

Transportation Energy Demand Model Overview

Inputs and Methods for the 2013 Transportation Energy Demand Forecast

Hearing Room A

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California Energy Commission

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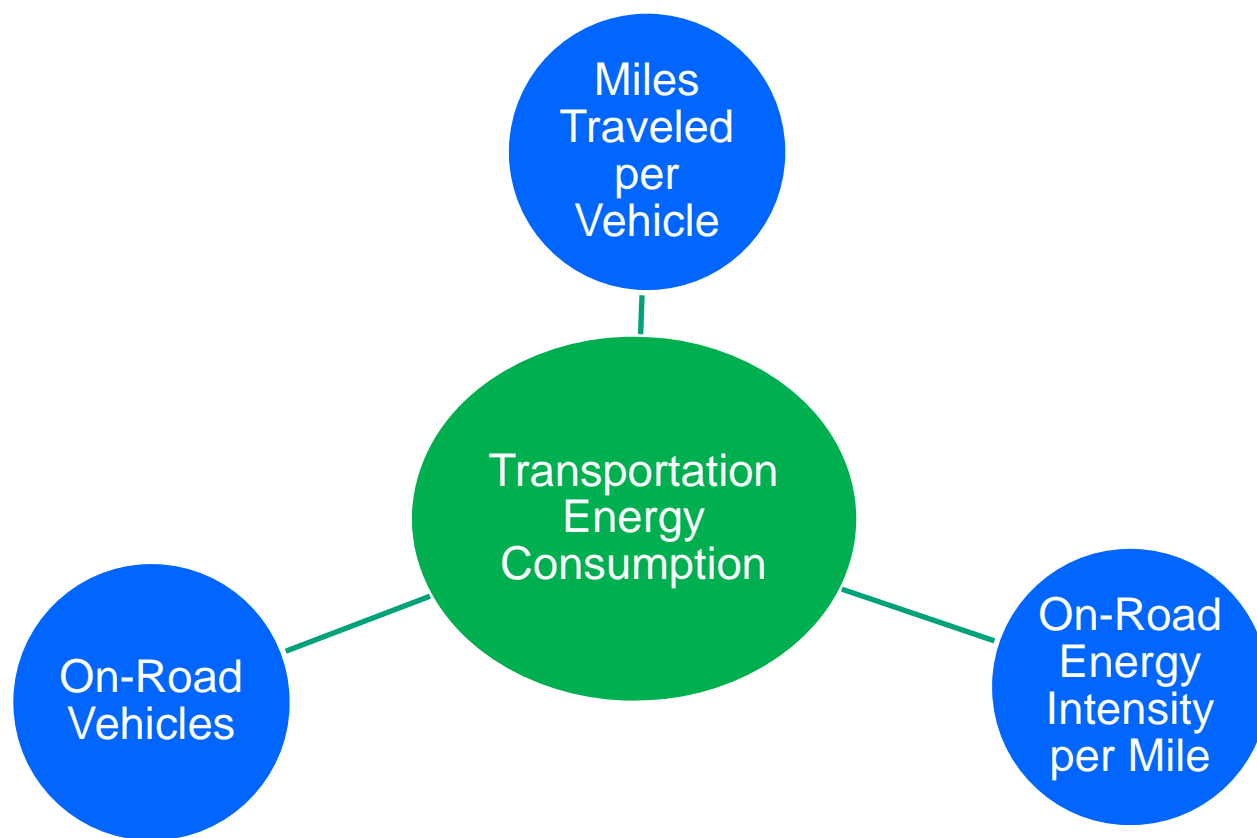
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Transportation Energy Consumption



Demand Forecasting Unit

Operates a number of demand models used in transportation energy demand analysis. These models:

- Include a number of transportation sector specific demand models, each representing consumption behavior of that sector
- Are all economic models, accounting for the impact of time and/or cost of an activity and/or a product, as well as income and/or economic output in the choice process
- All but one of the sector specific models include choice based model components
- Are not equilibrium models and do not include behavioral fuel choice or vehicle supply models
- Transportation energy prices are exogenous to these demand models

