Energy and Environmental Benefits

Managed Fleets vs. Driver Reimbursement

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American Automotive Leasing Association

Energy and Environmental Benefits

of Managed Fleets versus

Driver Reimbursement Systems

An independent study prepared for businesses offering commercial automotive fleet services, commissioned by the American Automotive Leasing Association (AALA)

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I. Introduction and Summary

This report evaluates the energy and environmental impacts of two different business models for meeting the light duty vehicle transportation needs of companies and other organizations. One involves the use of company provided vehicles, commonly referred to as "company cars," that are then operated under management systems either performed by the companies themselves, or by specialized third party providers (i.e., fleet leasing and management companies). This latter case is more particularly described in section II, and (as a business model) it is referred to in this report as a managed fleet program.

The other way in which businesses and other organizations meet their light duty vehicle transportation needs is to have the employees use their own vehicles on a reimbursable basis. That business model is also described in more detail in section II, and is referred to in this report as a driver reimbursement program.

Two underlying reasons exist for doing this study.

First, there are 3.2 million vehicles in managed fleets on the road today and their operations and impact are little understood by the general public. These vehicles are most often visually indistinguishable from other vehicles they see on the roads and highways, and to a casual observer, a "company car" is likely to be thought of as only a job "perk." However, the way these vehicles are managed results in different energy and environmental impacts.

Second, beginning in the 1990s, private vehicle fleets began to be seen as a category to which mandates could be applied directing the acquisition of vehicles using clean or alternative fuels. This was reflected in the enactment of the Clean Fuel Fleet Program of the Clean Air Act Amendments of 1990 and the enactment of the provisions of the Energy Policy Act of 1992 (EPACT). Given the limited state of public knowledge about private fleets at the time, Congress chose not to impose a private fleet mandate in either of these laws. Instead, Congress set an option for States to do so (in the case of the Clean Air Act), or for the Department of Energy to do so (in the case of EPACT). In each case, after extensive public rulemaking processes, the decision was made that it was not justifiable or necessary to impose mandates on private fleets for energy or environmental reasons. In the most recent decision-making[1] by the Department of Energy, part of the record relied on in making the decision included statements on: (a) the energy and environmental benefits of the managed fleet model, and (b) the ease in which businesses can shift between the managed fleet and the driver reimbursement models and the risks that a mandate might unintentionally encourage a shift away from managed fleets to driver reimbursement and thereby jeopardize those energy and environmental benefits.

We conducted this independent study over the past 6 months to examine more closely

[1] March 6, 2008. See 73 *Federal Register* 13729 et seq

those claimed benefits, and we used information in the public domain, with survey data and data from fleet operators, to address these issues and to estimate the potential environmental and energy-related benefits of the use of company-provided managed fleet vehicles.

The basis for our finding in this report is the fact that, as a business model, the use of managed fleets provides substantial economic and financial benefits that motivate fleet managers to develop the expertise and the tools to do better than individuals when it comes to reducing their vehicle fuel use, and thus reducing their vehicles' greenhouse gas emissions.

Obtaining precise numbers about the potential energy savings is difficult without analysis of the energy consumption of individual vehicles in the field and aggregating the data for fleets, which is beyond the scope of this report. We do estimate that the energy savings that the managed fleet program can achieve, using the expertise and sophisticated techniques available to these programs, when compared to the driver reimbursement program, is on the order of 10 percent. In 2007, we estimate that the efficiencies of managed vehicle fleets resulted in reductions on the order of 430 million gallons of fuel and 4.2 million tons of carbon dioxide emissions.[2]

[2] Some studies have attempted to compare vehicle costs between fleets and employee-reimbursed programs, but they used surveys and broad assumptions about the fuel economy of certain categories of vehicles, not the actual fuel economy or fuel economy based on model type and option packages. Such a detailed empirical study is also beyond the scope of this report.

