5.15 Energy Impacts

Transportation accounts for a major portion of energy consumption in the nation. Energy is directly consumed by vehicles traveling on roadways, and is indirectly consumed during the construction and maintenance of new roadways. Energy consumption for vehicle operation and roadway facility maintenance represent long-term energy impacts; whereas, energy consumption in new road construction is a large, short-term energy impact.

Studies suggest that over half of the energy consumed for most transportation projects involves vehicle operation, and another 42% of the energy is consumed in the manufacture and maintenance of transportation vehicles (Hatano et al., July 1983). Thus, transportation facility construction and maintenance involve less than 8% of the energy consumed for national transportation. Therefore, the energy impacts analysis focuses on direct energy consumption associate with vehicle travel.

5.15.1 Methodology

In the evaluation of the US 31 Improvement Project alternatives, a "post-processor" program was modified to analyze the travel characteristics produced by the US 31 Improvement Project Travel Demand Model. The Travel Demand Model replicates travel patterns for the No-Build Alternative and the four final alternatives, and reports daily auto and truck volumes, daily vehicles-miles of travel, and typical vehicle speeds for each link in the highway system. The "post-processor" program converts these travel characteristics into gallons of gasoline and diesel fuel consumed in the year 2030 over the No-Build Alternative. Factors were then used to convert gallons of fuel to BTUs to assess energy impacts. (One million BTUs are approximately equal to 8.007 gallons of gasoline or 7.201 gallons of diesel fuel.) For the purposes of this analysis, it was assumed that passenger cars and light-duty trucks consume gasoline and that heavy-duty trucks consume diesel fuel.

5.15.2 Results

Table 5.15.42 reports the results of the energy analysis. Because the final alternatives result in additional miles of roadway, the alternatives all result in an increase in annual vehicle-miles of travel (VMT) over the No-Build Alternative. The resulting VMT depends on the effectiveness of diverting traffic to the new facility and the length of additional new road mileage for each alternative. Alternative G-Cs results in the least increase in VMT because it is least effective in diverting traffic from existing US 31 although it is the longest route of new construction. Because Alternative Es is the most effective in diverting traffic from existing US 31, it has the greatest increase in VMT. While greater in length than Alterative Es, Alternative G-Es results in less VMT because it is less effective than Alternative Es in diverting traffic from existing US 31.

Alternative G-Es results in the greatest energy consumption because its length is greater than Alternatives Cs and Es and it is more effective than G-Cs in attracting traffic. Being shorter than Alternative G-Es, Alternative Es results in the second greatest energy consumption because it diverts the most traffic from existing US 31. Alternative G-Cs has the least addition energy consumption over the No-Build Alternative because it is the second longest final build alternative with the least traffic; however, there is little difference in energy consumption overall between the alternatives.

Short-term energy consumption by vehicles traveling in the US 31 corridors may also increase during construction due to possible delays. As maintenance of traffic is greater for Alternatives Es and G-Es during the construction of the freeway segment between Kern Road and the US 20 Bypass along the existing alignment of US 31, these alternatives have greater short-term vehicle operation energy impacts than final Alternatives Cs and G-Cs which use less existing US 31 alignment.

The large, short-term indirect energy impacts associated with the construction and maintenance of the new freeway are directly related to the total project capital cost and maintenance cost. The total project capital cost for materials and construction (excluding right-of-way, engineering and traffic maintenance costs) is greatest for Alternative G-Es, followed by Alternative G-Cs, Alternative Es and Alternative Cs. Annual roadway maintenance and operational (State Police) costs are driven by the additional lane-miles of facility. The incremental annual operation and maintenance is $319,3221 for Alternative G-Es, followed by $317,852 for Alternative G-Cs, $310,507 for Alternative Es and $304,632 for Alternative Cs.

Table 5.15.42: Energy Consumption in the Year 2030 by Alternative

Alternatives		Annual Vehicle-Miles of Travel (in millions)	Daily Fuel Consumption (in gallons)	Annual BTUs (in millions)	BTUs/Vehicle-Mile
No-Build		121,279	28,781,508	1,265.21	10,432
Cs		121,330	28,803,306	1,266.16	10,436
	% change over No-Build	0.042%	0.076%	0.075%	0.033%
Es		121,344	28,803,763	1,266.18	10,435
	% change over No-Build	0.054%	0.077%	0.077%	0.023%
G-Cs		121,329	28,802,601	1,266.13	10,436
	% change over No-Build	0.042%	0.073%	0.073%	0.031%
G-E (Preferred)		121,338	28,803,993	1,266.19	10,435
	% change over No-Build	0.049%	0.078%	0.077%	0.029%

Source: US 31 Improvement Project Travel Demand Model for 2030 and Net_BC post-processor

Summary of Preferred Alternative G-Es

Preferred Alternative G-Es was analyzed for energy consumption by converting expected travel characteristics into gallons of gasoline and diesel fuel consumed in the year 2030. Alternative G-Es results in the greatest energy consumption because its length is greater than Alternatives Cs and Es and it is more effective than G-Cs in attracting traffic.

The large, short-term indirect energy impacts associated with the construction and maintenance of the new freeway are comparatively greatest for Preferred Alternative G-Es.