

converter lock-up, and other measures which should be described.

b. Improved manual transmissions. Projections of percent of fuel economy improvement should include the benefits of increasing mechanical efficiency, using improved transmission lubricants, and other measures (specify).

c. Overdrive transmissions. If not covered in "a" or "b" above, project the percentage of fuel economy improvement attributable to overdrive transmissions (integral or auxiliary gear boxes), two-speed axles, or other similar devices intended to increase the range of available gear ratios. Describe the devices to be used and the application by model, engine, axle ratio, etc.

d. Use of engine crankcase lubricants of lower viscosity or with additives to improve friction characteristics or accelerate engine break-in, or otherwise improved lubricants to lower engine friction horsepower. When describing the 2002 baseline, specify the viscosity of and any fuel economy-improving additives used in the factory-fill lubricants.

e. Reduction of engine parasitic losses through improvement of engine-driven accessories or accessory drives. Typical engine-driven accessories include water pump, cooling fan, alternator, power steering pump, air conditioning compressor, and vacuum pump.

f. Reduction of tire rolling losses, through changes in inflation pressure, use of materials or constructions with less hysteresis, geometry changes (e.g., reduced aspect ratio), reduction in sidewall and tread deflection, and other methods. When describing the 2002 baseline, include a description of the tire types used and the percent usage rate of each type.

g. Reduction in other driveline losses, including losses in the non-powered wheels, the differential assembly, wheel bearings, universal joints, brake drag losses, use of improved lubricants in the differential and wheel bearing, and optimizing suspension geometry (e.g., to minimize tire scrubbing loss).

h. Reduction of aerodynamic drag.

i. Turbocharging or supercharging.

j. Improvements in the efficiency of 4-cycle spark ignition engines including (1) increased compression ratio; (2) leaner air-to-fuel ratio; (3) revised combustion chamber configuration; (4) fuel injection; (5) electronic fuel metering; (6) interactive electronic control of engine operating parameters (spark advance, exhaust gas recirculation, air-to-fuel ratio); (8) variable valve timing or valve lift; (9) multiple valves per cylinder; (10) cylinder deactivation; (11) friction reduction by means such as low tension piston rings and roller cam followers; (12) higher temperature operation; and (13) other methods (specify).

k. Direct injection gasoline engines.

l. Naturally aspirated diesel engines, with direct or indirect fuel injection.

m. Turbocharged or supercharged diesel engines with direct or indirect fuel injection.

n. Stratified-charge reciprocating or rotary engines, with direct or indirect fuel injection.

o. Two cycle spark ignition engines.

p. Use of hybrid drivetrains

q. Use of fuel cells; provide a thorough description of the fuel cell technology employed, including fuel type and power output.

r. Other technologies for improving fuel economy or efficiency.

7. For each model of respondent's light truck fleet projected to be manufactured in each of MYs 2003–2012, describe the methods used to achieve reductions in average test weight. For each specified model year and model, describe the extent to which each of the following methods for reducing vehicle weight will be used. Separate listings are to be used for 4x2 light trucks and 4x4 light trucks.

a. Substitution of materials.

b. "Downsizing" of existing vehicle design to reduce weight while maintaining interior roominess and comfort for passengers, and utility, *i.e.*, the same or approximately the same, payload and cargo volume, using the same basic body configuration and driveline layout as current counterparts.

c. Use of new vehicle body configuration concepts, which provides reduced weight for approximately the same payload and cargo volume.

8. Indicate any MY 2003–2012 light truck model types that have higher average test weights than comparable MY 2002 model types. Describe the reasons for any weight increases (e.g., increased option content, less use of premium materials) and provide supporting justification.

9. For each new or redesigned vehicle identified in response to Question 3 and each new engine or fuel economy improvement identified in your response to Questions 3, 4, 5, and 6, provide your best estimate of the following, in terms of constant 2003 dollars:

(a) Total capital costs required to implement the new/redesigned model or improvement according to the implementation schedules specified in your response. Subdivide the capital costs into tooling, facilities, launch, and engineering costs.

(b) The maximum production capacity, expressed in units of capacity per year, associated with the capital expenditure in (a) above. Specify the number of production shifts on which your response is based and define "maximum capacity" as used in your answer.

(c) The actual capacity that is planned to be used each year for each new/redesigned model or fuel economy improvement.

(d) The increase in variable costs per affected unit, based on the production volume specified in (b) above.

(e) The equivalent retail price increase per affected vehicle for each new/redesigned model or improvement. Provide an example describing methodology used to determine the equivalent retail price increase.

10. Please provide respondent's actual and projected U.S. light truck sales, 4x2 and 4x4, 0–8,500 lbs. GVWR and 8501–10,000 lbs., GVWR for each model year from 2002 through 2004, inclusive. Please subdivide the data into the following vehicle categories:

- i. Standard Pickup Heavy (e.g., C2500/3500, F–250/350)
- ii. Standard Pickup Light (e.g., C1500, F–150)
- iii. Compact Pickup (e.g., S–10, Ranger, Dakota)
- iv. Standard Cargo Vans Heavy (e.g., G3500, E–250/350)
- v. Standard Cargo Vans Light (e.g., G1500/2500, E–150)
- vi. Standard Passenger Vans Heavy (e.g., G3500, E–250/350)
- vii. Standard Passenger Vans Light (e.g., G1500/2500, E–150)
- viii. Compact Cargo Vans (e.g., Astro/Safari)
- ix. Compact Passenger Vans (e.g., Sienna, Odyssey, Caravan)
- x. Full-size Sport Utilities (e.g., Tahoe, Expedition, Sequoia)
- xi. Mid-size Sport Utilities (e.g., Trailblazer, Explorer)
- xii. Compact Utilities (e.g., Wrangler, RAV4)
- xiii. Crossover Vehicle (e.g., Pacifica, Rendezvous, RX 330)
- xiv. Other (e.g., Avalanche)

See Table IV–B for a sample format.

11. Please provide your estimates of projected *total industry* U.S. light (0–10,000 lbs, GVWR) truck sales for each model year from 2003 through 2012, inclusive. Please subdivide the data into 4x2 and 4x4 sales and into the vehicle categories listed in the sample format in Table IV–C.

12. Please provide your company's assumptions for U.S. gasoline and diesel fuel prices during 2003 through 2012.

13. Please provide projected production capacity available for the North American market (at standard production rates) for each of your company's light truckline designations during MYs 2003–2012.

14. Please provide your estimate of production lead-time for new models, your expected model life in years, and the number of years over which tooling costs are amortized.

Note: The parenthetical numbers in Tables IV–A refer to the items in Section IV, *Specifications*.

TABLE IV–A—TECHNOLOGY IMPROVEMENTS

Technological improvement	Baseline technology	Percent fuel economy improvement (percent)	Basis for improvement estimate	Models on which technology is applied	Production share of model with technological improvement				
					2003	2004	2005	2006	2007+
(6a.) Improved Auto Trans. LT–1	7.0	0	0	15	25	55