II. Background

The managed vehicle fleet business is a relatively new industry dating back to the post World War II period. After the war, with the economic expansion of the times, companies grew rapidly and many found that there was a set of core competencies involving the management of vehicle fleets that could be outsourced to companies that specialized in them. The core competencies included selecting the right vehicle for a particular purpose, developing proactive vehicle replacement plans so as to cost-effectively take advantage of the latest vehicle technologies (including fuel efficiency), negotiating the purchase of these vehicles, managing their maintenance and repairs, and managing their resale, among others. The efficiencies and cost savings arising from these competencies were given greater emphasis as American businesses retooled their operations to meet the rising international competition which began in the 1980s.

These core competencies grew significantly with the advent of management information system (MIS) tools that made it possible to inexpensively track a number of characteristics of different vehicles, including their mileage and their maintenance records. Recently, the advent of web-based MIS tools have taken these capabilities to a new level by making it possible to input and access this information from just about anywhere, and to track these performance items on a real-time basis. Most important, this now can be done at a central location with the capability to analyze the data and to take rapid response actions based on this analysis.

Most recently, the availability of telemetry linked to vehicle diagnostic systems has taken all of these capabilities to a much higher level. The bottom line is that the technology available to these fleet management companies, and the expertise they have developed in using them, give these companies sophisticated tools to increase the quality of their services for their clients, while also lowering the total costs of operating their vehicle fleets, including their fuel and environmental costs.

Today, this U.S. industry manages nearly 3.2 million vehicles for companies that have outsourced their fleet management. There also are an additional nearly 9.3 million vehicles in fleets managed by companies for themselves. In using the term “managed fleets,” this report refers to the very large fleets of vehicles where the management is outsourced, but similar conclusions could apply in many cases to very large fleets managed by the company using those vehicles, if they use techniques and expertise similar to those provided by fleet management companies.

Form of Reimbursement Contracts

Reimbursement provisions for employees who use their private automobiles typically take at least three forms. First, the employees may keep track of their actual expenses for use of their automobile and obtain reimbursement from their employers for these expenses. In this arrangement the employee has very little incentive to minimize fuel

use. Second, the employer may provide the employee a flat reimbursement per mile driven, although the employee may seek supplemental payments if this standard rate is demonstrably inadequate to compensate the employee. (The IRS has now changed the mileage allowance twice for 2008. The rate will increase to 58.5 cents a mile for all business miles driven from July 1, 2008, through Dec. 31, 2008. This is an increase of eight cents from the 50.5 cent rate in effect for the first six months of 2008, as set forth in Rev. Proc. 2007-70, although there are questions about the adequacy of using that tax deduction safe harbor as being fully compensatory.[3]) Third, the employer may pay an employee a lump sum to cover the employee's use of their private automobile.

In the latter two arrangements the employee does have an incentive to select his or her private vehicle and to operate it so as to conserve fuel because the payment is fixed on a per mile basis, or in total. However, as will be explained, time constraints and limited expertise, among other factors, interfere with the employee's ability to conserve fuel use. In this analysis we do not distinguish the form of reimbursement to the employee, but the first arrangement, compensation for actual bills, provides essentially no incentive for the employee to save fuel. (See *Gattuso v. Harte-Hanks Shoppers, Inc.* (Case No. S139555, Nov. 5, 2007) for a California Supreme Court opinion addressing these employee reimbursement arrangements for use of private vehicles.)

In contrast, the managed fleet contract typically provides a variety of services for the company that employs the services of the fleet manager. This may include provision of the vehicles, preventive maintenance, monitoring of performance, managing and overseeing repairs, insurance, and disposition through sale to others. Significantly, a selling point of the managed fleet is improved fuel economy and reduced fuel costs to the client. As a result, fleet managers have a strong incentive to structure their services to conserve fuel use. This is done starting from the very selection of vehicles and their characteristics, to the way in which they are maintained and monitored, and to the way they are driven as we will discuss below.

