The Wedge from Efficient Vehicles

BAU

Activity level(AL)

- 2 billion cars (light-duty vehicles)

Assumptions

- vehicle miles traveled(VMT): 10,000
- miles per gallon(mpg): 30

Conversion factors

- liter per gallon: 3.78
- gasoline gravity: 0.74kg/liter
- weight per gallon: 2.8kg
- carbon content in gasoline: 85% by weight
- carbon per gallon(cpg): 2.4kg

Emission factor(EF)

- =VMT*cpg/mpg=0.8 t-C/vehicle/year
- “overhead” emissions: 25%
- EF=0.8*1.25=1t-C/vehicle/year

Total emissions

- =AL*EF=2 Gt-C/year

Target

Same as in BAU, except for 60 miles per gallon, which leads to an emission factor of 0.5t-C/vehicle/year and total emissions of 1Gt-C/year. Thus, we derive a wedge.

Comments

Note that the improved fuel efficiency required to achieve a wedge is strongly dependent on the average fuel economy assumed in the BAU. Assuming 24 mpg, a wedge is available from fuel efficiency by achieving 40 mpg instead. Assuming a 36 mpg baseline, a wedge is available from fuel efficiency by achieving 90 mpg instead.

Note also that the assumption of 10,000 miles of driving per year for the average car is only slightly larger than the 14,000 km/y (8700 miles/y) value used by the U.S. Energy Information Agency as a world average today (S23). The assumption of two billion light-duty vehicles in 2054 is consistent with the 530 million cars in 1999 (S23), if the growth rate in number of cars is 2.4% per year.

The decarbonization of freight transport presents challenges similar to those for personal transport. It is widely agreed, however, that the decarbonization of aviation will be more difficult. And aviation is the fastest growing component of transportation.

Reference

S23 Energy Information Agency, U.S. Department of Energy, 2003. *International Energy Outlook, 2003*. Report # DOE/EIA-0484**.** http://www.eia.doe.gov/oiaf/ieo/index.html**.**