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TABLES

3.28 ENERGY IMPACTS

The following substantive changes have been made to this section since the Draft Environmental Impact Statement (DEIS) was published:

- This chapter has been updated to reflect the new information associated with impacts from RPA P and Alternative R.

3.28.1 Introduction

Automobile and trucks are popular modes for transporting people and goods. According to US Department of Energy, approximately 28 percent of total energy consumption in 2019 in the United States was for transporting people and goods (Source: www.eia.gov). This energy impact comparison analyzes direct energy consumption for vehicle travel within the 12-County Study Area. Please see also the analyses of Greenhouse Gas (GHG) emissions in **Appendix RR – Greenhouse Gas Analysis**, which further discusses trends in energy consumption.

3.28.2 Methodology

Travel characteristics for horizon year 2045 No-Build Alternative and all route/facility type combinations were analyzed using the Travel Demand Model (TDM) developed for this study. TDM outputs include daily automobile and truck volumes, daily Vehicle Miles Traveled (VMT), Vehicle Hours of Travel (VHT), and travel speeds for each link in the highway network. The study team used TREDIS software tool for evaluating economic, social, and environmental impacts analysis for each alternative compared with the No-Build Alternative. TREDIS is INDOT's standard analysis tool for estimating benefits of transportation projects. The version of TREDIS used for this study assumes automobiles use gasoline and multi-unit trucks (heavy duty) use diesel fuel.

Table 3.28-1 shows the fuel consumption rates for automobiles and multi-unit trucks used in TREDIS. TREDIS applies these fuel consumption efficiency rates for all analysis years.

Vehicle Type	Fuel Type	Gallons Per Mile
Auto	Gasoline	0.045
Multi-Unit Truck	Diesel	0.1521

Table 3.28-1: TREDIS Fuel Consumption Rates

In the United States British Thermal Unit (Btu) is used as a measure of heat energy. **Table 3.28-2** shows Btu content of one gallon of gasoline and diesel fuel[1]. These energy unit values were used to estimate annual energy consumption for No-Build and Build Alternatives.

Fuel Type	Btu Per Gallon
Gasoline (10% ethanol by volume)	120,286
Diesel	137,381

Table 3.28-2: Motor Fuel to Btu Conversion Factors

3.28.3 Analysis

Table 3.28-3 compares the energy consumption for No-Build and Build Alternatives. Annual VMT increases slightly for the build alternatives compared with the No-Build Alternative. One cause is changes in trip characteristics (e.g., number of trips, trip length, etc.) within the 12-County Study Area. Some of the increase in VMT for the build alternatives is due to external trips diverted into the Study Area which did not travel through the Study Area in the No-Build Alternative. Such an increase in VMT and energy consumption is offset by reductions outside of the Study Area. Note that at the regional scale of this analysis, table and **Table 3.28-4** show identical calculations for Alternatives P and RPA P.

1 U.S. Energy Information Administration: Monthly Energy Review, May 2020

Alternative	Auto			Truck			Btu/VMT Combined
	Annual VMT (millions)	Daily Fuel Consumption (gallons)	Annual Btus (millions)	Annual VMT (millions)	Daily Fuel Consumption (gallons)	Annual Btus (millions)	
No Build	4,285	642,750	23,194,148	367	186,069	7,668,704	6,634
Alternative B	4,310 - 4,317	646,500 - 647,550	23,329,470 - 23,367,360	371	188,097	7,752,286	6,638 - 6,640
Alternative C	4,315 - 4,316	647,250 - 647,400	23,356,534 - 23,361,947	369 - 370	187,083 - 187,590	7,710,495 - 7,731,391	6,633 - 6,635
Alternative M	4,300 - 4,302	645,000 - 645,300	23,275,341 - 23,286,167	368 - 369	186,576 - 187,083	7,689,599 - 7,710,495	6,633 - 6,635
Alternative O	4,309 - 4,319	646,350 - 647,850	23,324,056 - 23,378,186	368 - 370	186,576 - 187,590	7,689,599 - 7,731,391	6,629 - 6,637
Alternative P & RPA P	4,298 - 4,305	644,700 - 645,750	23,264,515 - 23,302,405	368 - 369	186,576 - 187,083	7,689,599 - 7,710,495	6,634 - 6,635
Alternative R	4,294	644,100	23,242,863	367	186,069	7,668,704	6,632

Table 3.28-3: Changes in VMT, Fuel Consumption and Btu Usage

Table 3.28-3 shows VMT and energy consumption is slightly higher for the build alternatives due to attracted trips from outside the study area and increases in the number and length of internal-internal and external-internal trips. Alternatives B, C and O have higher increases in VMT and energy consumption than Alternatives P, RPA P, R or M. Alternatives B, C and O have more indirect routes to I-69.

Table 3.29-4 shows percent changes in VMT and energy consumption between No-Build and Build Alternatives. It shows that overall percent changes in VMTs and energy consumption between No-Build and Build Alternatives are small (generally, less than one percent). Because of their comparatively indirect routing between I-64 and I-69, Alternatives B, C and O show larger percentage increases in VMT (0.67 to 0.71 percent) and energy consumption (0.54 to 1.10 percent). Alternative R shows the smallest percentage increase in energy consumption (0.0 to 0.21 percent).

Alternatives	Auto		Truck	
	% Change in VMT Compared to No-Build	% Change in Fuel Consumption Compared to No-Build	% Change in VMT Compared to No-Build	% Change in Fuel Consumption Compared to No-Build
No Build	N/A	N/A	N/A	N/A
Alternative B	0.67	0.67	1.10	1.10
Alternative C	0.71	0.71	0.68	0.68
Alternative M	0.37	0.37	0.41	0.41
Alternative O	0.68	0.68	0.54	0.54
Alternatives P & RPA P	0.39	0.39	0.41	0.41
Alternative R	0.21	0.21	0	0

Table 3.28-4: Percent Changes in VMT, Fuel Consumption and Btu Usage

3.28.4 Summary

All build alternatives would have slightly higher VMT and energy consumption within the Study Area compared to the No-Build Alternative. Increases in number of trips, trip lengths both within the 12-County Study Area and areas outside the study area contribute to slightly higher VMT and energy consumption. Differences in VMT and energy consumption for the build alternatives are small. Increases are greatest for Alternatives B, C and O. RPA P would have less than a 0.5 percent increase in fuel consumption compared to the No-Build Alternative.