The likelihood that the market will impede improvements in fleet efficiency is particularly worrisome to energy policy analysts because vehicle miles traveled (vmt), the complementary component of oil use, is widely expected to continue to rise. The rate of increase in light-duty passenger vmt between 1970 and 1988 was very large, about 3.3 percent per year, with auto travel growing somewhat slower (2.5 percent per year), and light-truck travel growing much faster (7.3 percent per year).[1] And the rate of increase in total light-duty travel became larger during 1982-1988: 3.9 percent per year. For the remainder of the century, the rate is likely to be lower, possibly much lower, primarily for demographic reasons; however, sufficient uncertainty exists that the rate of increase conceivably could remain at previous levels.

Figure 5-1 shows that the rise in vmt over the past several decades has been almost constant as expected "saturation points" in auto ownership and travel demand did not occur. Initial assumptions that vehicle saturation would occur at one vehicle per household were surpassed in the United States in the 1930s. Then, a proposed saturation point of one vehicle per worker was surpassed in the mid-1960s. Expected saturation of one vehicle for each licensed driver was surpassed in 1983.[2] For the past 30 years, vmt per vehicle has remained at about 10,000/year, driving total U.S. vmt upward at the rate of expansion of the fleet.[3] The year-by-year rise in travel faltered only twice, and then only for very brief periods when gasoline supply problems were coupled with very sharp price increases.

More than half of the increase in vmt over the previous 15 years can be attributed to the increase in the number of persons of driving age; the remainder was due to the growth in driving per licensed driver and the higher proportion of licensed drivers in the population—the latter due largely to the growth of women in the work force.

The Energy Information Administration's ***1989 Annual Energy Outlook*** projected personal travel by autos and light trucks to grow at 2.1 percent/year for 1988-2000, reflecting their judgment that the market for such travel would slow somewhat from its steady rate of the past few decades. EIA's most recent forecast, the ***1991 Annual Energy Outlook,***[5] has lowered this rate (for 1989-2000) to a projected 1.6 percent/year, with a range of 1.5 to 2.1 percent/year representing scenarios varying from high oil price to low oil price-high economic growth conditions. Other recent forecasts include Argonne National Laboratory: 1.6 percent/year for 1990-2000 (for autos and light trucks)[6]; and DRI: 1.85 percent/year for 1990-2000 (for autos and all trucks)[7,8]. This is an unusually high degree of agreement about a future vmt growth rate that represents a marked shift from previous experience.

OTA agrees that a decreased growth rate for travel is likely. However, there is considerable room for argument about the extent and likelihood of a decrease. On one hand, the previous

[1]U.S. Department of Transportation, Federal Highway Administration, table VM-201, "Annual Vehicle-Miles of Travel by Vehicle Type and Highway Category, 1936-1985," and annual tables for 1987-89.

[2]P.D. Patterson, "Analysis of Future Transportation Petroleum Demand and Efficiency Improvements," paper presented at IEA Energy Demand Analysis Symposium, Pans, France, Oct. 12-14, 1987.

[3]Ibid.

[4]U.S. Department of Energy, Energy Information Administration, 1989 *Annual Energy Outlook*, DOE-EIA-0383(89), Jan. 1989.

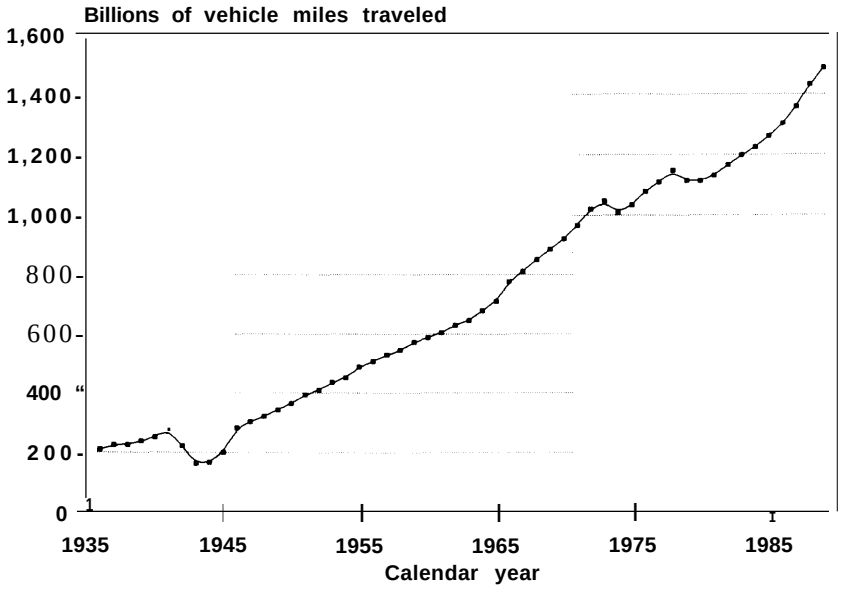
[5]U.S. Department of *Energy,* Energy Information Administration, *1991 Annual Energy Outlook*, DOE-EIA-0383(91), Mar. 1991.

