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Docket Management Facility
U.S. Department of Transportation
400 Seventh Street, S.W.
Nassif Building, Room PL – 401
Washington D.C. 20590 – 001

Subject: Request for Comments – Light Truck Average Fuel Economy Standards--Model Years 2008-2011; Request for Product Plan Information

Docket Number: 2005-22144, RIN 2127-AJ71

Ford Motor Company (Ford) appreciates the opportunity to comment on the National Highway Traffic Safety Administration's (NHTSA) August 30, 2005 Request for Comments on product plan information to support NHTSA's analysis of the Notice of Proposed Rulemaking regarding Average Fuel Economy Standards for Light Truck Model Years 2008-2011.

This submission contains the non-confidential information of the Ford response. A confidential version has been submitted to the Office of the Chief Counsel.

We will be pleased to discuss this information with you or members of your staff. Should you wish to do so, please contact me at 313-322-0033 or Peg Gutmann at 313-594-0400. Questions regarding our request for confidentiality should be addressed to Mark Edie, Office of the General Counsel, Ford Motor Company, Room 321-A4, World Headquarters, The American Road, Dearborn, MI 48126-2798; telephone (313) 248 2355.

Sincerely,

Kelly M. Brown

cc Mr. Peter Feather, Division Chief
Mr. Kenneth Katz, Lead Engineer

Enclosures

DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
49 CFR Part 533
[Docket No. 2005-22144]
RIN 2127-AJ71
Light Truck Average Fuel Economy Standards--Model Years 2008-2011; Request for Product Plan Information

Ford Motor Company recognizes the difficult task that the National Highway Traffic Safety Administration (NHTSA) is undertaking in this evaluation of CAFE standards for light duty trucks. We commend the agency for taking on this difficult task and are committed to working with NHTSA to finalize this proposed rulemaking for the 2008 through 2011 model years (MYs).

II. Assumptions

The data presented in Ford's submission includes actions that allow compliance with the following safety and emission standards. Below is a summary of the phased in future safety standards used for this analysis. In addition to these regulations, Ford has also implemented voluntary improvements for vehicle-to-vehicle compatibility, in particular Front-to-Side (FtS) and Front-to-Front (FtF) compatibility.
[

]c

Emission standards as defined by the Federal Tier 2 and California (CA) LEV II standards are included in the fuel economy assumptions. Current cycle plans and technology information are based on the following states that have adopted the CA LEV II emissions regulations.

Emissions, Green State Assumptions	2005 +	2008	2009
CA	**X**		
NY	**X**		
MA	**X**		
VT	**X**		
ME	**X**		
CT		**X**	
RI		**X**	
[ ]c		**X**	
NJ			**X**
[ ]c			**X**
[ ]c			**X**

[ ]c

III. Specifications – Light Truck Data

1. Identify all light truck models currently offered for sale in MY 2005 whose production you project discontinuing before MY 2008 and identify the last model year in which each will be offered.

   Answer: Please see Attachment Q.1-2 for the light truck models that will be discontinued before 2008 MY.

2. Identify all basic engines offered by respondent in MY 2005 light trucks which respondent projects it will cease to offer for sale in light trucks before MY 2008, and identify the last model year in which each will be offered.

   Answer: Please see Attachment Q.1-2 for the light truck basic engines that will be discontinued before 2008 MY.

3. For each model year 2005-2012, list all projected trucklines and provide the information specified for each model type.

   The agency also requests that each manufacturer provide an estimate of its overall light truck CAFE for each model year. This estimate should be included as an entry in the spreadsheets that are submitted to the agency.

   Answer: Please see Attachment Q.3 for the requested information.

   The estimate of Ford's CAFE is located at the bottom of the vehicle spreadsheet in the attachment.

   We recently announced plans regarding hybrid electric vehicle (HEV) production. Ford Chairman & CEO Bill Ford stated, "We'll have the capacity to produce at least a quarter-million hybrids a year, and the ability to scale up as the market demands." Presently, Ford produces about 24,000 HEVs a year. Our goal of reaching 250,000 units is a global target. We expect that most of the volume will be in the U.S. within the 2010 time frame, but it will include HEV sales outside of the U.S. We also expect to be expanding our offerings to other brands besides Ford and Mercury.

   In addition to the Escape and Mariner Hybrids, we will expand our offerings to include the Mazda Tribute and passenger cars by 2008. These include the Ford Fusion and Mercury Milan. Preliminary plans for additional truck programs (not publicly announced) are included in the attachment. Other programs are yet to be determined.