[3] See New York Times, August 9, 2005 *Gas Allowances from Fantasyland*, also American Automobile Association AAA, publication *2008 Your Driving Costs,* which showed average cost of driving to be 3.6 cents per mile higher than the then IRS rate, and that was based on fuel at $2.97 a gallon. See www.aaaexchange.com. For current IRS rate announcement of June 23, 2008, see http://www.irs.gov/newsroom/article/0,,id=184163,00.html

III. Management of Fleets vs. Reimbursed Use of Employee Owned Vehicles

A. Selection of Vehicles

Under driver reimbursement programs, when company employees select their private vehicles that they may use in their work environment, there are numerous factors that prevent selection of the ideal vehicle for company use. A young employee may have only one vehicle and have to size the vehicle for infrequent but essential uses, such as needing a minivan or SUV for the family vacation. The employee may want the convenience of buying from a dealer's existing inventory rather than ordering the car with only the options desired. The car in the dealer inventory can include unessential, fuel economy-robbing option packages, including a large engine with excessive horsepower, or less than ideal transmission or gearing arrangements.

It should come as no surprise that even consumers who want to make rational decisions about the fuel economy of the cars they purchase, given their driving habits, often appear woefully ill-equipped to do so. Studies confirm this:

> "…it is clear that even our most financially capable buyers have not purchased their cars and trucks based on the application of payback or net present value analyses to these household decisions."
>
> *Automobile Buyer Decisions about Fuel Economy and Fuel Efficiency Final Report To United States Department of Energy and Energy Foundation***,** Ken Kurani and Thomas Turrentine, Institute of Transportation Studies (University of California, Davis)Year 2004 Paper UCD-ITS-RR-04-31 ITS-Davis ITS-Davis, Institute of Transportation Studies, Report submitted in fulfillment of requirements to the following contracts: Oak Ridge National Laboratory: 4000022472 Energy Foundation: G-0309-07006, p. 32 (http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1105&context=itsdavis)

The process of selecting the vehicles for a typical managed fleet stands in stark contrast to the employee's selection of his or her private vehicle. When purchasing the vehicles in their fleets, the managers have their clients' specific functions in mind because they have a strong motivation to "right-size" the vehicles according to the purposes of the individual fleets. Because accident costs and the impacts on their employees' health and morale can be so high, the safety of their fleet's vehicles is also an important consideration in this process. "Right-sizing" means optimizing many of a large number

of parameters that will improve the vehicles' performance for their clients. This will include model selection such as compact vehicle versus minivan, engine size and horsepower, transmission arrangements, gearing, turbocharger vs. non-turbocharger, etc. The fleet managers use computer models for determining which of these parameters will best serve their client's interests with an important priority on reducing overall costs, in which fuel costs play an increasingly large part. For example, a fleet that will be used for dense urban neighborhood deliveries will be very different from one used for rural area deliveries. Further, given the number of vehicles purchased they can choose exactly the options and features they need, and avoid the limitations of a dealer's limited inventory.

Some clients have asked their fleet manager to help them develop zero-carbon footprint measures to offset their carbon emissions. Given their expertise, fleet managers are able to incorporate greenhouse gas emission criteria from its clients into the vehicle selection process, if the client so desires.

B. Regular Maintenance of Vehicles

Under driver reimbursement programs, employees who are compensated for using their private vehicles in their work have the normal incentive of every car owner to maintain their vehicles, so as to preserve their asset. Yet the public is often uncertain about what maintenance is truly valuable, when is it really needed, and whether the garage they selected is doing it properly. Even something as simple as checking tire pressures is typically neglected.

> "A tire industry survey this year found 85 percent of drivers fail to properly check tire pressure."
>
> "NHTSA: Check Your Tire Pressure," Joe Benton, News, ConsumerAffairs.com, http://www.consumeraffairs.com/news04/2007/08/nhtsa_tires.html

Consumer inattention to proper maintenance can have substantial adverse effects, not just on fuel economy, but on the environment due to noxious pollutants:

> "Smoking vehicles can generate 10 to 15 times more pollution than well-tuned vehicles."
>
> Pa. Bureau of Air Quality Cars/trucks (see: http://www.dep.state.pa.us/dep/deputate/AIRWASTE/AQ/cars/carcare.htm)

