6	1.8	5.0	9.3	14.5
	Pyrolysis Jet Fuel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
	SUM OF BIOFUELS	**0.2**	**0.9**	**0.9**	**1.1**	**1.5**	**2.6**	**5.9**	**10.4**	**16.0**
	Natural Gas	17.1	16.5	16.9	18.3	18.5	18.8	19.6	20.8	22.0
	Liquefied Natural Gas (LNG)	0.0	0.2	0.4	1.0	3.9	11.4	22.1	35.4	51.4
	SUM OF GASEOUS FUELS	**17.1**	**16.7**	**17.2**	**19.4**	**22.4**	**30.2**	**41.7**	**56.2**	**73.5**
	ELECTRICITY	**5.0**	**5.2**	**4.9**	**4.6**	**3.9**	**3.6**	**3.3**	**3.2**	**3.2**

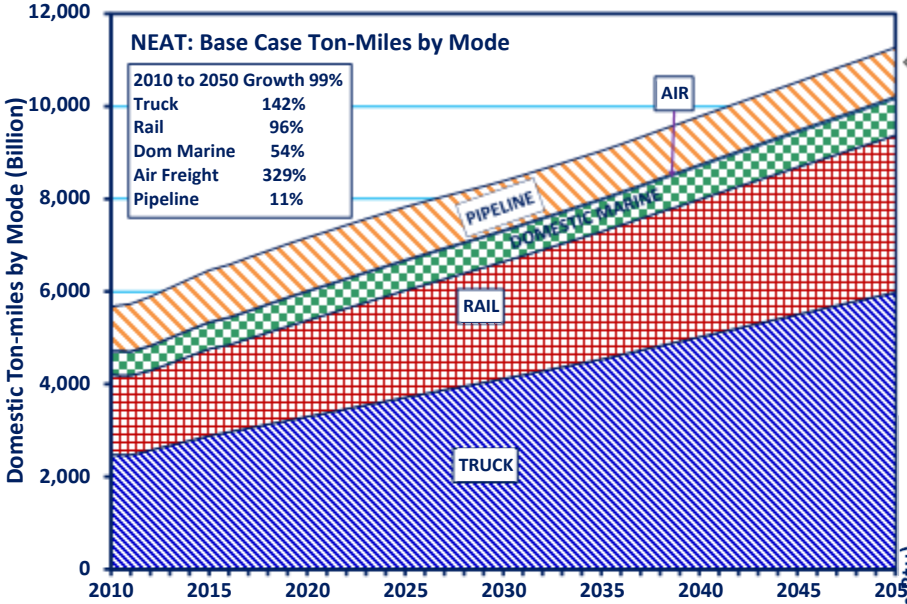
NEAT Accomplishment: Prepared User Guide and Released Base Case

- Prepared model user's guide
- Documented internal calculation procedures
- Developed a webpage dedicated to the model
- Both model working file and user's guide are available on Argonne website
- Sent release announcement to potential users
- Presentations made to DOE BETO, 21 Truck Century Truck Group and DOE Policy Office



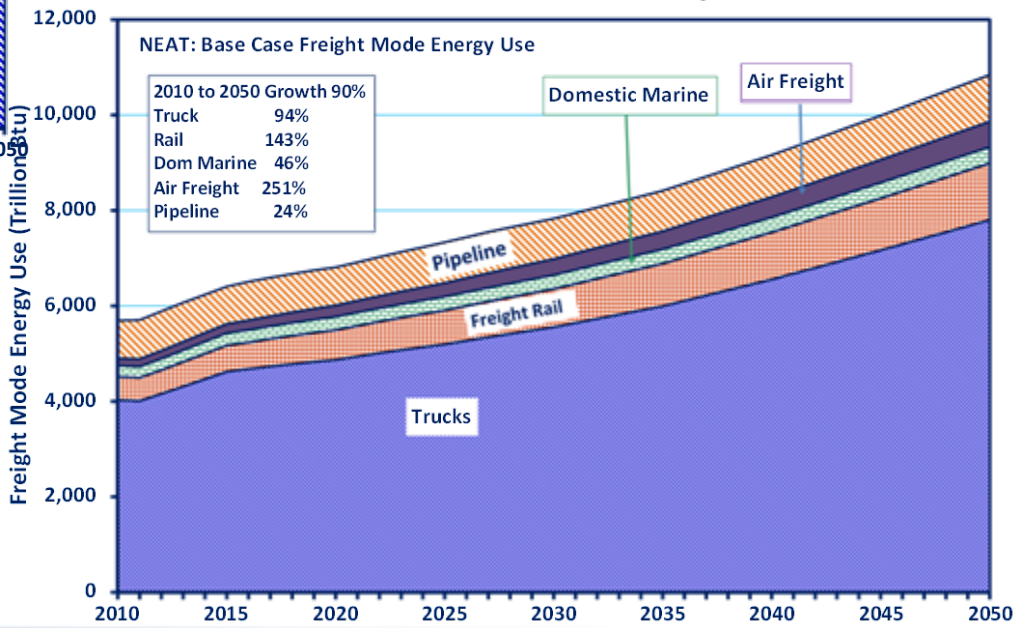
NEAT webpage:
http://www.transportation.anl.gov/modeling_simulation/NEAT/index.html

