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5.25 Energy Impacts

Since the publication of the Draft Environmental Impact Statement (DEIS), traffic forecasts from the I-69 Corridor Travel Demand Model have been refined. These modifications include forecasts for the Refined Preferred Alternative (RPA) to represent the build condition for the energy analysis. Minor changes have been made to the data shown in **Table 5.25-1**.

5.25.1 Introduction

Transportation accounts for a major portion of energy consumption in the United States. Energy is directly consumed by vehicles traveling on roadways and is indirectly consumed by vehicle manufacture and maintenance as well as by roadway construction and maintenance. Energy consumption for vehicle operation and roadway facility maintenance represents a long-term energy impact; whereas, energy consumption in vehicle manufacture and new road construction is a short-term energy impact.

Studies show that 42 percent of the energy for transportation is consumed in the manufacture and maintenance of transportation vehicles (Hatano et al., 1983). Most of the remainder of the energy consumed for transportation involves ongoing vehicle operation, rather than transportation facility construction and maintenance. Therefore, this energy impact analysis focuses on direct energy consumption associated with vehicle travel.

5.25.2 Methodology

In the evaluation of the future no-build scenario and the build alternatives (Alternatives C1, C2, C3, C4, and the RPA), a postprocessor program was used to analyze the travel characteristics forecasted by the I-69 Corridor Travel Demand Model. The travel demand model replicates travel patterns for the no-build scenario and build alternatives in the year 2045. It reports daily automobile and truck volumes, daily vehicle-miles of travel, and typical vehicle speeds for each link in the highway system. The postprocessor program converts these travel characteristics into gallons of gasoline and diesel fuel consumed. Factors are used to convert gallons of fuel to British Thermal Units (BTUs) to assess energy impacts. One million BTUs equal approximately 8.007 gallons of gasoline or 7.201 gallons of diesel fuel.

For this analysis, it is assumed that passenger cars and light-duty trucks use gasoline and heavy-duty trucks use diesel fuel. Fuel consumption efficiency rates by vehicle and travel type are held constant due to the difficulties inherent in attempting to predict changes in efficiency. It is expected, however, that efficiency rates would improve over time.

All build alternatives follow similar mainline alignments along existing SR 37, and all alternatives, including the RPA, have a total end-to-end distance of about 26 miles.

5.25.3 Analysis

Since all build alternatives are approximately the same length, follow the same route, and provide the same number of lanes, there would be no material difference in energy consumption by Alternatives C1, C2, C3, C4, or the RPA. The travel demand model and the postprocessor for estimating energy use yield nearly identical results for annual vehicle miles travelled (VMT), daily fuel consumption, BTU for VMT, and annual BTUs expended. **Table 5.25-1 r**eports the results of the energy analysis for the future no-build scenario and the RPA, representing the build condition.

Due to the diversion of through traffic from other interstates and principal arterials, the RPA would result in an increase in annual VMT compared with the future no-build scenario. The increase in VMT would result, in part, from "new" traffic in the study area as traffic diverts from alternate routes outside the study area to use I-69.

Travel demand model runs for the future no-build scenario use the existing roadway system as a base and add improvements that are expected to occur outside the project area before 2045. The no-build roadway network for modeling is based on the assumptions listed below.

- I-69 is assumed to be complete between Evansville and Martinsville. The completion date for the final portion of this segment is 2018.

- I-69 from Henderson, Kentucky to Evansville, Indiana (SIU 4 of the National I-69 project) is not assumed to be complete. Environmental studies have been funded, but are not yet completed. There was no commitment to fund the construction of this segment at the time modeling was conducted. Recognizing that this project was added to INDOT plans during the period of this study, a sensitivity analysis was conducted to determine how traffic levels would be affected if this link was in place. It was found that traffic would increase by only one to two percent, depending on the location, on I-69 Section 6.