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   ][c]

4. Does respondent project introducing any variants of existing basic engines or any new basic engines, other than those mentioned in your response to Question 3, in its light truck fleets in MYs 2005-2012?

   Answer: All information has been included in the response to question 3. Please see the Engine Data information in Attachment Q.3.

5. Relative to MY 2005 levels, for MYs 2005-2012, please provide information, by truckline and as an average effect on a manufacturer's entire light truck fleet, on the weight and/or fuel economy impacts of the following standards or equipment:

   a. Federal Motor Vehicle Safety Standard (FMVSS 208) Automatic Restraints
   b. FMVSS 201 Occupant Protection in Interior Impact
   c. Voluntary installation of safety equipment (e.g., antilock brakes)
   d. Environmental Protection Agency regulations
   e. California Air Resources Board requirements
   f. Other applicable motor vehicle regulations affecting fuel economy.

   Answer:
   (a through c) Please refer to Attachment Q. 5 for Ford's assessment of safety regulations and actions that affect fuel economy and weight. Many of the items included in this summary are based on high confidence implementation of the proposed FMVSS regulation. Please note that a majority of the additional safety related weight additions from the previous 2002 response (Docket 2002-11419) has already been phased into the vehicle programs.

   (d through e) Since our last response, Ford has determined that the Tier 2 and LEV II standards do have some effect on the fuel economy improvements that can be achieved from certain technologies. Modifying our current vehicles to meet the California PZEV standards has increased exhaust backpressure. This has resulted in a decrease in fuel economy [ ][c].

   Other gasoline fuel economy enabling technology will also be limited due to new Federal and California standards. Direct injection stratified charge has a potential to improve fuel economy by only [ ][c] that could be achieved without the emissions constraints. Lean burn operation is another fuel economy-enabling technology that will be limited in benefit and implementation due to increased NOx requirements in the Federal and California emissions regulations. Under Federal standards, lean operation is only containable at idle speeds. [ ][c]

   Advanced diesel combustion technologies have the potential to offer a significant fuel economy benefit. Several factors currently make it difficult to implement diesel powertrain programs that meet Federal Tier 2 emission standards. Sulfur content in the diesel fuel will be addressed by new regulations limiting the amount of sulfur starting in 2007 MY. Although low-sulfur fuel is required to achieve required NOx catalyst durability, there are many additional technical hurdles to overcome in order to achieve Federal Tier 2 standards. Actions required are costly and unproven. Ford estimates that in order to achieve Tier 2 Bin 5 levels, the expected fuel economy improvements for diesels will be degraded by [ ][c]. The fuel economy loss for achieving PZEV is estimated to be between [

]c. Additional costs may incur to achieve emissions compliance. In some cases the additional cost will impede ability to produce in significant volumes.

6. For each of the model years 2005-2012, and for each light truck model projected to be manufactured by respondent (if answers differ for the various models), provide the requested information on new technology applications for each of items "6a" through "6r":

Answer:
Attachment Q. 6 contains the detailed information on our future fuel economy technology. Several qualifications must be considered when considering the technology's potential and implementation schedule. Technology implementation rates are limited by the availability of engineering resources. Many of the technologies require development and prove-out from concept to implementation to production. Due to limitations in manpower and development time, these technologies are targeted at programs with the most benefit to fuel economy. It would not be possible to implement multiple technologies across our entire product lineup within a short period of time. Although technology rollout times vary in length, it often takes engineering resources between five and ten years to fully rollout a technology across all product lines.

The current state of analytical models and component testing capabilities results in a large range of variability when trying to predict and verify the benefits of multiple technologies. In addition, once technologies reach the implementation stage on actual vehicles, unanticipated functional interactions are often encountered requiring many compromises, like increased weight or packaging, to achieve overall vehicle acceptability.

Technological risks exist for implementing and achieving the full potential of fuel economy improvement technologies on a program-by-program basis. Programs with different customer targets will implement technologies that meet their specific customer wants. Fuel economy improvement technologies are often measured as stand alone actions and not part of a vehicle system. Finally, competing requirements can limit fuel economy improvement benefits.

We have found that our initial estimates of fuel economy improvements are typically 40-60% higher than the improvements that ultimately result on the production vehicle. The agency should assume at least the same level of loss from anticipated improvements when basing future light truck standards on analytical projections of fuel economy benefits.

7. For each model of respondent's light truck fleet projected to be manufactured in each of MYs 2005-2012, 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.

Answer:
Ford's goal is to maintain average truck fleet weights by offsetting increased content, competitive functional upgrades, and increased regulatory vehicle requirements.

