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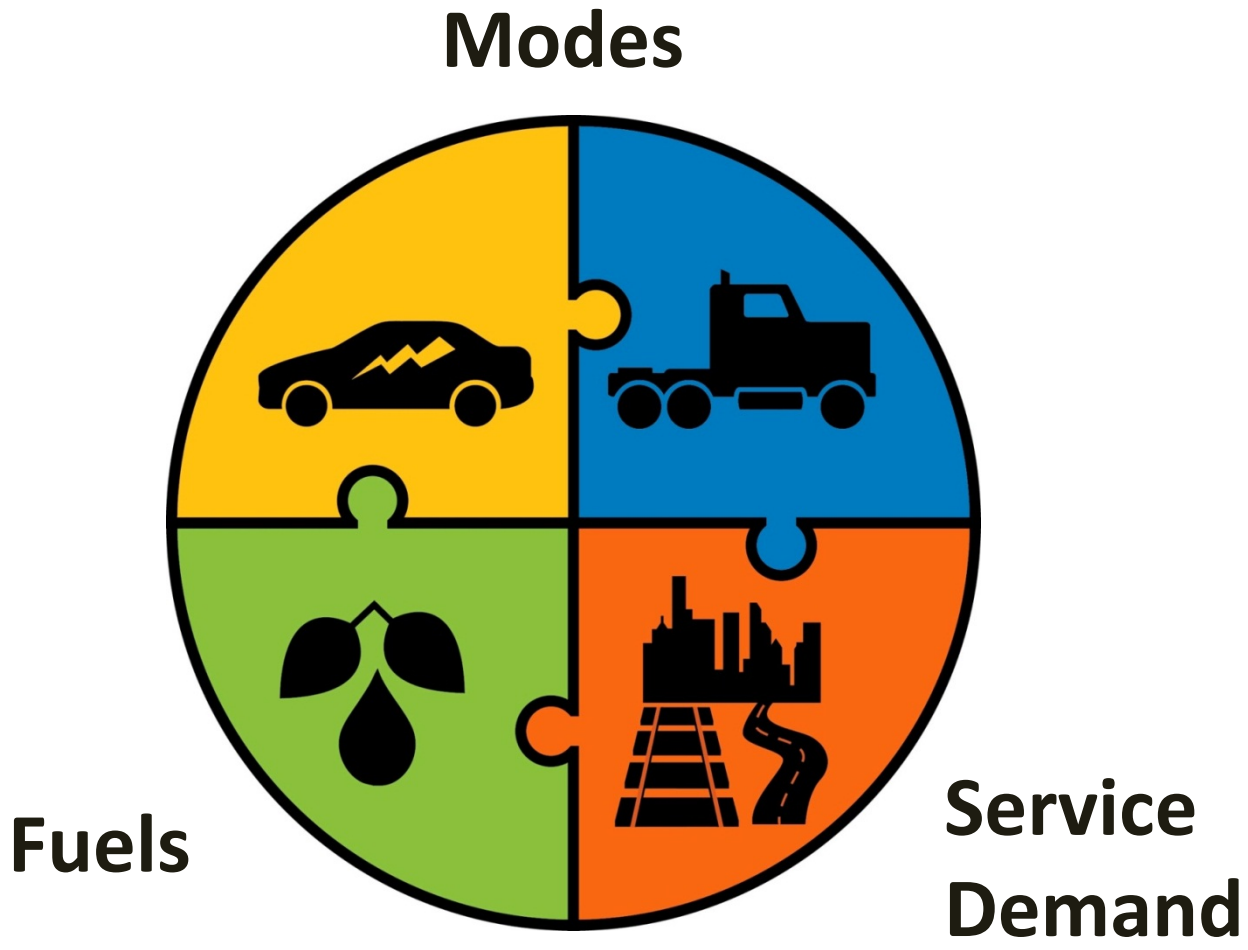
Transportation Energy Futures

Project Overview and Findings

Transportation Energy Futures



Outline

- Approach and motivation for the study
- Key findings from primary topic areas
- Study conclusions regarding transportation energy consumption and emissions reduction potential.

Transportation Energy Futures: A Landmark Collaboration

- TEF is a project implemented by EERE, ANL, NREL, and draws upon broad expertise from EPA, DOT, academia, and private sector advisors to address underexplored opportunities in transportation.
- TEF is cross-sector; it includes elements for light-duty, non-light duty, fuels, and transportation demand.
- TEF consists of nine published technical reports as well as summary material.