On the other hand, vehicle fleet managers have a strong economic motivation to perform maintenance on their vehicles in frequent intervals. Because of this they ensure that the preventive maintenance is performed regularly, and check a number of factors that are critical to the operating efficiency of their vehicles, the most important of which include:

- *Keeping proper tire pressures*. For example, low tire pressures can increase an individual's gasoline expenses by $5 a month. While $5 a month in fuel savings may not induce an individual to monitor his/her tire pressures, it represents $600,000 a year in savings to a fleet of 10,000 vehicles. According to the U.S. Department of Energy (DOE), this could improve fuel economy by 3-6%
- *Performing regular oil changes*: ensure correct oil is used and at proper levels. According to DOE, this could improve fuel economy by 1-2%.
- *Checking and replacing air filters on a regular basis*. According to DOE, this could produce up to a 10% fuel economy benefit.
- *Performing regular engine diagnostics and appropriate adjustments*. According to DOE, this could improve fuel economy by an average of 4%, but it could be larger, for example, if a faulty oxygen sensor were fixed.

The point is that managed fleets normally adhere to pro-active maintenance programs. Our research did not find any like programs under the driver reimbursement option.

C. Management of Vehicle Operation

The average company employee is ill-equipped to monitor precisely even the ongoing fuel economy of their vehicles on a consistent basis so as to obtain optimum fuel economy. Measuring as little as a 10% increase or decrease in fuel economy of his or her vehicle is a challenge.

> "We find that car and truck drivers do not have the basic building blocks to make calculated decisions about better fuel economy, and most do not keep track of fuel cost over any significant time period, be that the life of the vehicle, their duration of ownership, annually or even monthly. Refueling does not happen on a regular schedule, so even in the context of our interviews, households can only make rough estimates of costs over time."
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> *Automobile Buyer Decisions about Fuel Economy and Fuel Efficiency Final Report To United States Department of*

> *Energy and Energy Foundation*, Ken Kurani and Thomas Turrentine, Institute of Transportation Studies (University of California, Davis)Year 2004 Paper UCD-ITS-RR-04-31 ITS-Davis ITS-Davis, Institute of Transportation Studies, Report submitted in fulfillment of requirements to the following contracts: Oak Ridge National Laboratory: 4000022472 Energy Foundation: G-0309-07006, p. 32 (http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1105&context=itsdavis)

Even if consumers are able to measure their fuel economy, there are so many variables that affect fuel economy, such as temperature, traffic levels, elevation, etc., that it is difficult for the average driver to attribute changes in fuel economy to specific factors.

Consumers frequently overbuy octane in fueling decisions, driven by advertising that suggests that higher octane gasoline is better for any car; but this is often unnecessary, and the production of higher octane gas is inherently more energy intensive because it usually involves increased levels of refinery operation.

> "Premium (highest octane) gas sells for an average of 17 cents more per gallon than regular gas. Only about 6 percent of cars sold in the U.S. need premium gas." (Statement from the Office of the Illinois Attorney General *Rise in Gas Prices Investigated in Wake of Hurricane Katrina* ***http://www.illinoisattorneygeneral.gov/consumers/gas_prices.html)***

Vehicle fleet managers have a very strong interest in ensuring that their vehicles are operated in a safe, efficient manner, and fuel costs are a large part of operating their vehicles. Therefore, fleet managers usually direct that their vehicles be driven in sensible ways: speeds should be below 60 miles per hour (mph), and rapid acceleration and braking should be avoided. The latter are extremely fuel inefficient; according to DOE, they can cause a 5-33% fuel economy penalty.

In addition, fleet managers place a high premium on staying below speed limits – these also happen to be speeds above which driving vehicles generally become less efficient to operate. According to DOE, 5 miles per hour over 60 mph can cause a 7% fuel economy penalty. (This is due to the fact that the aerodynamic drag on a vehicle increases with the square of the vehicle's speed.) Later in this report we will discuss how fleet managers are now using telemetry to assure that their drivers are incorporating these objectives.

There are a number of other ways fleet operators can improve their fuel efficiency,

including removing excess weight in the vehicles. For example, according to DOE, a vehicle's fuel economy is reduced by 1-2%, for every extra 100 lbs it carries.