- SR 37 between Martinsville and Indianapolis is not assumed to be modified, except for routine maintenance. No improvements (other than I-69) are shown in adopted long-range transportation plans (LRTPs) or transportation improvement programs (TIPs). SR 37 is assumed to operate with at-grade intersections and numerous residential and commercial drives, as it does today.

The build alternative networks for modeling are based on the same assumptions as the no-build scenario, except that SR 37 is replaced by I-69 Section 6, from the end of I-69 Section 5 near SR 39 in Martinsville to I-465 in Indianapolis, resulting in a continuous interstate highway from Evansville to Indianapolis.

The vehicle mix is also assumed to be the same with the build and no-build scenarios, operating at current fuel use levels to provide the most conservative estimate. With this approach, all changes in energy use are associated with differences in trip patterns (VMT) and facility type. As shown in **Table 5.25-1**, the RPA would result in an increase of approximately 244 million annual

Table 5.25-1: Energy Consumption in the Year 2045 by County

Alternatives	Annual VMT (millions)	Daily Fuel Consumption (gallons)	Annual BTUs (millions)	BTUs/VMT
Hendricks County				
No-Build Scenario	2,140	342,080	14,439,693	6,748
RPA (Build Condition)	2,138	341,308	14,408,889	6,737
Change, No-Build to RPA	-2	-772	-30,804	-11
Percent Change	-0.10%	-0.2%	-0.2%	-0.2%
Johnson County				
No-Build Scenario	1,932	321,247	13,615,433	7,047
RPA (Build Condition)	1,967	328,201	13,915,053	7,074
Change, No-Build to RPA	+35	+6,954	+299,620	+27
Percent Change	+1.8%	+2.2%	+2.2%	+0.4%
Marion County				
No-Build Scenario	9,733	1,607,553	68,087,309	6,996
RPA (Build Condition)	9,887	1,632,999	69,164,519	6,995
Change, No-Build to RPA	+154	+25,446	+1,077,210	-1
Percent Change	+1.6%	+1.6%	+1.6%	0.0%
Morgan County				
No-Build Scenario	911	175,795	7,555,175	8,297
RPA (Build Condition)	968	188,046	8,086,299	8,357
Change, No-Build to RPA	+57	+12,251	+531,124	+60
Percent Change	+6.3%	+7.0%	+7.0%	+0.7%
Total 4-County Study Area				
No-Build Scenario	14,716	2,446,675	103,697,910	7,047
RPA (Build Condition)	14,960	2,490,554	105,570,760	7,057
Change, No-Build to RPA	+244	+43,879	+1,872,850	+10
Percent Change	+1.7%	+1.8%	+1.8%	+0.1%

VMT for Hendricks, Johnson, Marion, and Morgan counties. This is an increase of about 1.7 percent over the no-build scenario of 14,716 million VMT.

Due to the increase in VMT, the amount of daily fuel consumption with the RPA would increase by 43,879 gallons, a 1.8 percent increase over the no-build scenario of 2.447 million gallons in

the four-county study area. The amount of energy expended would also increase by approximately 1.8 percent with the RPA compared with the no-build scenario, resulting in the consumption of about 1.9 million additional BTUs per year.

The estimated average BTUs per VMT is also estimated to increase with the RPA, by about 10 BTUs per VMT. This represents about a 0.1 percent increase over the no-build scenario. The increase in BTUs per VMT would result from a change in vehicle mix, as long-distance truck traffic diverts to I-69 from other routes that are located outside the study area.

5.25.4 Summary

Because of the increase in roadway miles traveled as traffic diverts to the facility from outside the I-69 corridor, all alternatives for the build condition, including the RPA, would result in greater total VMT than the no-build scenario. This would result in an about a 1.8 percent annual increase in BTUs of energy consumed for transportation. The predictions for the build alternatives, including the RPA, indicate that they would have nearly identical results for annual VMT, daily fuel consumption, annual BTUs, and BTUs per VMT, making them essentially equal in the amount of energy consumption.