NEAT Accomplishment: Domestic Freight Sector Energy Use Growth (90%) is less than Ton-Miles Growth (99%) due to mode shift from 2010 to 2050 (Base Case)

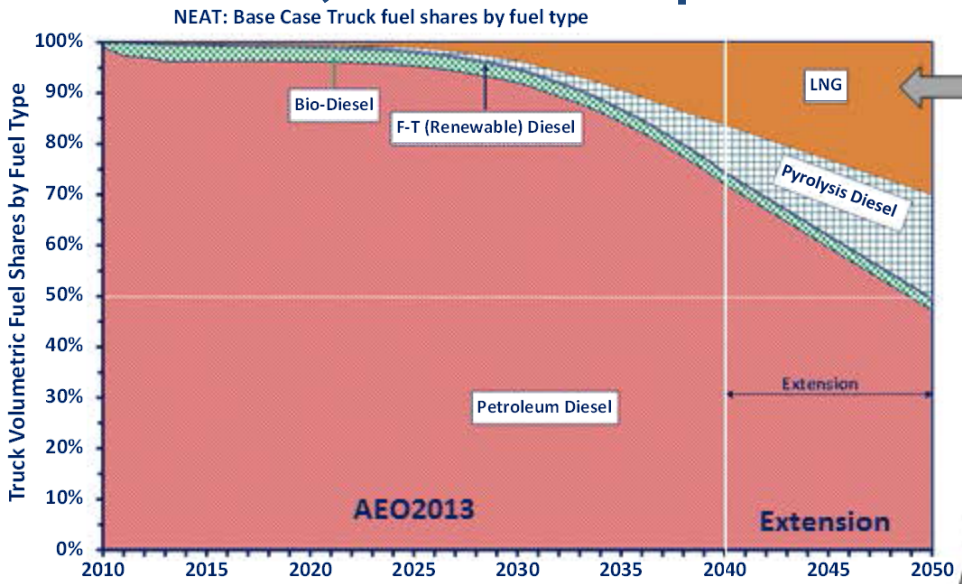


Ton-Miles Grow 99% From 2010 to 2050

Energy Use would Increase by 90% between 2010 and 2050



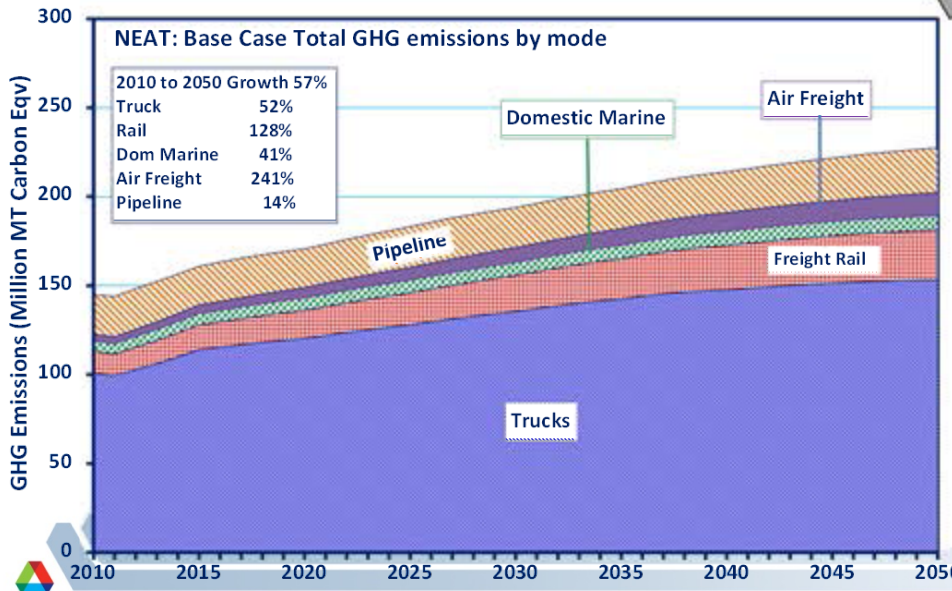
NEAT Accomplishment: Alternative Fuels Lower GHG Growth, Increase Upstream Energy Use