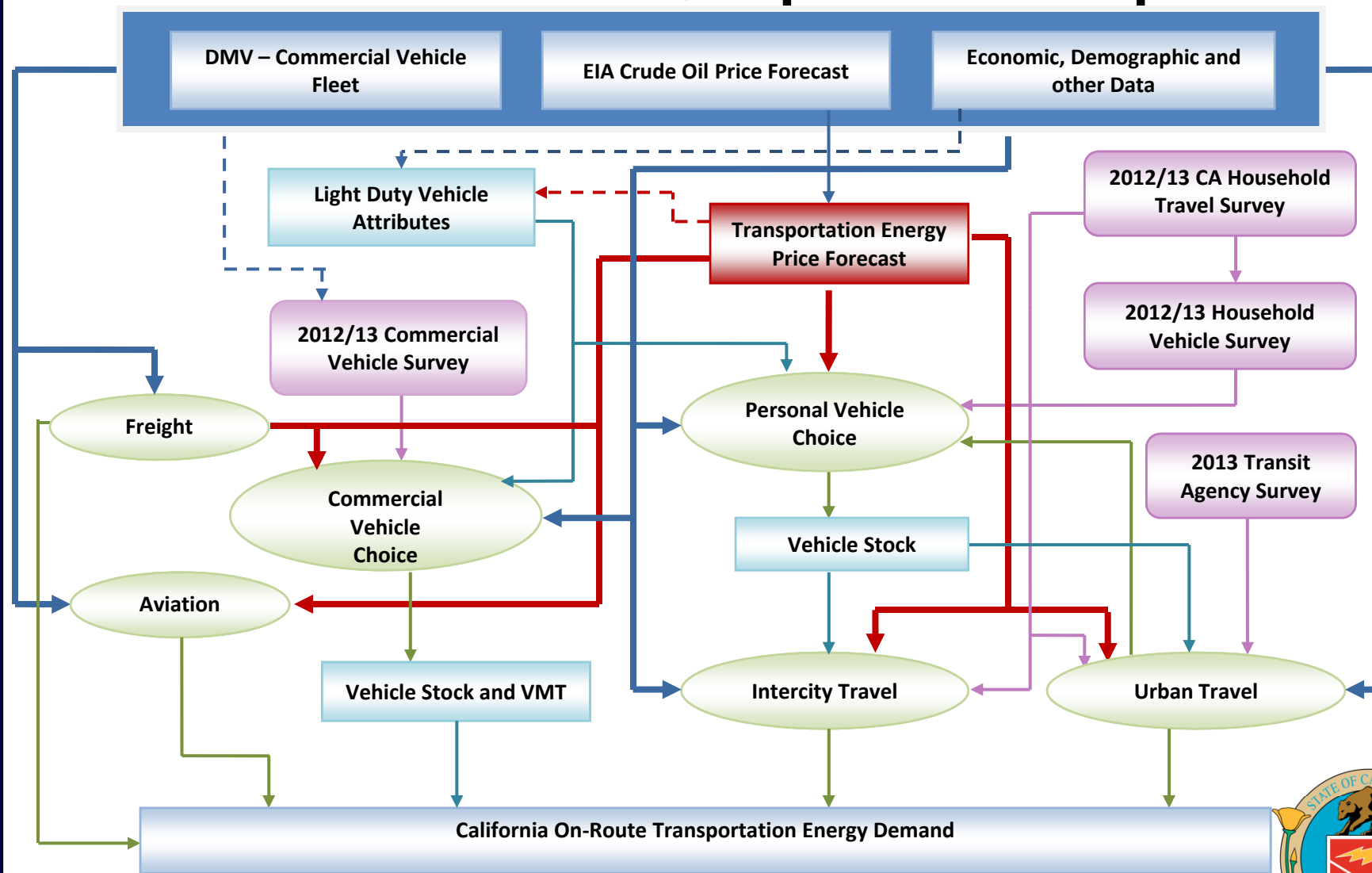


Fuel Demand Sectors

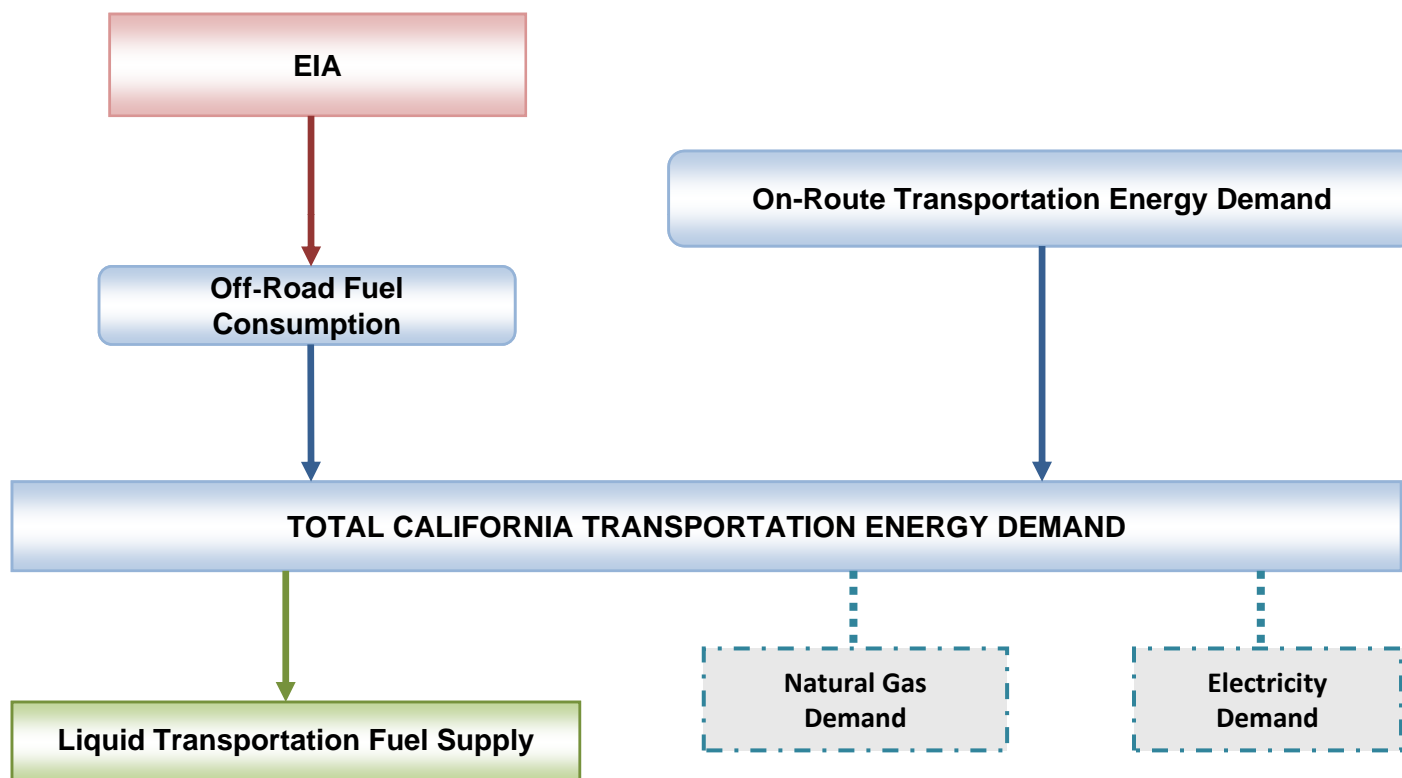
- A software application, DynaSim, houses demand models
- Models forecast and/or use projections of travel activity, vehicle stock, and fuel economy to forecast fuel demand by sector:
 - Light duty vehicle (LDV) fuel demand for personal travel (Urban and Intercity)
 - LDV fuel demand for commercial travel
 - Heavy duty vehicle (HDV) fuel demand for personal travel (Urban and Intercity) by transit mode: Bus, Rail, Light Rail, and others.
 - HDV fuel demand for movement of goods (Freight) by commodity sector and by mode: Rail and Truck
 - HDV fuel demand for services (Freight) by sector
 - Aviation fuel demand for intrastate, interstate, and international personal and business travel (Commercial Passenger Aviation)
 - Aviation fuel demand for goods movement by intrastate, interstate and international destinations (Freight Aviation).



