EVALUATIONS OF 1997 FUEL CONSUMPTION PATTERNS OF HEAVY-DUTY TRUCKS

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The proposed 21st Century Truck program selected three truck classes for focused analysis. These were Class 8 (heavy), Class 6 (medium), and Class 2b (light). To develop and verify these selections, an evaluation of fuel use of commercial trucks was conducted, using data from the 1997 Vehicle Inventory and Use Survey (VIUS). Evaluation of the VIUS fuel use data for the classes of truck from 2b to 8 indicated that most fuel use for such trucks occurs in Class 8 trucks on long trips in relatively steady speed interstate operation. The remaining fuel use appeared to be comparable for the other two leading consumers – Class 2b and 6. The majority of fuel use of Class 2b and Class 6 trucks was shown to be in trips typically less than 100 miles in length. The portion of fuel use of Class 8 trucks in trips less than100 miles was found to be comparable to, but greater than the totals for Class 2b and 6.

It was also observed that, in contrast to the distribution of fuel use, the number of light- and medium-duty trucks is about twice that of heavy-duty trucks.

Using VIUS, the average loads and miles per gallon patterns of Class 8 trucks as a function of typical trip length were determined. Several candidate driving cycles for Class 8 trucks were examined by using them within the National Renewable Energy Laboratory (NREL) Advanced Vehicle Simulator (ADVISOR) model to simulate fuel consumption of a typical Class 8 truck, given loads specified by VIUS by trip length, and truck attributes recommended by industry. It was estimated, by use of the ADVISOR results and by construction of a candidate composite driving cycle, that the fuel economy predicted for known loads could be plausibly matched to VIUS field data on fuel consumption. The results suggested that fuel consumption for each of three trip length categories could be adequately characterized. This was done by constructing weighted combinations of two steady interstate speeds (65 mph and 70 mph) and two considerably slower variable speed urban driving cycles. The urban cycles had been established by NREL and West Virginia University by chasing Class 8 trucks. Effects of overnight and truck stop idling were also taken into account. These results are encouraging, indicating that, in conjunction with VIUS, the recently developed vehicle simulation models, such as ADVISOR and Partnership for a New Generation of Vehicle Systems Analysis Toolkit (PSAT), allow a very detailed evaluation of the probable in-use driving behavior of trucks.