Premium gas should be used (and only be used) when required by the manufacturer. If premium gas is not used when required, it will lead to engine "knocking" and bad performance and poor mileage; and, if used when not required, its production requires a more energy intensive process (premium gas requires more octane yielding components, and more energy intensive refining.) To address the problem of octane overbuying, fleet managers have a simple solution: fleet managers can issue credit cards that limit fuel purchases to regular gasoline.

Again, the pro-active maintenance programs offered through managed fleets help increase their fuel economy.

D. Specific Examples of Managed Fleet Practices

For the reasons above, we believe that fleet managers are capable of being more fuel efficient than individuals who are reimbursed for their travel. To check whether these techniques are used, and their results strong enough to effect real improvements, we reviewed the operations of one large manager of vehicle fleets who manages more than 600,000 vehicles in the U.S. and Canada.

This fleet manager advises its clients from the very beginning – what vehicles the client should acquire to best meet his or her specific needs.

This fleet manager has invested in developing and maintaining a sophisticated management information system (MIS) that keeps up-to-the-minute current data on all of the client's vehicles. This MIS keeps track all the way from scheduling preventative maintenance, to recording what was found when performing that maintenance, to keeping repair records, the vehicle's gasoline use, mileage, and the traffic infraction records of its drivers.

This enables the fleet manager, at any time, to see how the vehicles and drivers are performing, and allows them to quickly identify any problems that are generic to a particular type of vehicle and thus address whatever problems may arise in a timely fashion. This MIS has built into it sophisticated reporting capabilities that empower the fleet manager to identify and quickly address problems that may not be apparent on a superficial basis.

In addition, this fleet manager has developed relationships with maintenance/repair facilities throughout the country which do whatever work is required. The fleet manager also has on its staff its own qualified mechanics, available on a 24/7 basis, to receive reports from the maintenance/repair facilities, and direct the preventive maintenance and repair work to be done. The fleet manager's mechanics are available

for consultation with the drivers to advise them on issues ranging from vehicle noises to the location of appropriate repair shops and on the advisability of particular courses of action.

This fleet manager also is able to incorporate greenhouse gas emission criteria from its clients into the vehicle selection process, if the client so desires. Several clients have asked the fleet manager to help them develop zero-carbon footprint measures to offset their carbon emissions.

More recently, it has become possible to outfit these vehicles with telemetry which allows the fleet manager to remotely monitor the location of, and the routes taken by the various vehicles, including their idle time which is very wasteful of fuel. Telemetry also allows the fleet manager to remotely monitor the engine performance of the vehicles, including their real-time fuel use and efficiency.

This fleet manager has found that the application of these new tools has improved the performance of its fleets significantly over their previous good performance. For example, idle time is down significantly, the unauthorized use of the vehicles (which translates into fewer miles driven) is greatly reduced, the time driving above speed guidelines is nearly eliminated, the accident rate is down by 10%, and the fuel economy is up by 13%.

An individual vehicle owner simply does not have access to these tools or expertise, or even have the economic motivation, that a fleet manager has, given the economies of scale. Therefore an individual owner is not, and cannot be, as attentive to these fuel economy issues as the vehicle fleet manager.

IV. Savings Estimates

Section III (B) shows how fleet managers have the economic motivation to properly maintain fleet vehicles with measures that could result in the aggregate in more than a 20% increase in fuel economy. Section III (C) shows how these managers also have the motivation to operate the vehicles in ways that could add up to an additional 20% in fuel economy. These are increases compared with vehicles that are not maintained well, and are driven without much concern for fuel economy.

Fleet managers on average replace their cars nearly every 3 years after 63,000 miles, and their light duty trucks every 3.5-4 years after 86,000 miles. Individuals, on the other hand, have cars which on average are over 9 years old, and light duty trucks over 7 years old (R.L. Polk data), and that are properly maintained by only 28% of their owners (Autobytel survey, 2002).