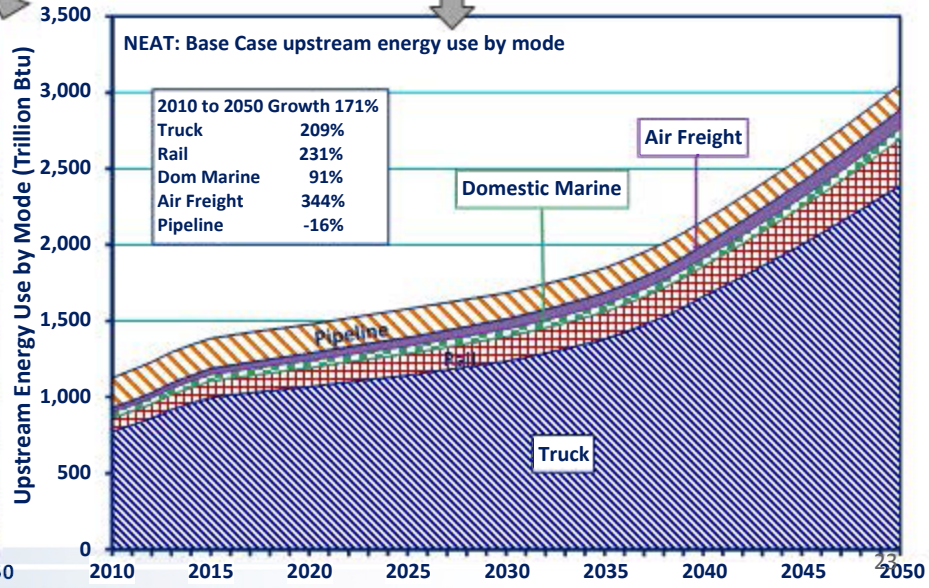


All Alternative Diesel Fuels and LNG in AEO 2013 Are Assumed to be Used Only by the Truck Mode

Alternative Fuels and Mode Shift Would Cause Lower GHG Emissions Increase of 57% During 2010-2050