Demand Models, Inputs & Outputs



Transportation Energy Demand & Supply



Model Inputs (Sources)

We obtain input projections from multiple sources inside and outside the Energy Commission, for direct use or preprocessing for use in the models.

2011-2050 Projections

- Different measures of income and employment (Moody's and IHS Global Insight)
- Economic activity in the business sector (Moody's and IHS Global Insight)
- Transportation energy prices (EIA, and Energy Commission)
- Class specific LDV, HDV, and Aircraft attributes (Sierra Research and EIA)
- Population and households (Department of Finance, Moody's, IHS Global Insight)

2011 Base Year

- Different measures of travel activity for people movement (CHTS, ACS, HPMS, National Transit Database, SCO Annual Transit Report, Energy Commission Transit Agency Survey)
- Different measures of travel activity for goods movement (VIUS, FAF)
- Vehicle stock (Energy Commission analysis of DMV data)
- Fuel Consumption (2011 Supply-Demand Balance, Energy Commission Analysis)



Scenarios

- 2050 forecast horizon covers a number of milestones in Federal and California regulatory timeline
- Scenarios are defined to capture a wide range of projections of model inputs, and to include regulations that are approved and implemented at state and federal levels
- We share 3 common scenarios with others at the Energy Commission, using the same economic and demographic inputs, as well as transportation energy prices
- To be consistent with other federal and state agencies, as well as other offices within the Energy Commission, some of the scenario data are obtained from and/or shared with other offices and agencies
- We propose adopting two additional scenarios to account for low and high petroleum consumption



The Proposed Scenarios

Shared Commission-wide Scenarios*

- High Energy Consumption (Low energy prices and high income)
- Reference Energy Consumption (Reference energy prices and income)
- Low Energy Consumption (High energy prices and low income)

Transportation-Specific Proposed Scenarios

- High Petroleum Consumption (Low liquid fuel prices, High Income, High CNG, electricity & hydrogen prices)
- Low Petroleum Consumption (High liquid fuel prices, Low income, Low CNG, electricity & hydrogen prices)

All Scenarios Assume:

- NAS technology cost curves apply
- All Federal & State fuel and vehicle regulations are in effect

*http://www.energy.ca.gov/2013_energy_policy/documents/2013-02-19_workshop/presentations/03_Kavalec_Chris_Demand_Forecast_Assumptions.pdf



Input Composition of Scenarios

- Forecast outputs of other source models (NEM, Moody's, and IHS Global Insight, NAMGAS...) become the input projections defining our scenarios.
- The source models of our inputs are mostly composed of equilibrium models
- Each source has different scenario/case descriptions: EIA has 32 cases, Moody's has 6 scenarios, IHS has 3 scenarios
- Each has different sectoral growth projections, with IHS projecting the highest growth for manufacturing
- Different input projections defining our different scenarios come from different sources and source models
- These external input projections are mixed and matched to create scenarios that define the range of outcomes in California transportation energy demand