For the purposes of this analysis we will start with assuming that drivers who attended to properly maintaining and operating their vehicles could achieve a 20% increase in fuel economy compared with normal drivers who typically do not pay attention to these issues. Note that this is one half of the combined highest efficiency assumptions above; this appears to be a reasonable estimate for the increase in fuel economy that could be achieved.

But not every fleet manager will achieve the 20% increase in fuel economy, and some individual drivers will be more attentive to these issues than the normal driver. To accommodate this, we further assume that fleet managers will only achieve 80% of that increase, while there will be individual drivers who will achieve 28% of that increase, using the Autobytel survey mentioned previously.

These assumptions imply that fleet vehicles on average should achieve 52% of the potential fuel mileage efficiency increase of 20% assumed in this report. This means that it would be reasonable to expect that, on average, vehicle fleets achieve a 10% increase in fuel economy relative to the alternative of reimbursing individuals for the use of their vehicles.

This assumes, conservatively, that fleet managers have fleets with the same fuel economy as the fuel economy of the vehicles that the individuals would use. The reason it is conservative is that fleet managers have a strong motivation to choose fuel efficient vehicles given the large part that fuel costs play in their overall costs, while the general population chooses its vehicles by including many other considerations, which are not fuel-economy based: for example, many people must choose SUVs for family vacation considerations, others like powerful engines, etc. [4]

[4] While it is possible that the fuel economy of some of the vehicles owned by the individuals being reimbursed could be higher than that of the company's fleet vehicles, the vehicles certainly will not be as well-suited to the tasks required of them. In this case it might require more trips to accomplish the required tasks, say in the case of merchandise deliveries, than it would if a fleet vehicle were available. In

This estimate is conservative also because it does not take into account the additional fact that fleet managers right-size their vehicles for the tasks required, or that fleet managers tend to have a faster turnover in the stock of their vehicles.

The U.S. managed vehicle fleets in 2007 accounted for about 3.2 million vehicles – nearly 1 million cars, and 2.2 million light duty trucks. According to the AALA fleet industry survey, the cars are driven an average of close to 23,900 miles per year, and the trucks closer to 23,100 miles per year. The cars average 22.9 miles per gallon (MPG), while the light duty trucks average 18.2 MPG. As a result, we estimate they consumed about 3.83 (1.04+2.79) billion gallons of fuel in 2007.

If these vehicles, when not managed by fleet managers, had achieved an MPG only 10% below what they had achieved when managed by fleet managers, they would have used approximately an additional 4.26 billion gallons of fuel.

Accordingly, the fuel savings from these fleet managed vehicles, relative to the use of individual vehicles on a reimbursed basis, could be substantial – perhaps on the order of 430 million gallons a year.

These fuel savings translate directly into greenhouse gas reductions since CO2 emissions are directly related to the amount of fuel consumed. The 430 million gallons of gasoline saved represent a reduction of 4.2 million tons of CO2 emissions per year.

These same assumptions could be used to estimate the fuel and CO2 savings for the vehicle fleets managed internally by companies, rather than being outsourced to fleet management companies. These companies account for 3.1 million cars and 4.1 million light duty trucks operated as fleets, after excluding vehicles owned by rental companies. If the assumptions previously made for managed vehicle firms held for these other vehicle fleets, the savings could represent an additional nearly 980 million gallons of gasoline and 9.6 million tons of CO2 emissions per year.

We note that one fleet manager claims that its fuel management program has reduced its clients' consumption by up to 15% per year. Our savings estimate is also conservative because it does not specifically include the benefits of partnership programs whereby fleet management companies work with well recognized non-profit environmental organizations that help fleet managers' clients find ways to reduce emissions without increasing their clients' costs by focusing on overall outcomes rather than specific technologies.