One major near term weight reduction is [

][c].

Higher strength steels usage is accelerating at Ford and should help offset content and regulatory weight increases. These weight reductions will be timed for minor to major product changes during the 2006 – 2010 timeframe. [

][c].

Ford is expanding its hybrid vehicle applications. Unfortunately, these powertrains are significantly heavier than conventional gasoline engines.

Lastly, lack of profitability is a challenge in the North American market. It drives all of the manufacturers to reduce costs while innovating to gain revenue. These economics make major system redesigns/downsizing while maintaining comfort, package, and functional upgrades, a more difficult business proposition than a few years ago.

8. Indicate any MY 2005-2012 light truck model types that have higher average test weights than comparable MY 2004 model types. Describe the reasons for any weight increases (e.g., increased option content, less use of premium materials) and provide supporting justification.

   Answer:
   To meet the competitive challenge in the mid-size SUV segment, increased GVWR, payload, and functional attributes for Explorer and Mountaineer were implemented in 2006 MY. The frame was stiffened for NVH/ride/handling/durability improvements and track increased by 6mm. Advance Trac[r] with Roll Stability was added as well as Safety Canopy[tm] to 1st and 2nd row seats. Both 2nd and 3rd seat function was improved to enhance cargo flexibility. A navigation system, power fold 3rd row seat, and one-touch moonroof options were also added. To help offset the loss in fuel economy from added weight, a more efficient six speed transmission and 3-valve V8 replaced the less efficient 5-speed transmission and 2-valve V8.

   The Explorer Sport Trac to be re-introduced next year will acquire these platform upgrades including the independent rear suspension.

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 2005 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.

Answer:
(a), (b), and (d) For investment and variable costs and capacity information associated with fuel economy technology please refer to Attachment Q. 6.

(c) Actual Capacities - See the projected volumes found in the answer to Question Q. 3 for the actual planned capacity for each model line.

(e) Equivalent Retail Price - Program specific work has not yet started for many of the models that will be introduced or redesigned during the MY 2008-2012 time period, so it is not possible to predict the equivalent retail prices. In addition, some new models are not based on existing models, so there is no way to derive meaningful retail price increase values.

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 2005 through 2012, inclusive.

Answer: The projected sales for 2005 through 2012 for the Ford truck fleet by vehicle class can be found in Attachment Q.10.

11. Please provide your estimates of projected <u>total industry</u> U.S. light (0-10,000 lbs, GVWR) truck sales for each model year from 2005 through 2012, inclusive. Please subdivide the data into 4x2 and 4x4 sales and into the vehicle categories listed in the sample format in Table III-C.

Answer: Please see Attachment Q.11 for information on projected total industry light duty truck sales (not broken out by 4X2 and 4X4).

12. Please provide your company's assumptions for U.S. gasoline and diesel fuel prices during 2005 through 2012.

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][c]

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 2005-2012.

    Answer:
    Projected North American production capacity is found in Attachment Q.13. It should be noted that there are limited opportunities to change mix and technology options without incurring capital expenditures. Engine plants have fixed capacity that is linked to assembly plant capacity. Changing that capacity or shifting production to other plants will require careful system-wide planning and additional expenditure. In addition, forced mix changes to comply with standards could result in incremental sales loss when consumers choose to purchase other vehicles.

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.

    Answer:
    New model production lead-time varies depending on program issues and cycle plan timing. In general, it is between [ ][c] months from the time when work begins on a program until full-scale vehicle production begins. As a program progresses, the freedom to make design changes in response to regulatory changes and to compensate for changes in factors that determine fuel efficiency decreases, and the expense and risk incurred in making design changes rapidly increases.

    By [ ][c] months prior to production, depending the program team has completed a plan to meet regulatory requirements and major customer wants, defined vehicle level target ranges and product assumptions, and identified any new technologies to be implemented.

    At approximately [ ][c] months before production, design decisions affecting powertrain choice are solidified. The powertrain line-up is selected, and the powertrain package envelope is defined. Engineering design work on other vehicle subsystems and components then proceeds based on these design decisions. In addition, vehicle, system, and subsystem level targets are set. At this point it is nearly impossible to implement any major changes to address increases in fuel economy standards.

    Model life varies from model to model depending on the market segment, competitive environment, and a number of other factors. For passenger cars and light trucks, the expected model life ranges from [ ][c] years with an average life of approx. [ ][c] years.