Modes
- Light-Duty Vehicles (LDV)
- Non-Light-Duty Vehicles

Fuels

Service Demand

NREL NATIONAL RENEWABLE ENERGY LABORATORY

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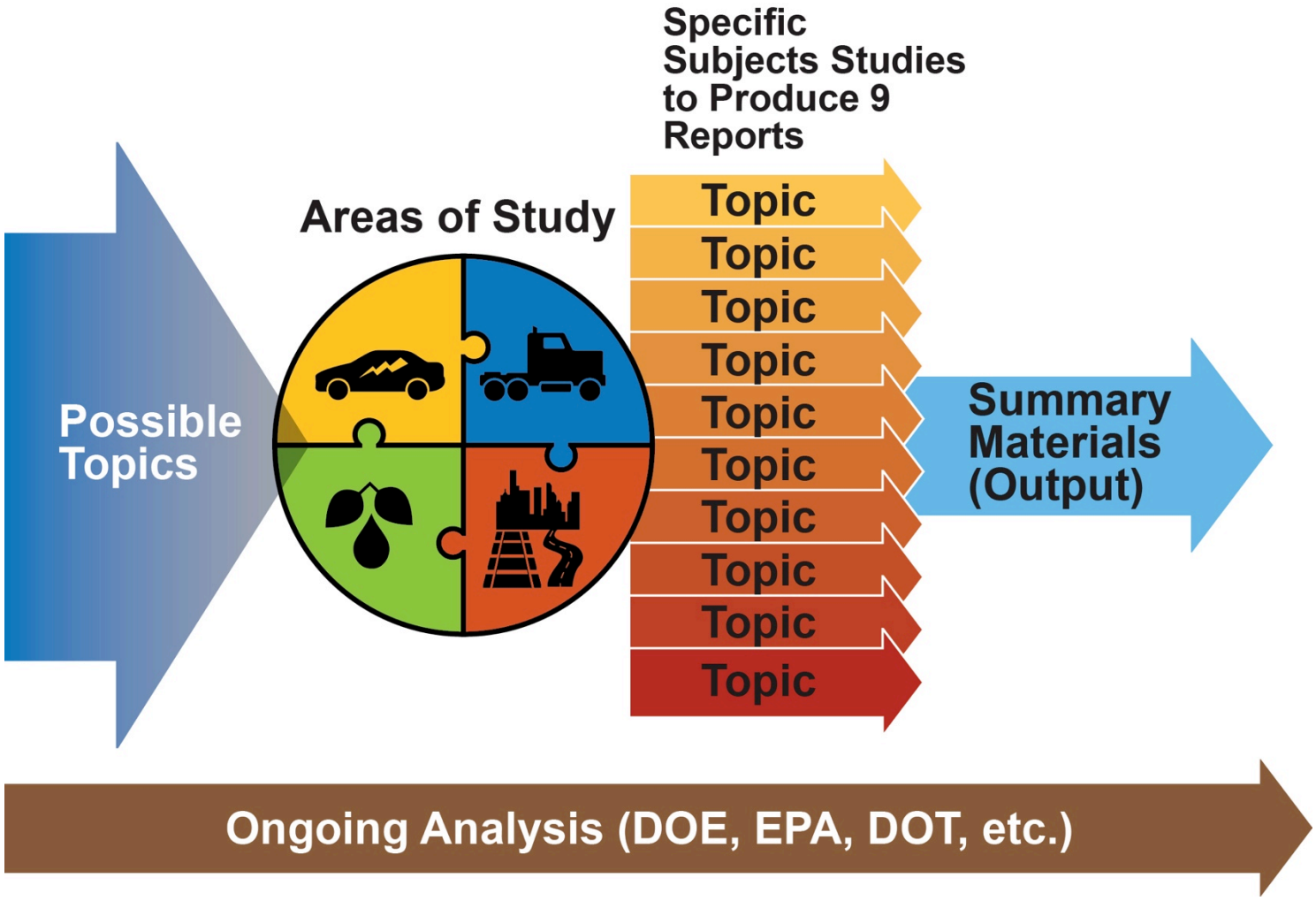
Argonne NATIONAL LABORATORY

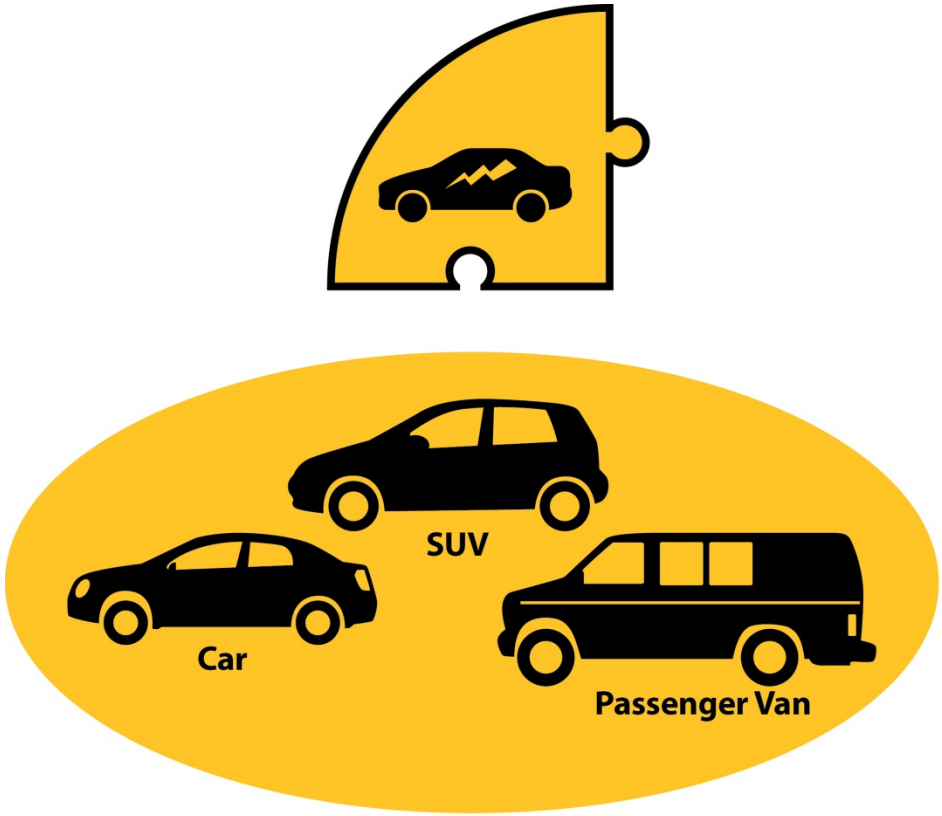
Scoping and Review

- Built on a foundation of previous and ongoing DOE, DOT, and EPA analysis
- Selected a 19-member steering committee of experts from industry, academia, government, and non-profits
- Refined the topic list into a set of highest-priority issues to cover in partnership between the steering committee and project team
- Engaged experts for extensive peer review throughout the project.