2040: Scenario Input Values in 2011 Dollars

Scenario	Case/Scenario	Oil Price (WTI)	Oil Demand	Oil Supply	%Economic Growth	NG/electricity Hydrogen Prices
CEC	Low Liquid Fuel Demand	237	L		L	L
	High Liquid Fuel Demand	75	H		H (4.5)	H
EIA	High Growth				2.9	
	Low Growth				1.9	
	High Oil Price	237	H	L	H	
	Low Oil Price	75	L	H	L	
	Reference	163 125 (2014)			2.5	



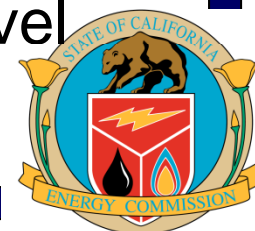
Key Assumptions

- Consumer preferences remain unchanged over the forecast period
- Vehicle manufacturers and suppliers will meet California consumer demand
- Vehicle manufacturers will offer vehicles with fuel economies described in our attribute projections
- Fuel suppliers will meet California consumer demand in all scenarios, through domestic production and/or imports
- Fuel price cases cover the range of plausible outcomes over the forecast period
- Income and employment cases cover the range of plausible outcomes over the forecast period
- Sectoral composition and growth rates cover the range of plausible outcomes over the forecast period
- Land-use changes do not change travel forecast
- Fuel & vehicle prices are exogenous to California transportation energy and vehicle demand



Key Assumptions

- Fuel production and consumption in California has no impact on long term annual fuel prices
- Fuel/vehicle substitution by California consumers has no impact on fuel prices
- There is a single growth path for aviation fuel economy
- VMT per vehicle, for commercial light duty travel, remains constant over the forecast period
- LDVs do not migrate between commercial and personal market segments
- Inflation rate is the same for all scenarios, regardless of economic growth path
- Air passengers behave the same, whether they travel for business or personal reasons



California & National New Vehicle Markets*

Year	Hybrid			All			EV			PHEV		
	California	National	CA % of National	California	National	CA % of National	California	National	CA % of National	California	National	CA % of National
2012		434,645			14,440,929			14834			38604	
2011	39,207	266,329	14.7%	1,096,865	12,736,755	8.6%	3954	10060	39.3%	1,248	7671	16.2%
2010	93,784	274,210	34.2%	1,136,333	11,557,696	9.8%						
2009	42,832	290,282	14.8%	929,376	10,429,014	8.9%						
2008	85,921	313,673	27.4%	1,415,253	13,260,747	10.7%						
2007	93,516	352,274	26.5%	1,702,768	12,264,003	13.9%						

*California: model year stock, Source: DMV on-road registered vehicle Data

*National: new vehicle sales, Source: www.dashboard.com



Price Response?

Price Changes	July 2012	March 2013
Average New MSRP	\$37,124	\$37,991
Total Discounts	\$4,941	\$5,467
Manufacturer Incentives	\$3,604	\$4,162
Dealer Incentives	\$1,337	\$1,305
<i>Core Transaction Price</i>	\$32,183	\$31,826
%Mfg Incentive of MSRP	9.71%	10.96%
%Total Discount of MSRP	13.31%	14.39%

Source: CNW Research: retail Automotive Summary March 2013



What Will 2050 Look Like?

It Depends...

- Products are socially constructed
 - **Producers** learn from consumers, from each other, and from their own production experience
 - Over time, they can change not only their products and technology but also their business model*
 - **Consumers** learn from each other/peers and from suppliers
 - Over time, their preferences change & they can change their behavior and habits*
- Over time, markets change in size, structure, etc.
 - Vehicle ownership models can change from owning a vehicle to pay per use or other models
 - Vehicle insurance models can change, from primarily fixed rate to per mile rate, and potentially reducing VMT and fuel use
- And more changes in institutions, road and fuel/energy infrastructure, price and non-price competition, state and spread of knowledge in the fuels and vehicle related fields, methods of converting knowledge into technology, etc.



A Few Things We Didn't Know 40 Years Ago

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