However, Upstream Energy Use Would Grow by 171%, 2010 to 2050





Future Work

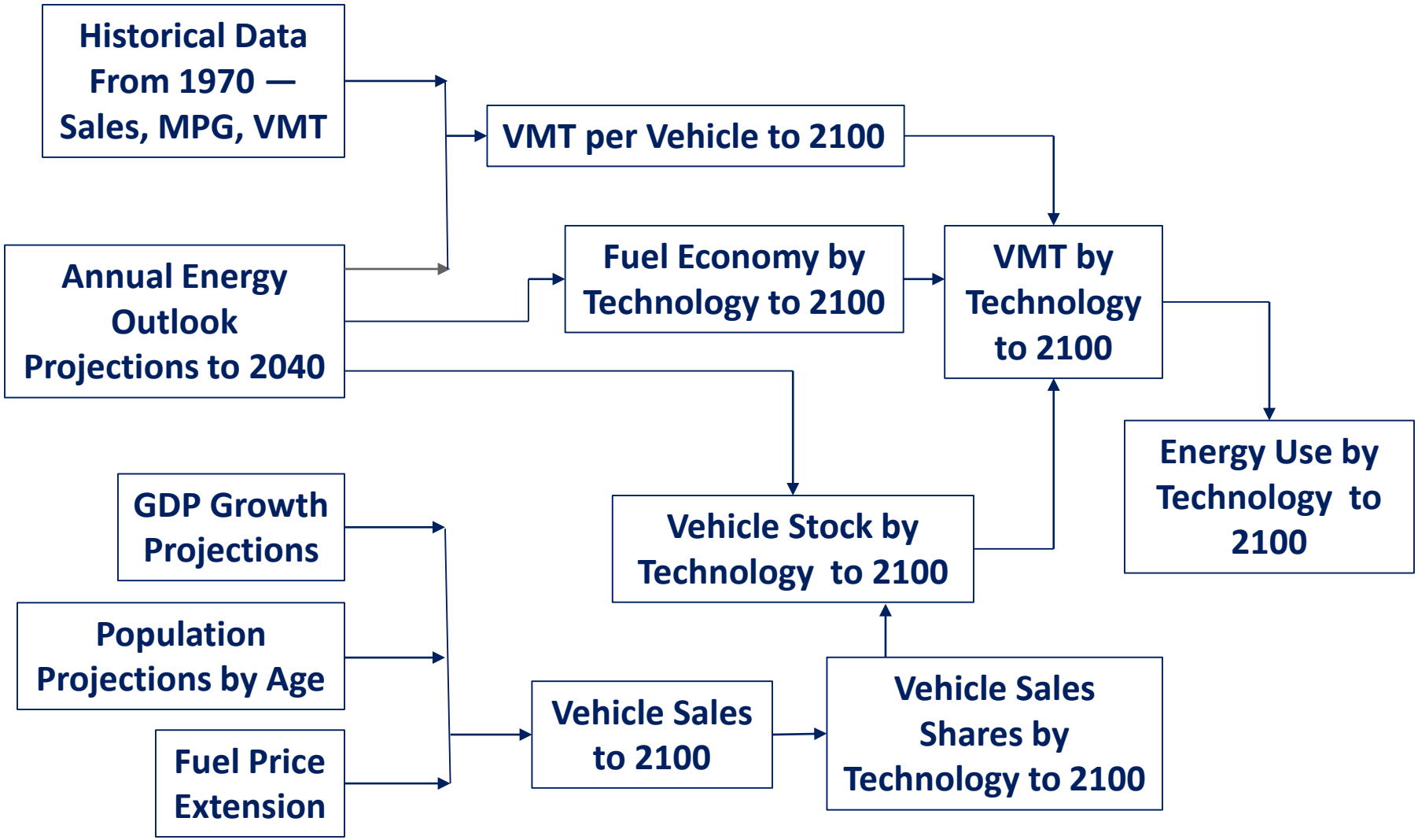
	Annual Update		Improvement	
	VISION	NEAT	VISION	NEAT
FY15	Continue update to latest AEO and GREET	Continue update to latest AEO, GREET and FAF	Enhanced heavy vehicle data file	
FY16	Update to latest AEO and GREET	Update to latest AEO, GREET and FAF (major update in 2016)	Add total cost of ownership to outputs Streamline user interface	Add buses and its competing modes to address multi-mode energy use for VTO

Summary

- Relevance
  - Develop transparent tools to provide flexible energy and GHG scenario analysis by vehicle technology (VISION), freight mode and fuel types (NEAT), relevant to EERE Interests, answers to key questions
- Approach
  - VISION: Baseds on vehicle sales, stock, VMT, MPG, economic and population information, fuel type/share, upstream energy emission and energy use rates.
  - NEAT: Baseds on commodity level ton-miles, mode shares, and energy intensitiesy, plus mode level fuel type/share, exhaust and upstream GHG emission and energy use rates
- Technical Accomplishments
  - Create a base case of full fuel cycle energy and GHG emissions by vehicle technology and freight mode
  - VISION is widely used by government agencies and research institutes, and has more than 300 registered users
- Collaborations
  - Work with EIA, ORNL, TA Engineering, NREL and other research institutes on data collection and model testing
- Future Work
  - Annually update the model with most current data
  - Annually enhance the model with new features
  - Update website for VISION and NEAT for making the tools widely available