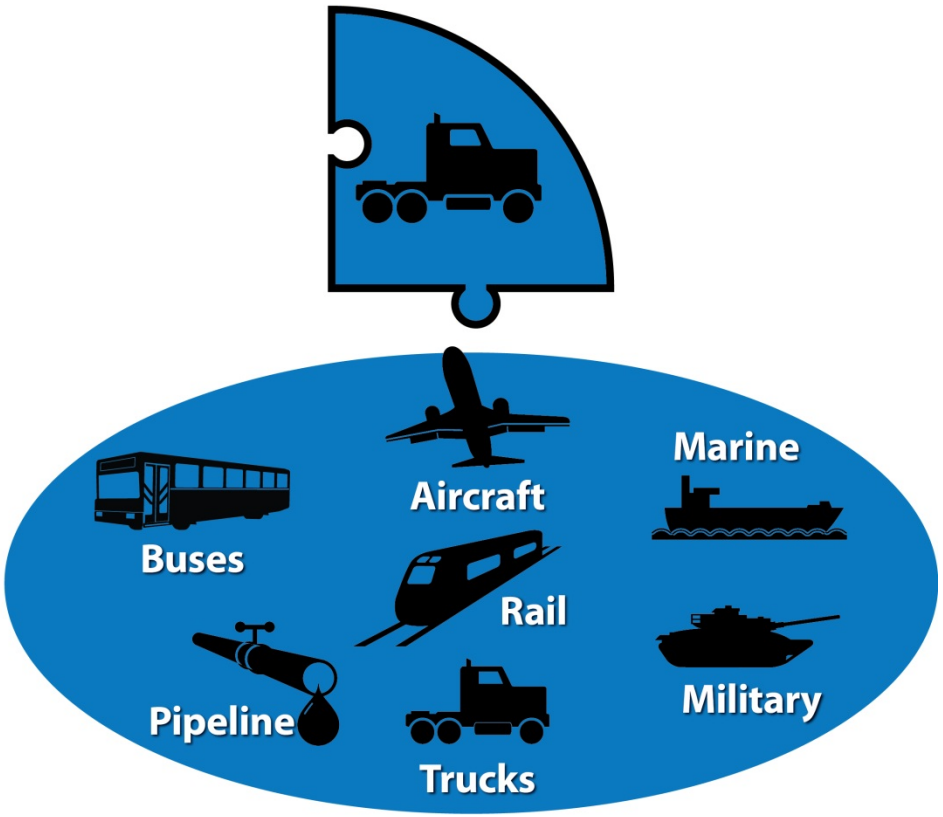
Scoping and Review



Key Findings/Modes



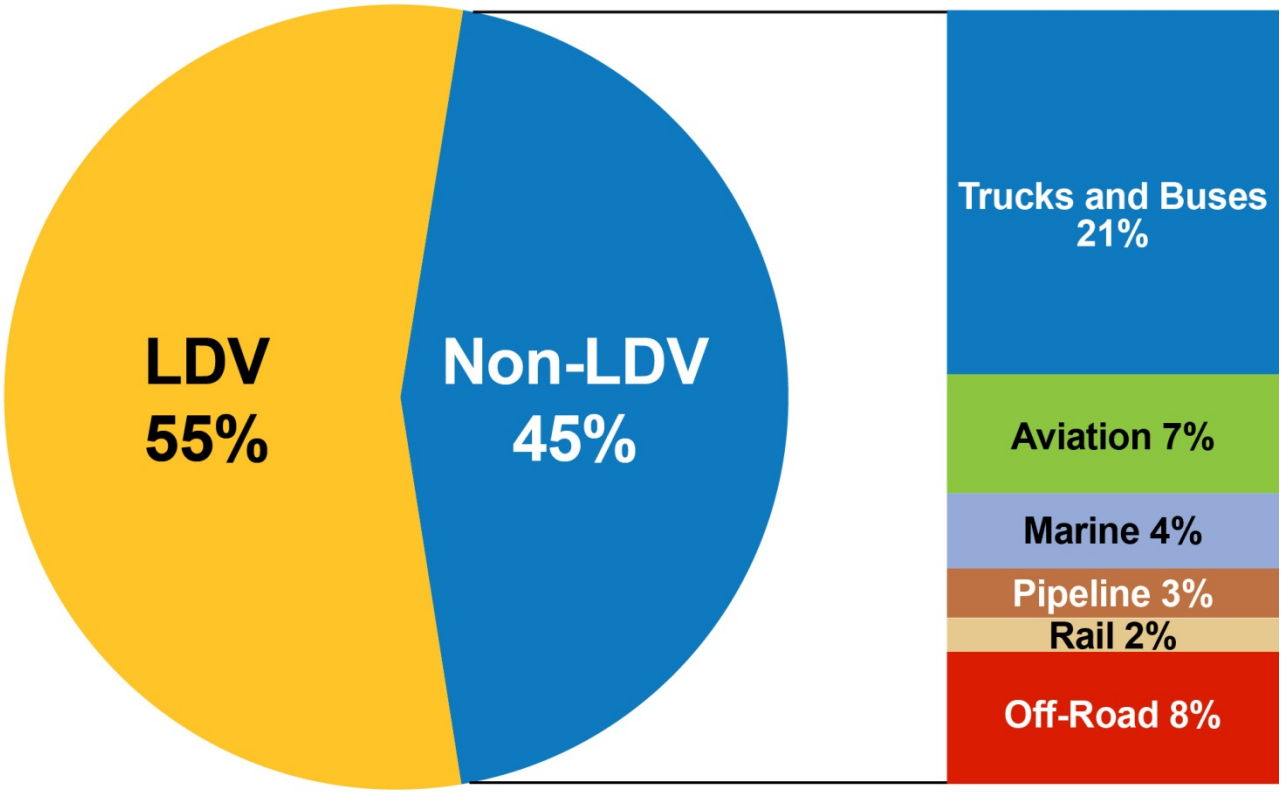
LDVs



Non-LDVs

Current transportation energy use is closely split between LDV and Non-LDV

2011: 27.4 quadrillion Btu of transportation energy use



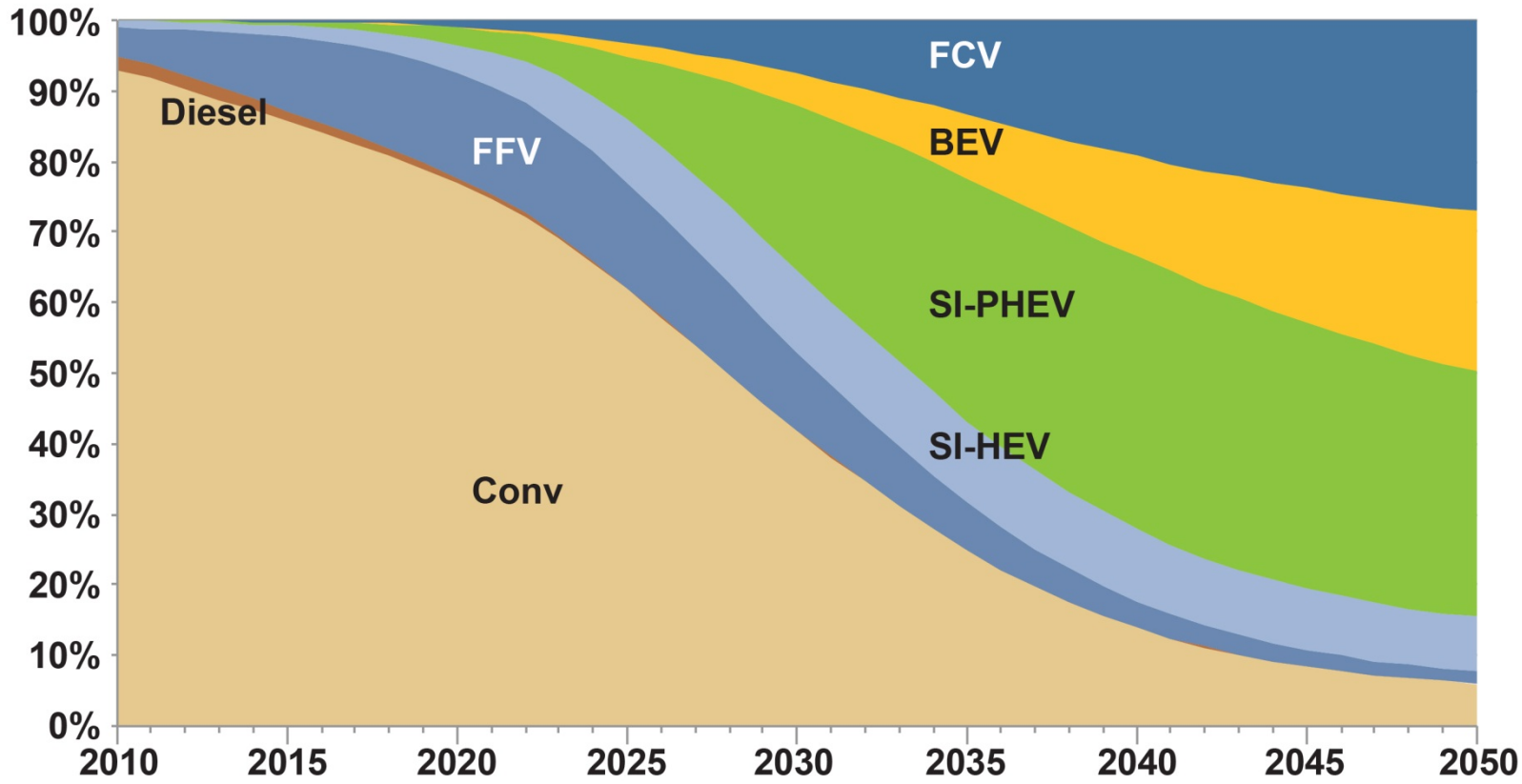
Vehicle efficiency improvements are essential to balance increases in travel and freight demand

Effects of vehicle efficiency improvements and use increases on net energy consumption by 2050

	LDVs	Trucks	Aviation	Inland Marine	Ocean Marine	Rail	Pipeline	Off-road
Vehicle energy efficiency improvements	61%	50%	65%	30%	75%	35%	20%	18%
Vehicle use increases	75%[a]	87%[a]	217%[b]	32%[a]	450%[c]	47%[a]	16%[a]	20%[d]
Net changes in total energy consumption	-32%	-17%	+11%	-8%	+38%	-4%	+1%	-6%

[a] EIA projections extrapolated.
[b] FAA projections extrapolated.
[c] Growth in dollar value of trade (EIA).
[d] Projected at half the population growth.