[6]M. Mintz, Argonne National Laboratory, persona] communication, Mar. 25, 1991.

[7]Data Resources, Inc., *Energy Review,* Winter 1990-91, table 18.

[8]*Note:* These forecasts are projecting "personal" travel, excluding vmt for freight hauling by light trucks.

Figure 5-1 –Passenger Car VMT Growth, 1936-89



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stability of vehicle mileage trends argues against projecting a significant decrease; on the other hand, demographic factors seem to indicate such a decrease. Factors affecting future vmt include:

. **Women in the work force.** During the past few decades, the growing share of women working (therefore needing to commute) has contributed significantly to rising levels of light-duty vehicle travel. Between 1%9 and 1983, the percentage of adult women working rose from 39 percent to 50 percent; and the percentage of those working who had driver's licenses rose from 74 percent to 91 percent. Further increases in the share of women working will continue to affect the demand for transportation services during the next few decades, but probably at a considerably slower rate because the current percentage of working women is now high. In fact, by 1988, women made up 45 percent of the total work force, up from 27 percent in 1947.[9]

The fact that women, working or not, still do not drive nearly as much as men seems to leave open the possibility that changes in lifestyles among women could drive vmt at a higher rate than expected. However, the vmt gap between men and women appears to be caused principally by the social custom of men being the primary drivers for extended, family, and social travel.[10] Were this to change, vmt would be redistributed but not increased.

- **Number of adults. The** rate of growth of adults of driving age will slow as the baby boom passes. After 2010, however, the rate of increase will depend on future birthrates, which are uncertain. A recent surge in birth rates points out the danger in assuming that recent trends will necessarily continue.

- **Possible saturation among high-mileage drivers.** Employed men between 25 and 54 years of age drive more than any other large

[9]C.A. Lave, "Future Growth of Auto Travel in the U. S.: A Non-Problem," paper presented at *Energy and Environment in the 21st Century,* Massachusetts Institute of Technology Conference, Mar. 26-28, 1990.

[10]C.A. Lave, op. cit.

group-each about 18,000 miles per year, on average. This represents an average of 1.5 hours per day spent driving. Although "common sense" about saturation of driving has been wrong before, it is at least possible that this group may be nearing saturation. One important area of uncertainty: Recent trends in car design making the vehicle interior a more hospitable environment (comfortable seating, excellent climate control, superb music systems, availability of telephone communication, etc.) may increase the likelihood that drivers will tolerate spending more time on the road.

- **Changing economic structure. The** growth in part-time work and the shift in the economy toward more services may increase driving by bringing more individuals into the workplace and by increasing delivery requirements. Providing certain types of services, especially information, electronically may eventually replace some transportation, but such trends have not yet been observed.

- **Traffic congestion.** More congestion of metropolitan areas will alter travel patterns. Congestion will decrease fuel efficiency of trips made; discourage other trips (or shift them to public transportation, or to electronic media when possible); persuade some people to work closer to home or live closer to work; and encourage businesses to relocate to the less congested fringes, increasing travel requirements. Net effect on fuel demand is unpredictable.

In OTA's view, the most probable aspects of the above factors are a lower number of persons reaching driving age and a likely slowdown in the rate of women entering the work force, both slowing growth in vmt. Nevertheless, uncertainty associated with various factors affecting travel demand allows a range of feasible growth rates of 1 to 3 percent ***without*** considering the potential for future oil price shocks. Unexpected large increases in gasoline costs or supply problems could cause growth rates of personal travel demand to fall below these levels, or even cause travel demand to decline. A period of price stability and continued improvements in vehicle designs would make the high end of the range quite plausible.

We note that our projected range of vmt growth extends to a level lower than most projections (e.g., the three projections noted). At the lower end of the range, total fuel use by the fleet will likely decline ***unless*** negative effects on fuel economy due to growing congestion are very large.

As a final note, we should point out that studies of travel demand indicate that variable travel costs, including fuel cost, affect the magnitude of travel demand. Higher fuel prices will tend to depress travel demand; and increased fuel efficiency, which lowers the "per mile" cost of travel, will tend to boost travel demand. Since travel demand depends on numerous factors that have varied significantly over time, it is not possible to predict precisely how much additional demand for travel might result from actions that boost fuel economy–but analysts agree the effect is significant. In other words, the fuel economy savings expected from an increase in the severity of CAFE standards will be smaller—probably by 10 to 20 percent or so—than if demand for travel were assumed to be unaffected by the new standards.