    Tooling cost amortization also depends on many factors. Vehicle tooling costs are capitalized on a vehicle line basis and amortized over the life of a vehicle line. For example, if a vehicle line was launched this year, and was planned for production for the next five years, i.e. the next major change to the program was in five years, the tooling costs would be amortized over a 5-year period. Vehicle line life varies from line to line. For planning purposes, the amortization is estimated to be approximately the same as the model life.

    If instability in regulation affecting fuel economy necessitates continual introduction of new technologies, tooling will have to be replaced more often, thereby reducing the length of time over which costs can be amortized. Therefore, it is desirable to make changes in fuel economy regulations as infrequent as possible to reduce this costly churn and to ensure that tooling can be kept in use long enough to pay for itself.

IV. Cost and Potential Fuel Economy Improvements of Technologies

Table IV-A – Estimates of Fuel Economy Improvement of Fuel Economy Technologies for All Vehicle Classes

	NAS		Ford	
	Low	**High**	**Low**	**High**
Production-Intent Engine Technology				
Engine Friction Reduction	1.0%	5.0%	[	
Low Friction Lubricants (using GF3 engine oil baseline)	1.0%	1.0%		
Multi-Valve, Overhead Camshaft (over 2V OHC base)	2.0%	5.0%		
Variable Valve Timing (covers: i-VCT; DeVCT; Ti-VCT)	2.0%	3.0%		
- 4 cylinder engine	2.0%	3.0%		
- 6 cylinder engine	2.0%	3.0%		
- 8 cylinder engine	2.0%	3.0%		
Variable Valve Lift & Timing (assumes two-position)	1.0%	2.0%		
Cylinder Deactivation [ ][c]	3.0%	6.0%		
- 6 cylinder engine	3.0%	6.0%		
- 8 cylinder engine	3.0%	6.0%		
Engine Accessory Improvement	1.0%	2.0%		
Engine Supercharging & Downsizing (turbocharged also)	5.0%	7.0%		][c]
Production-Intent Transmission Technology				
5-Speed Automatic Transmission (vs. 4-speed base)	2.0%	3.0%	[	
Continuously Variable Transmission	4.0%	8.0%		
Automatic Transmission w/ Aggressive Shift Logic	1.0%	3.0%		
6-Speed Automatic Transmission (vs. 5-speed automatic)	1.0%	2.0%		
6-Speed Automatic Transmission (vs. 4-speed automatic)	3.0%	5.0%		][c]
Production-Intent Vehicle Technology				
Aero Drag Reduction	1.0%	2.0%	[	
Improve Rolling Resistance	1.0%	1.5%		][c]
Emerging Engine Technology				
Intake Valve Throttling	3.0%	6.0%	[	
Camless Valve Actuation	5.0%	10.0%		
Variable Compression Ratio	2.0%	6.0%		
Direct Injection [ ][c]	N/A	N/A		
Diesel Engine	N/A	N/A		][c]
Emerging Transmission Technology				
Automatic Shift Manual Transmission (AST/AMT)	3.0%	5.0%	[	
Advanced CVTs	0.0%	2.0%		][c]
Emerging Vehicle Technology				
42 Volt Electrical Systems [ ][c]	1.0%	2.0%	[	
Integrated Starter/Generator (assumes: stop-start; regen braking; improved efficiency 42V components)	4.0%	7.0%		
Electric power Steering	1.5%	2.5%		
Vehicle Weight Reduction (dependent upon reduction amount and final weight class)	3.0%	4.0%		][c]

Table IV-C – Cost Estimates for Fuel Economy Technologies for All Vehicle Classes

The NAS projections are expressed in terms of retail price equivalent (RPE). Specifically, the NAS estimates use piece costs provided by component manufacturers, multiplied by a factor of 1.4 to account for other systems integration, overhead, marketing, profit, and warranty issues. Ford does not agree with this multiplier because it does not fully or accurately account for investment and integration costs. At a minimum, the 1.4 multiplier is [ ][c]. With respect to investment, manufacturers incur significant tooling, facility, launch, and engineering costs (TFLE). In most cases, for components purchased from vendors, [ ][c]. Also, most of the technologies identified by NHTSA cannot simply be bolted on to the vehicle -- extensive modifications to the engine may be required. These changes involve a substantial investment and can require all new facilities.

Even if technology is bought from a supplier, [ ][c]. As technology combinations become more complex, the engineering costs become significantly higher because of [ ][c].

Additionally, just because some of these technologies are [ ][c].

Ford believes that, at a minimum, NHTSA should recalculate its technology cost estimates using a mark-up factor [ ][c]