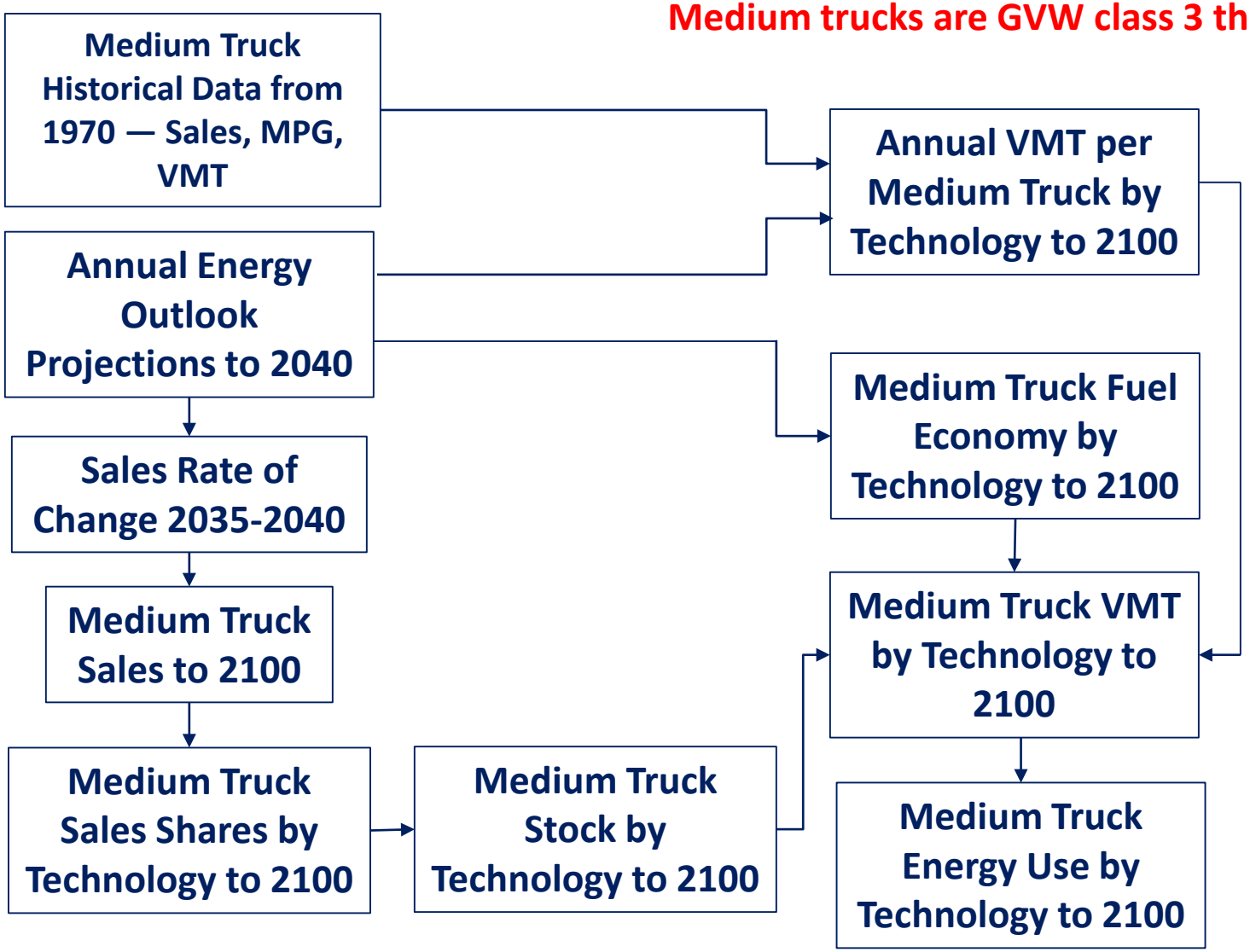
Technical Back-up Slides

VISION Approach: Create a Light Duty Long Term Base Case



