

**Advanced Technology Vehicles Manufacturing Incentive Program  
Technical Support Document  
Substantially Similar Attributes Determination**

Under Section 136, Advanced Technology Vehicles (ATV) must have at least 125% of the average base year combined fuel economy for vehicles with “substantially similar attributes.” The Department of Energy (DOE) has determined that model year (MY) 2005 will be used as the base year for the determination of vehicle attributes and fuel economy. Details concerning the determination and calculation methods for “substantially similar attributes” are presented below.

**Use of existing EPA Vehicle Fuel Economy Classes**

To identify vehicles with substantially similar attributes, DOE relied in part on EPA’s existing 2005 vehicle classes to establish appropriate vehicle classifications. For MY 2005, EPA segmented the U.S. vehicle fleet each into classes of vehicles for the purpose of fuel economy comparisons between vehicles with similar characteristics. DOE based its identification of vehicles with “substantially similar attributes” for the purpose of the ATV definition on the EPA classes. DOE further segmented vehicles into performance classes where appropriate, as explained below. The initial EPA classes plus the addition of performance subclasses (and consolidation of two categories) resulted in 18 categories that define the vehicles with substantially similar attributes as shown below:

<b>EPA Vehicle Class Definitions*</b>	<b>EPA Vehicle Classes</b>	<b>EPA Vehicle Classes plus Performance Classes**</b>
Any vehicle designed to seat two adults	Two Seater	Two-Seater
		Two-Seater Performance
< 85 ft <sup>3</sup>	Mini-compact Sedan	Minicompact Sedan
		Minicompact Performance Sedan
85-99 ft <sup>3</sup>	Subcompact Sedan	Subcompact Sedan
		Subcompact Performance Sedan
100-109 ft <sup>3</sup>	Compact Sedan	Compact Sedan
		Compact Performance Sedan
110-119 ft <sup>3</sup>	Midsize Sedan	Mid-Size Sedan
		Mid-Size Performance Sedan
120 ft <sup>3</sup> or more	Large Sedan	Large Sedan
<130 ft <sup>3</sup>	Small Wagon	Small Wagon
130-159 ft <sup>3</sup>	Midsize Wagon	Mid-Size and Large Wagon
160 or more	Large Wagon	
< 6000 lbs	Small Pickup	Small and Standard Pickup
6000-8500 lbs	Standard Pickup	
< 8500 lbs	Passenger Van	Passenger Van
< 8500 lbs	Minivan	Minivan
< 8500 lbs	Cargo Van	Cargo Van
< 8500 lbs	Sports Utility	Sport Utility Vehicle
< 8500 lbs	Special Purpose	[Not Used]

*\*For cars (two-seaters, sedans, and wagons), EPA size class is based on interior passenger and cargo volume; light trucks (pickups, vans, and utility vehicles) are classified by gross vehicle weight rating (<http://www.fueleconomy.gov/feg/info.shtml#sizeclasses>).*  
*\*\*Several EPA classes are merged into a single DOE vehicle class because the EPA category contained no vehicles in Model Year 2005. The Special Purpose class, which includes vehicles that do not fit into another class, does not group vehicles with similar attributes and is not used.*

DOE notes that in MY 2005, not every EPA class was populated with vehicles manufactured in MY 2005 (i.e., large wagons and small trucks). In those instances, DOE combined classes in a manner consistent with grouping vehicles by “substantially similar attributes.” The large wagon class was combined with the mid-size wagon class, and the small pickup class was combined with the standard pickup class.