Advanced vehicles have the potential to dominate the LDV market by 2050

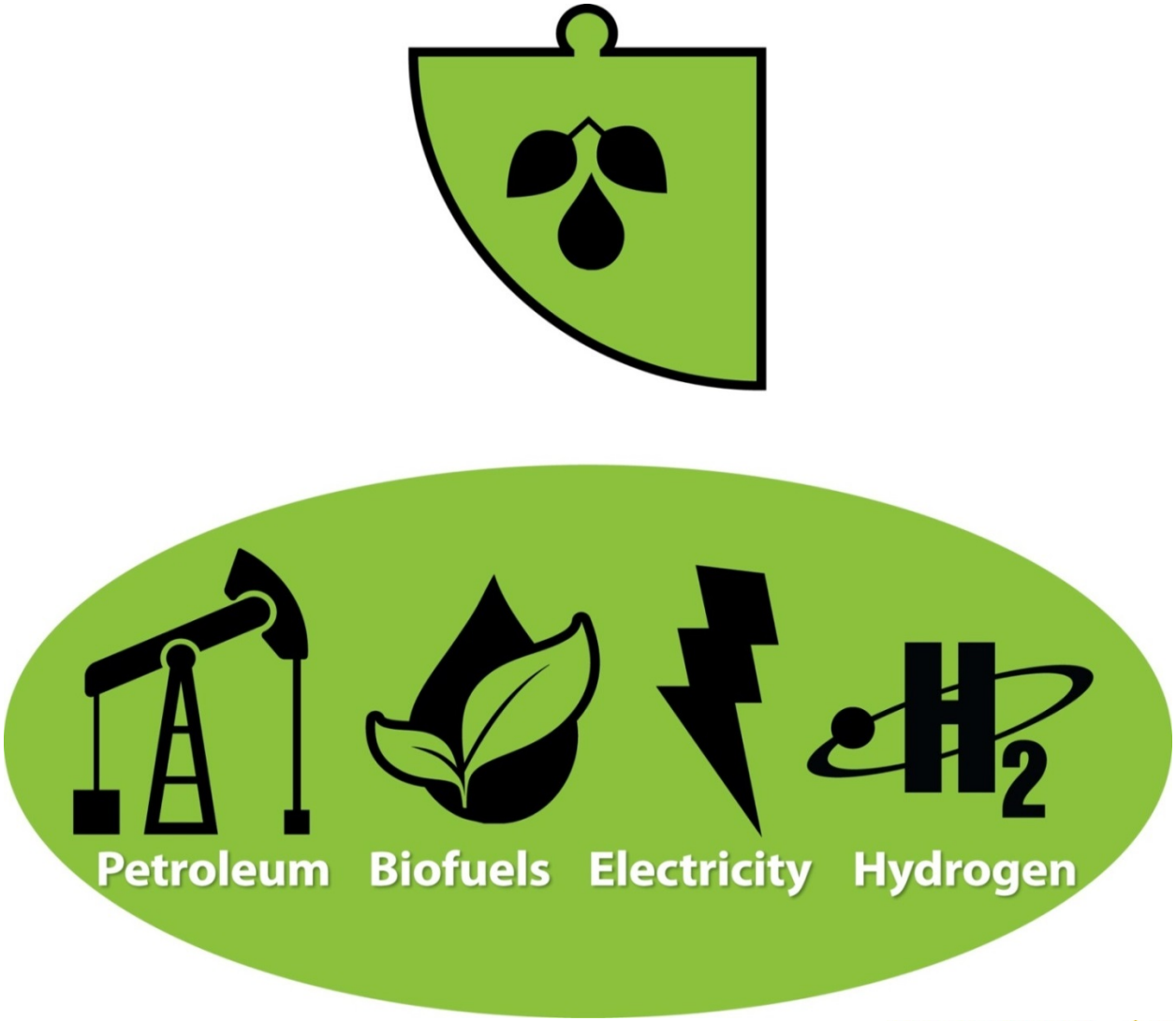


See studies for additional scenario vehicle mixes..

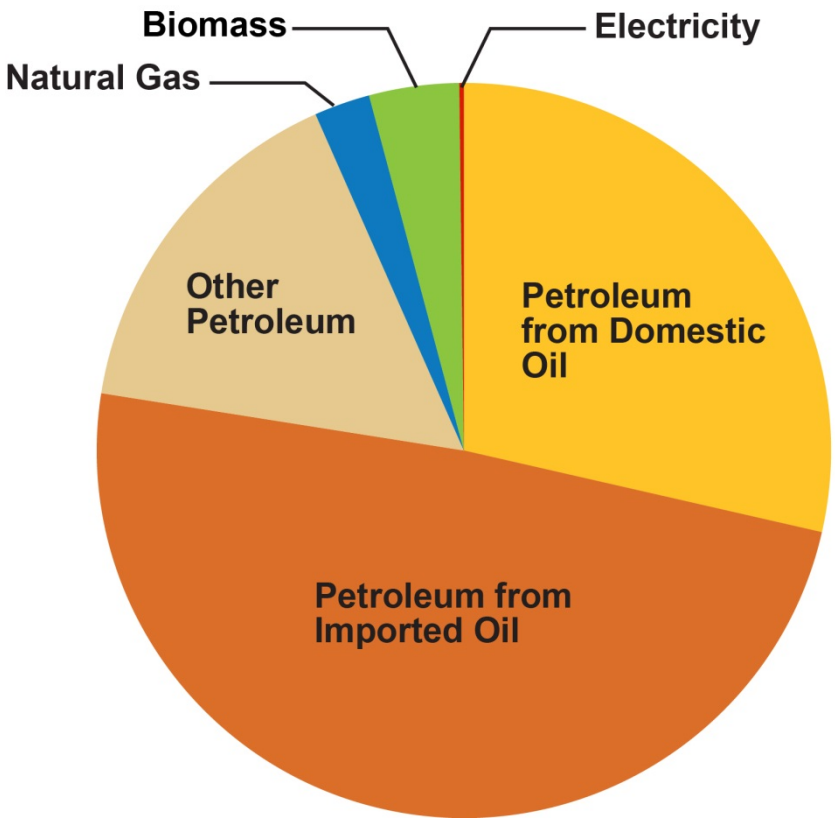
Non-cost barriers to adoption of advanced vehicles must be overcome to reach such scenarios

Non-Cost Barrier	Relevant Factors	Possible Policy Responses
• **Limited driving range and fueling/charging stations**	• Vehicle range • Driver mobility needs • Local conditions • Driver's value of time	• Subsidization of charging/ fueling stations • Information
• **Unfamiliarity** • **Lack of awareness**	• Prevalence of new technology • Preferences of early adopters	• Labeling • Information • Outreach programs
• **Bias or perceived negative differences** • **Uncertainty of benefits**	• Social and behavioral factors	• Information • Outreach programs
• **Lack of adequate standards**	• Maturity of new technologies • Potential for incompatibilities or safety issues	• Testing and standards development
• **Limited availability in models/makes**	• Consumer preferences • Modularization of design and manufacturing	• R&D on modularization