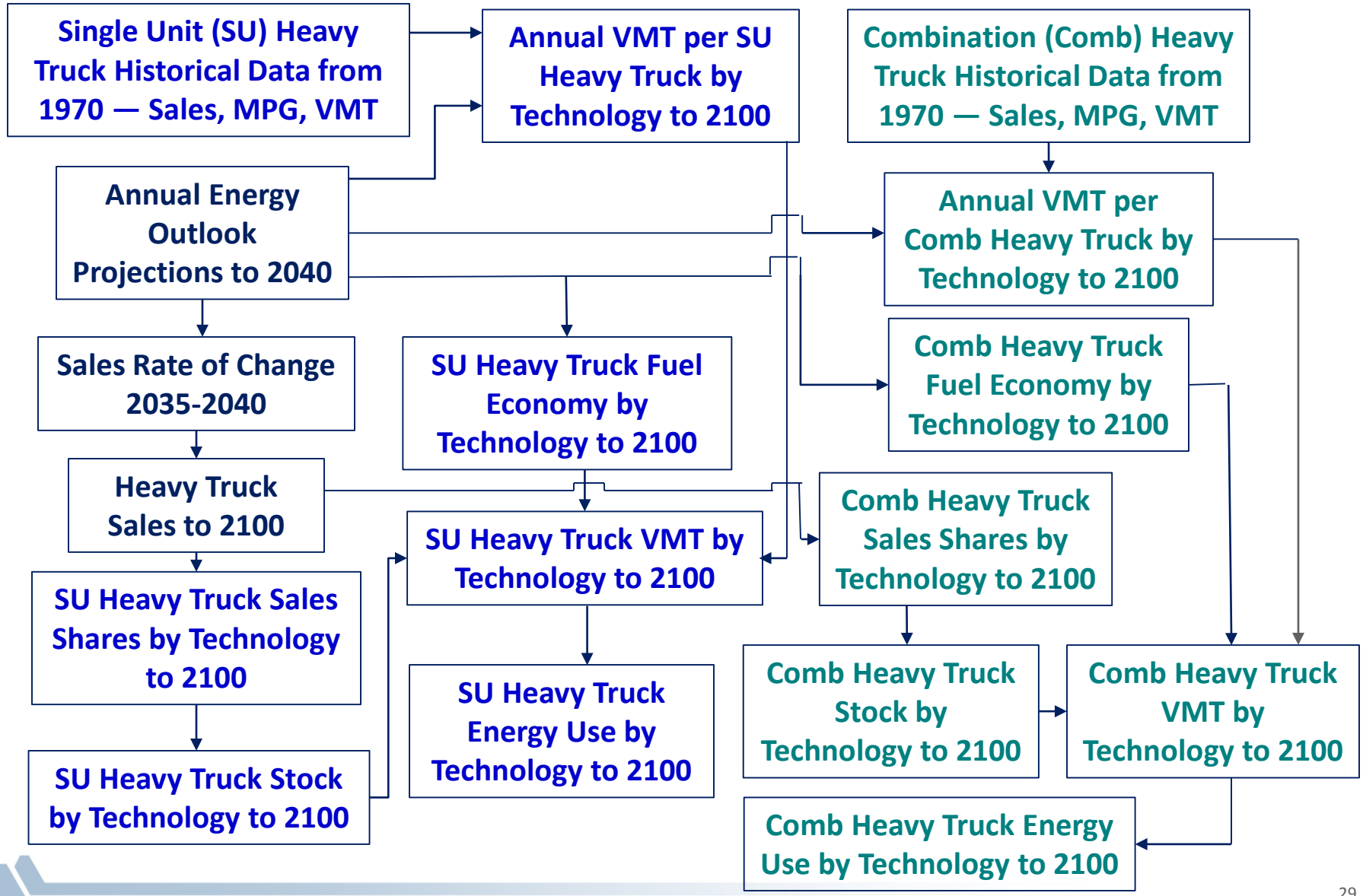
Approach: Create a Medium Truck Long Term Base Case