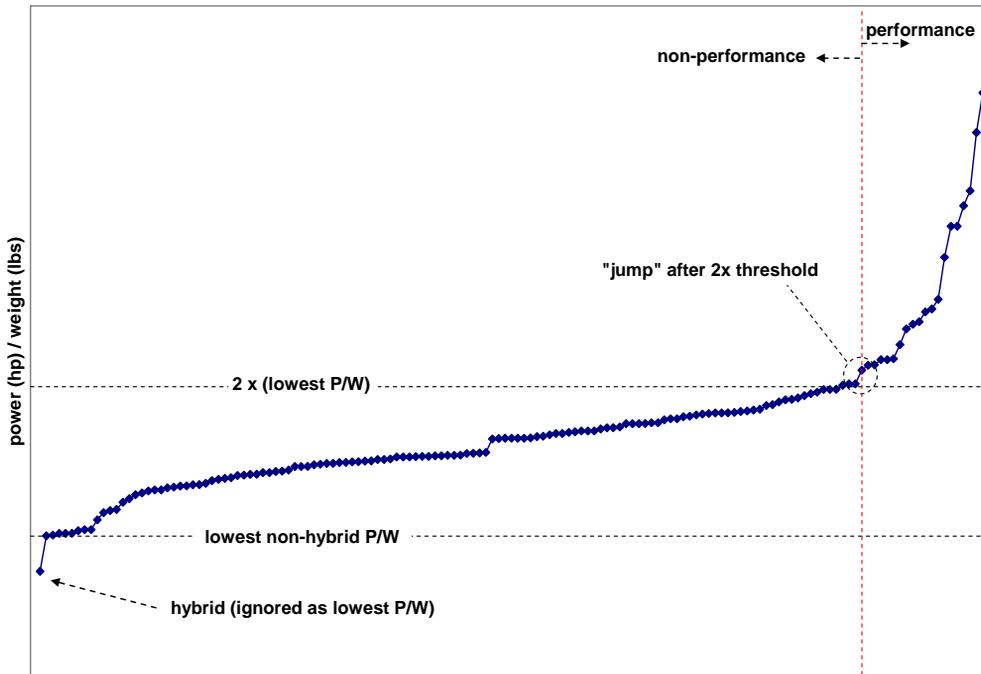
### **Creation of Performance Classes**

EPA’s vehicle classes combine vehicles with wide variation in vehicle power and weight, so DOE examined each vehicle class to identify the potential for subclasses. Within five of the EPA classes there was an apparent delineation based on comparison of power to weight ratio that supported creating performance subclasses. Performance classes were established by ranking vehicles by power-to-weight ratio, calculated by dividing a vehicle’s peak power (measured in horsepower (hp)) by its curb weight (measured in pounds (lbs))\* . For classes in which the highest power-to-weight ratio (P/W ratio) of a vehicle in that class exceeded the lowest non-hybrid P/W ratio of a vehicle in that class by more than 100% (i.e. more than twice the lowest P/W ratio), the class was divided into a performance and a non-performance segment, except in cases where there was no clear point to divide the class (see below) or where division of the class would have created a performance class with very few vehicles. In classes in which a hybrid vehicle had the lowest P/W ratio, the lowest non-hybrid P/W ratio was used as a means for comparison. Hybrids were considered an inappropriate lowest point on a P/W chart because the maximum power information for hybrids (reported in hp) only includes power from the engine, and does not include the contribution of the hybrid system (usually measured in kW). This method of reporting results in a lower reported P/W than the likely actual P/W, since total power of the vehicle available is the sum of engine power and maximum hybrid power.

The division of a class into performance and non-performance classes was made at the point along the P/W line at which there was an apparent increase in the P/W values. Visually, this increase appeared as a jump on a plot of P/W ratios ranked in increasing order, as shown below:

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\* Final model year peak power (hp) and curb weight (lbs) data as reported by manufacturers to the National Highway Traffic Safety Administration as required by 49 U.S.C. 32907.



The P/W evaluation resulted in the creation of five performance classes - two-seater performance, mini-compact performance sedan, sub-compact performance sedan, compact performance sedan, and midsize performance sedan. Conversely, because other vehicle classes—large Sedans, all classes of wagons, small and standard pick-ups, all classes of vans, and sport utility vehicles—have relatively flat P/W curves or narrow P/W ranges across the entire class, DOE did not create performance classes in those categories.

### Average MY 2005 Combined Fuel Economy For Vehicles with Substantially Similar Attributes

In order to identify the average fuel economy for vehicles with substantially similar attributes, DOE calculated the harmonic production weighted average fuel economy for each class identified by DOE. DOE calculated the average fuel economy for each vehicle class using a harmonic production weighted average as illustrated below:

$$MPG = \frac{\#VehicleA + \#VehicleB + \dots}{\frac{\#VehicleA}{MPG_{VehicleA}} + \frac{\#VehicleB}{MPG_{VehicleB}} + \dots}$$

DOE relied on the Final model year combined fuel economy and model sales data as reported by manufacturers to the National Highway Traffic Safety Administration as required by 49 U.S.C. 32907. As explained in the interim final rule, DOE relied on the combined fuel economy value for all vehicle models as if none of the vehicles were dual fueled for the purpose of compliance with the corporate average fuel economy standards.

## **Vehicle Models for which Multiple Powertrains were Reported**

Vehicle models that reported multiple powertrains, such as the Ford Mustang, were separated by P/W lines as appropriate under the performance classes. As an example, Ford Mustang models with lower P/W ratios were categorized into the subcompact sedan class. The 2005 4.6L Mustang with a larger P/W ratio was placed in the subcompact performance sedan class.