Key Findings: Fuels

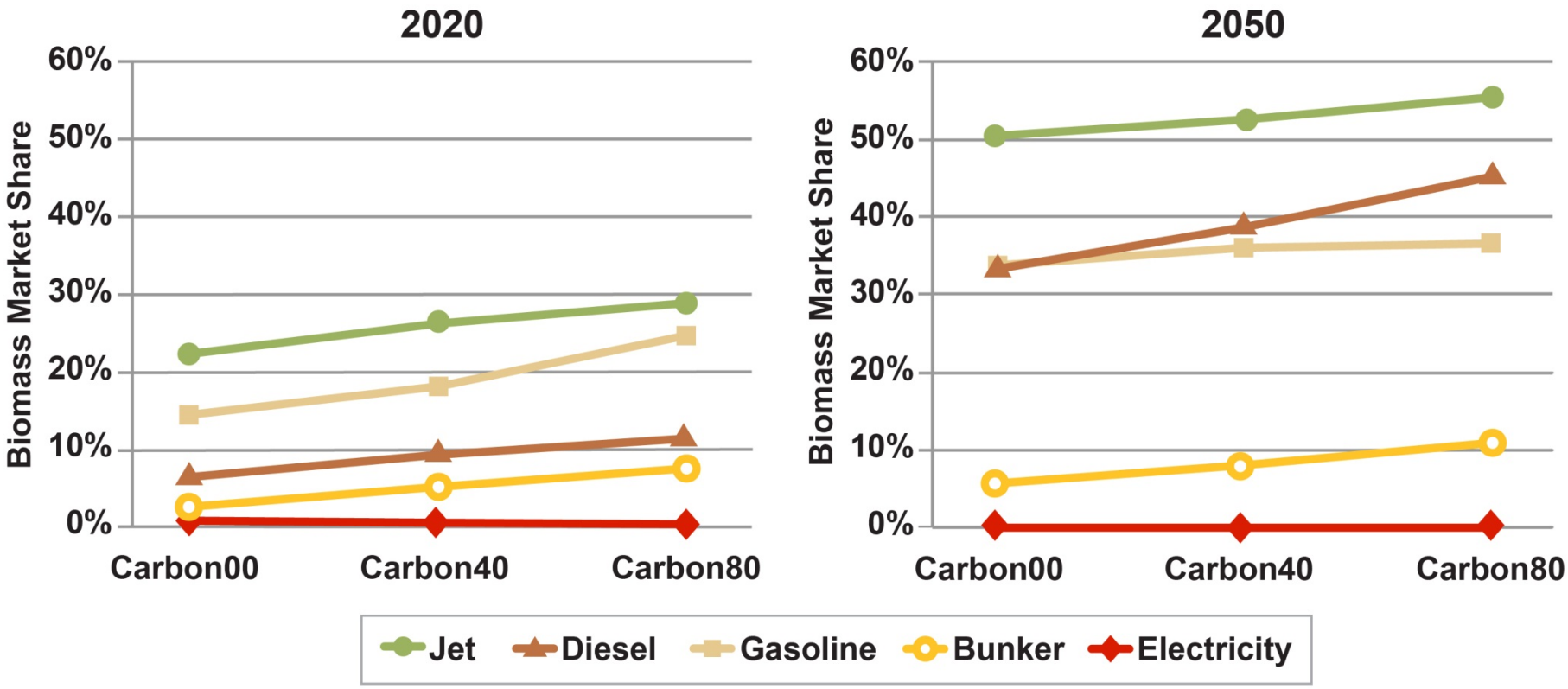


Petroleum is the dominant fuel for the current transportation system



2011: 27.4 Quadrillion Btu of transportation energy use

Biofuels can displace significant volumes of petroleum in future fuel markets



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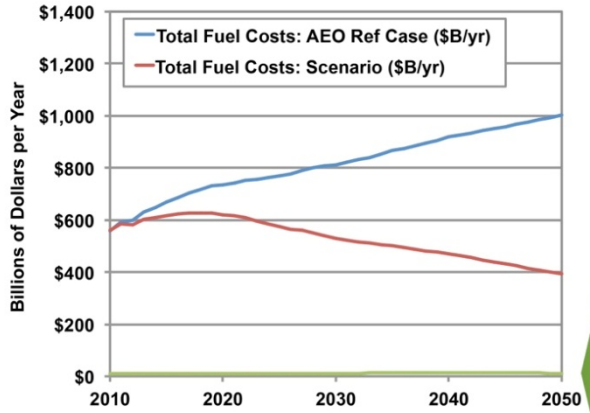
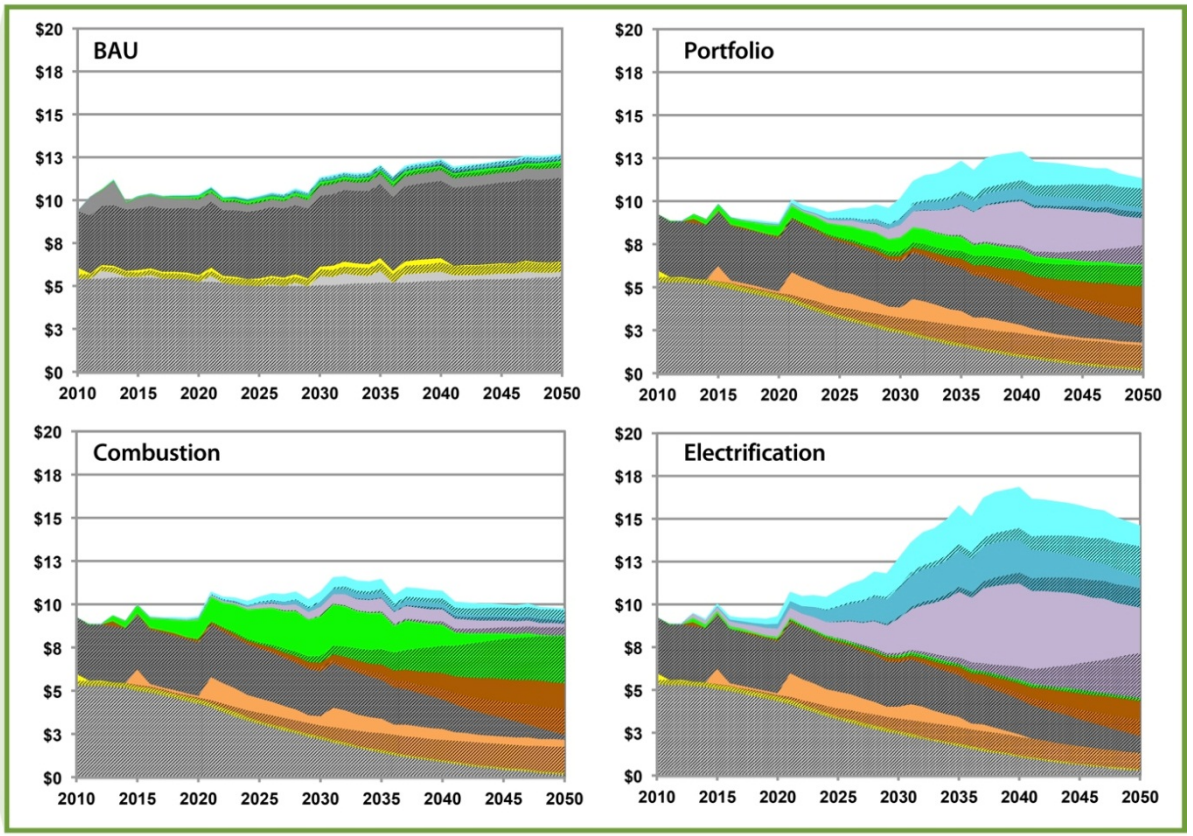
Total fuel retail capital costs remain small relative to total annual fuel costs in advanced fuel scenarios

Total Fuel Costs to Consumers
and
Total Capital Cost for Retail Stations
($billion/year)



Scale for total fuels costs: $1,400B
Scale for retail capital: $20B