Medium trucks are GVW class 3 through 6

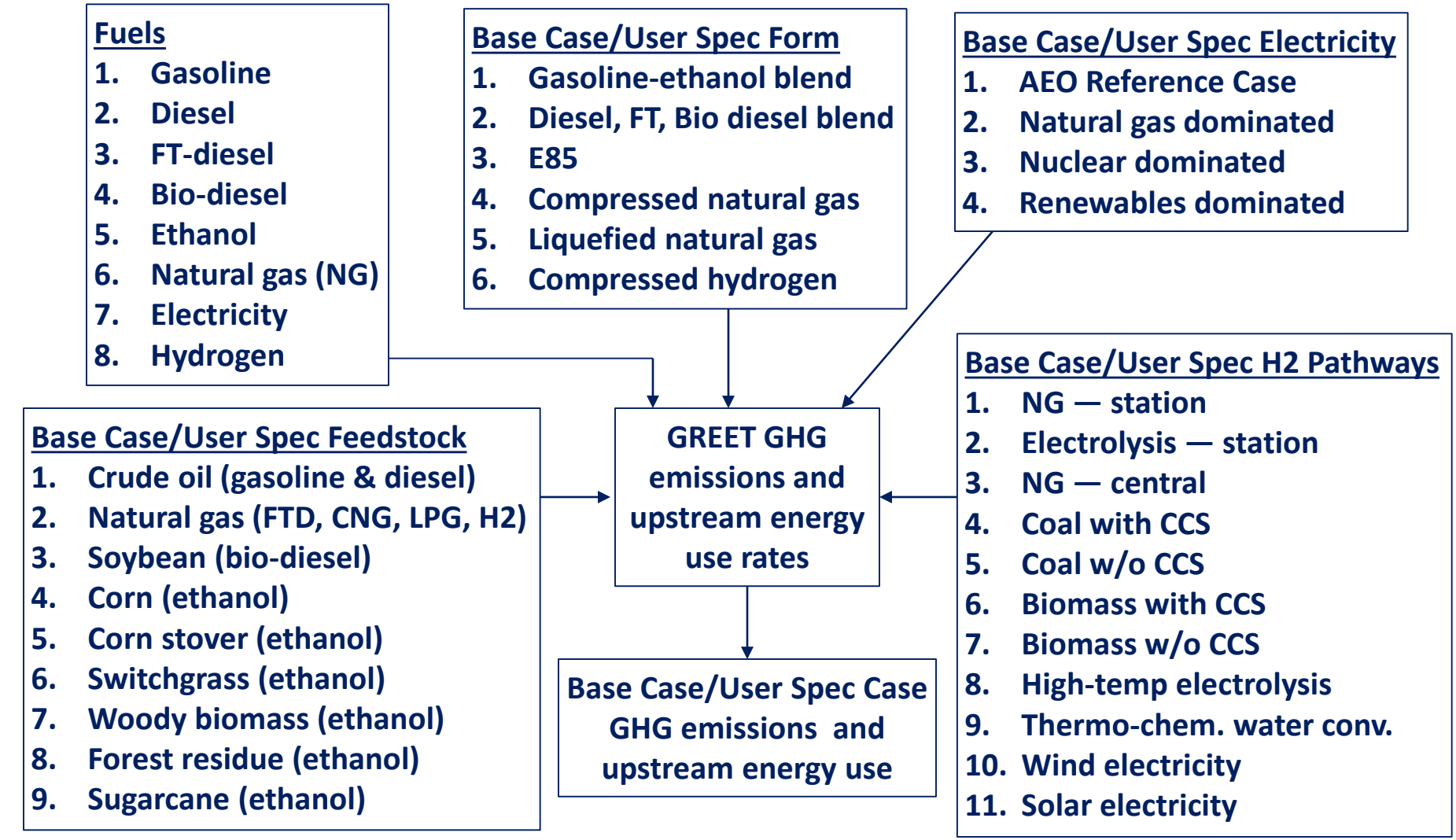


Approach: Create a Heavy Truck Long Term Base Case

Heavy trucks are GVW class 7 and 8



Approach: Incorporate Upstream Energy Use and GHG Emissions Rates from GREET Life Cycle Analysis



NEAT Approach: 36 Commodities Are Included in the Tool

SCTG	COMMODITY	SCTG	COMMODITY	SCTG	COMMODITY
01	Live Animal/Fish	15	Coal	25-26	Logs & Wood Product
02-04	Cereal Grain, Other Ag Product & Animal Feed	16	Crude Petroleum	27-29	News print/Paper, Paper Articles & Printed Matter
02200	Corn for Fuel Ethanol (from 02)	17-18	Gasoline & Fuel Oil	30	Textile & Leather
03602	Cellulosic Biomass (from Other Ag Product)	19	Coal not-elsewhere-classified	31	Nonmetallic Mineral products
05	Meat/ Seafood	19330	Natural Gas	32-33	Base Metals & Their Articles
06-07	Milled Grain Product & Other Food stuff		Biofuels	34	Machinery
08	Alcoholic Beverages (excluding Fuel Ethanol)	20	Basic Chemicals (Excl H2)	35	Electronics
08310	Fuel Ethanol	20242	H2, N2, O2 & Rare Gases	36	Motor Vehicles
09	Tobacco Product	21	Pharmaceuticals	37	Transportation Equipment
10-12	Building Stone, Natural Sand & Gravel	22	Fertilizers	38	Precision Instruments
13	Nonmetallic Minerals	23	Chemical Products	39	Furniture
14	Metallic Ores	24	Plastics & Rubber	40-99	Misc Manufacturing Prod, Waste/Scrap, Mixed Freight, U/K