As previously noted, Congress has chosen for many years not to directly impose mandates on private light duty managed fleets. In this regard, earlier this year, the Department of Energy issued its most recent rulemaking decision to not impose fleet mandates. In that rulemaking, the Department noted the affirmative efforts made by

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such a case, the result would be more fuel required to accomplish the required tasks, even if the fuel economy of the fleet vehicles were lower on average.

fleet management and leasing industry members, working with their clients, and in several cases well known environmental groups such as Environmental Defense and the Sierra Club, to further reduce the environmental and energy impacts of the industry's vehicles. These programs included no-cost greenhouse gas emissions reductions, carbon foot-printing, C02 offsets, fuel economy improvements, recycling, etc. See *72 Federal Register 13732.*

V. Conclusions

This report addresses the question "*how does vehicle fleet management compare with the alternative of reimbursing employees for the use of their automobiles for company purposes?*"

Because it is beyond the scope of this report, we cannot give a definitive answer for any particular fleet compared with a particular set of employees' vehicles. However, we can say that we believe that the expertise and sophisticated techniques used by vehicle fleet managers, in aggregate, should result in substantial fuel savings and lower carbon emissions, when compared with the alternative of reimbursing employees for the use of their vehicles for company purposes.

We estimate these reductions are on the order of 10 percent of the fuel that would have been used by the individuals being reimbursed. In 2007, we estimate that the efficiencies of managed vehicle fleets resulted in reductions on the order of 430 million gallons of fuel and 4.2 million tons of carbon dioxide emissions.

The basis for our finding is the fact that, as a business model, the use of managed fleets provides substantial economic and financial benefits that motivate fleet managers to acquire and develop the expertise that allow them to do substantially better than individuals when it comes to reducing their vehicles' fuel use, and reducing their vehicles' greenhouse gas emissions. Below we recapitulate the reasons for our findings:

- First, fleet managers have a strong economic motivation for addressing fuel saving opportunities. Individual vehicle owners also have the motivation to reduce their fuel expenses, but the size of a typical fleet creates scale economies that are not available to individuals. For example, low tire pressures can increase an individual's gasoline expenses by $5 a month. While $5 a month in fuel savings may not induce an individual to monitor his/her tire pressures, it represents $600,000 a year in savings to a fleet of 10,000 vehicles.
- Second, a managed fleet of sufficient size makes it economically possible to develop management tools and information systems that deliver substantial savings and improved performance.
- Third, vehicle fleet managers have the economic motivation to manage their fleets in ways that will keep their vehicles efficient throughout their fleet-life. Reducing the operating costs, including the fuel costs, of their fleets is important to their profitability.
- Fourth, vehicle fleet managers also have the economic motivation to manage their fleets in ways that will maximize the value of the vehicles in their fleets at the end of their lease period when they are resold.
- Fifth, the manufacturers' warranties for their vehicles require—as a condition of

keeping the warranties in effect—that the vehicles be maintained properly on a periodic basis. This is something individuals are much less likely to do, in large part because they do not have the economies of scale available to fleet operators in providing such maintenance services, and because they have other priorities. Moreover, keeping their warranties in effect is central to protecting the value of the fleet's vehicles when they are resold.

- Sixth, when they purchase the vehicles in their fleets, the managers have the incentives to right-size the vehicles according to the purposes of the individual fleets. Individuals also are interested in doing this, but they also have other interests which will not be consistent with fuel economy. "Right-sizing" means optimizing many of a large number of parameters that will improve the vehicles' performance for their clients needs, including: safety; engine size choices; fuel using choices; minivan vs. station wagon; etc. The fleet managers use computer models for determining which of these parameters will best serve their clients' interests with an important priority on reducing overall costs, in which fuel costs play an increasingly large part. For example, a fleet that will be used for dense urban neighborhood deliveries will be very different from one used for rural area deliveries.
- Seventh, fleet managers represent a substantial part of the demand for new vehicles. Because their vehicles are kept for a relative short period of time before they are resold, vehicles in managed fleets are younger than otherwise would be expected. Over time, all new vehicles have become more efficient each year as a consequence of the introduction of new engine technologies, new lighter weight materials, etc. This trend will accelerate now that the 2007 amendments to CAFÉ have been enacted, requiring a 40% increase in auto efficiency by 2022. Due to this requirement, fleet managers in the next 15 years will make a stronger annual contribution to improved fuel efficiency in the U.S. than they had been making in previous years.