Capital Costs for Retail Infrastructure Components
($ billion/year)
under four example scenarios



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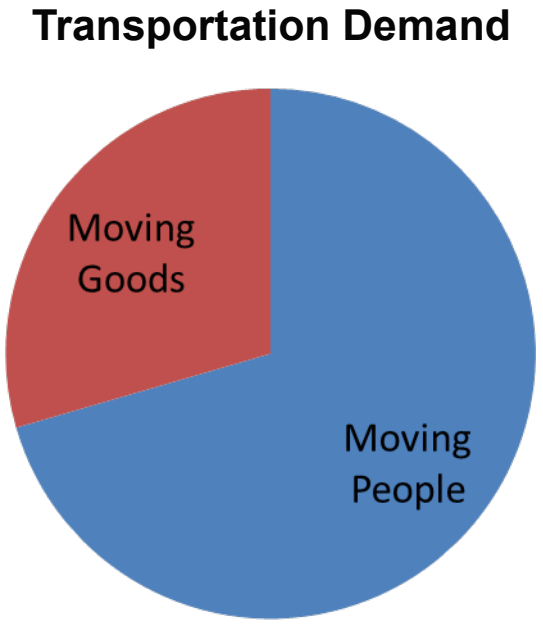
Key Findings: Service Demand

Coordinated demand reduction strategies can lead to significant savings while maintaining service quality

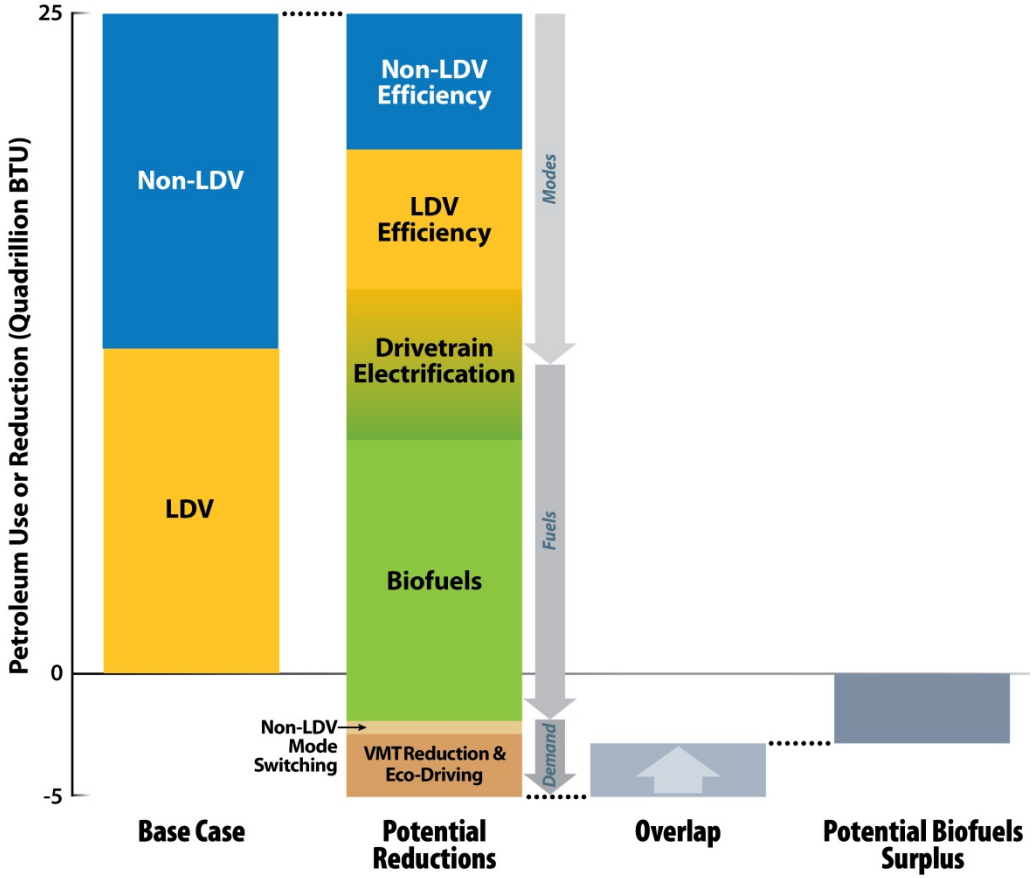
Demand Reduction Strategy	Impact Type	Potential Magnitude of Impact
Built Environment Characteristics	LDV VMT reduction	12-18% (15% used for summary)
Trip Reduction	LDV VMT reduction	1-10% (5% used for summary)
Efficient Driving	MPG improvement	1-5% (5% used for summary)
Non-LDV Mode Switching	Ton-miles switched	<10% (10% used for summary)



2011: 27.4 quadrillion Btu of transportation energy use

TEF Conclusions: Deep reductions in transportation energy use are technically possible by 2050…

Projected 2050 Petroleum Use and Potential Reductions



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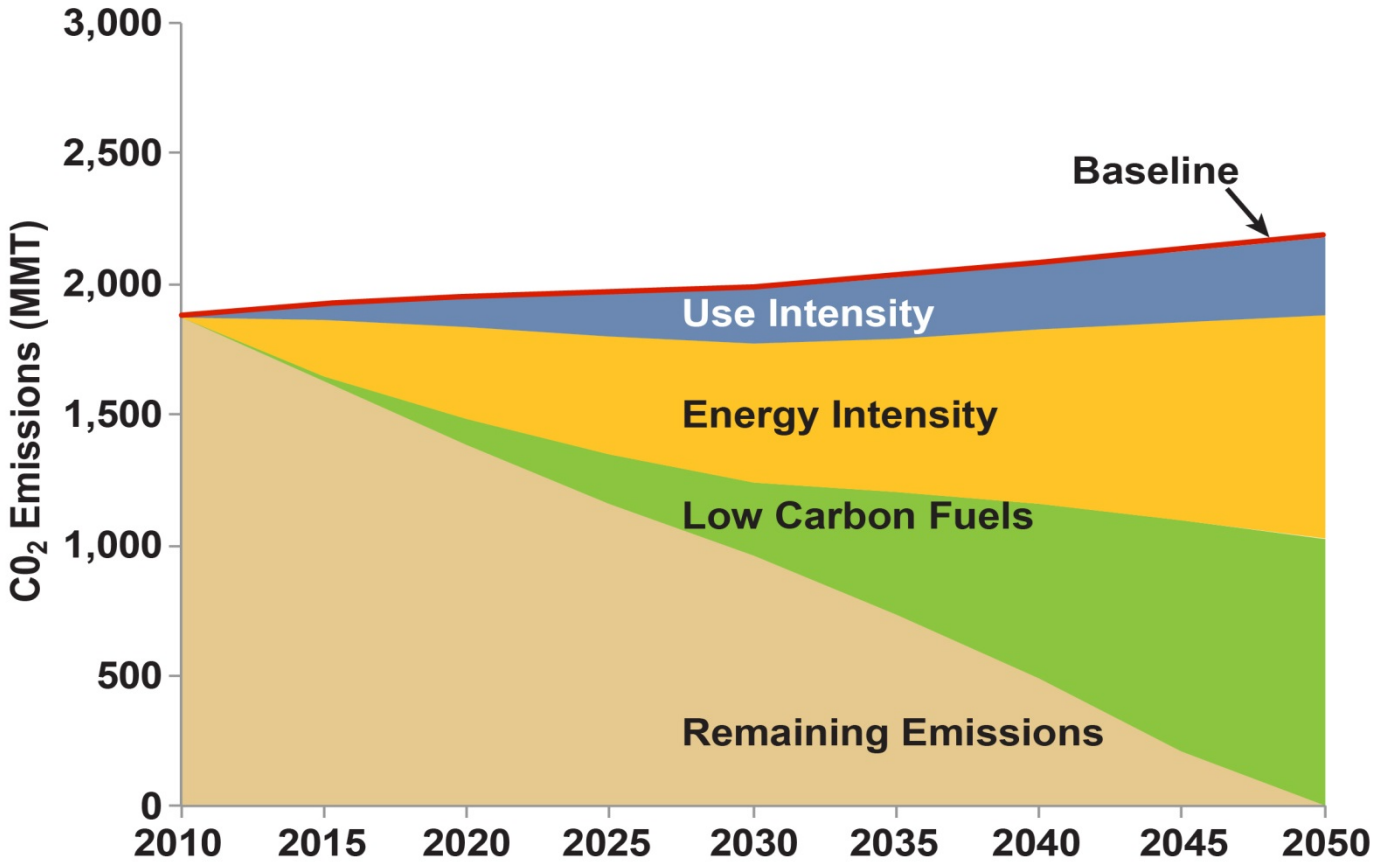
…As are deep reductions in transportation greenhouse gas emissions



(Source: Summary of prior values in presentation)

For More Information

- TEF Website with papers: http://www1.eere.energy.gov/analysis/transportationenergyfutures/
- TEF represented in an online scenario analysis tool: https://bites.nrel.gov/inputs.php?id=1146
- Many of the vehicle and fuel cost assumptions are also in the "Transparent Cost Database," available at: openei.org/tcdb/
- For questions, contact eere.analysis@EE.Doe.Gov.