The existence of these potential benefits, and the fact that the fleet managers are profit-making enterprises with the ability and motivation to exploit economies of scale, and to develop important expertise, strongly suggest that the vehicles they manage will, in the aggregate, be operated more efficiently than the vehicles operated by individuals reimbursed for the use of their vehicles.

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9. "A Comparison of Company-Provided and Employee Provided Vehicles", a Deloitte &Touche Study for National Association of Fleet Administrators (NAFA), February 2, 2004.

Appendix: Typical Items Checked During Maintenance

- Tire pressures
  - According to DOE, this could improve fuel economy by 3-6%
- Tire treads
- Wheel alignment
- Perform regular oil changes: ensure correct oil is used and at proper levels.
  - Scheduled oil changes help cut emissions as well as improve fuel economy. Using the correct API rated oil ensures the proper formulation and additive package for the application.
  - According to DOE, this could improve fuel economy by 1-2%.
- Replace air filters on a regular basis
  - According to DOE, this could produce up to a 10% fuel economy benefit.
- Engine, belts and hoses
- Engine maintenance, either scheduled (e.g., tune-ups etc in older vehicles) or fault diagnosis (e.g., check engine light)
  - According to DOE, this could improve fuel economy by an average of 4%, though it could be much larger, for example, if a faulty oxygen sensor were not fixed.
- Coolant
- Brakes
- Proper gasoline grade is used
  - premium gas should only be used when required. If premium gas is not used when required, it will lead to engine knocking, bad performance and poor mileage in older vehicles (new vehicles' computers compensate to protect the engine but at the expense of fuel economy). If used when not required, its production requires a more energy intensive process (premium gas requires that more octane yielding components be used in its manufacture).
- Transmission and power steering
- Cooling system
- HVAC
- Suspension
- Ignition
- Electrical system

Authors' Biographical Information

Michael L. Telson

Mike Telson is President of Telson & Co. He served as Chief Financial Officer (CFO) of the U.S. Department of Energy (DOE) from October of 1997, when he was confirmed by the U.S. Senate, through May of 2001. He was at the DOE from January, 1995 through May, 2001. Prior to becoming CFO, he served as a Special Assistant to the Secretary, and before that to the Deputy Secretary for energy, science and budget issues.

Before DOE, he served as senior analyst for energy and science on the staff of the Committee on the Budget, U.S. House of Representatives, from 1974 to 1995. In the 95th Congress, he also served as the Staff Economist of the House Ad Hoc Committee on Energy, created to help enact the 1978 National Energy Act. In the 96th Congress, he also served as Staff Coordinator of Speaker Tip O'Neill's Task Force on Energy created to deal with problems relating to the 1979 oil shortages, including passage of the 1980 Energy Security Act.

He holds Ph.D., E.E., M.S., and B.S. degrees in electrical engineering from MIT, and a Master's degree in management from the MIT Sloan School of Management. He is a Fellow of the American Association for the Advancement of Science (AAAS) and of the American Physical Society (APS), as well as a Senior Fellow of the U.S. Association for Energy Economics.

James T. Bruce III

Jim Bruce, President of J.T. Bruce & Associates, is an attorney, engineer, and consultant with expertise in energy, climate change, and other technology issues related to government policy. He also is an accomplished legislative draftsman. He recently was a partner at Wiley, Rein, LLP in the Government Policy Group in Washington, D.C., assisting corporate clients, including national and multinational companies in major energy intensive industries, on climate change legislation pending in Congress and other energy legislation, including the regulation of automobile fuel economy.

Before his 18 year term at Wiley Rein, he was the Senior Counsel to the U.S. Senate Committee on Energy and Natural Resources with 13 years service, where he drafted or participated in the drafting of many of our nation's energy laws, and provided expertise on energy, defense, and appropriations legislation. While in that capacity he also became one of the Senate's experts on the Strategic Defense Initiative (SDI), co-authoring several reports to the Senate in classified and unclassified editions, based on extensive briefings at the national laboratories and from SDI program officials and defense contractors. Prior to that service, he was Counsel to the Senate Committee on Aeronautical and Space Sciences.

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