

**Supporting Statement**  
**“Test of Potential Fuel Economy Benefits of**  
**In-Vehicle Driver Feedback Devices”**  
**OMB Control Number: 1910-New**

This supporting statement provides additional information regarding the Department of Energy (DOE) request for processing of the proposed information collection, Test of Potential Fuel Economy Benefits of In-Vehicle Driver Feedback Devices. The numbered questions correspond to the order shown on the Office of Management and Budget (OMB) Form 83-I, “Instructions for Completing OMB Form 83-I.”

**A. Justification**

**1. Explain the circumstances that make the collection of information necessary. Identify any legal or administrative requirements that necessitate the collection. Attach a copy of the appropriate section of each statute and regulation mandating or authorizing the information collection.**

Wide-ranging claims are made about the effects of driver behavior on a real-world fuel economy under a variety of information and educational conditions. These claims tend to not be backed by accepted standards of research design, due in part to the difficulty and expense of measuring real-world driving behaviors. This study will evaluate driving behaviors and the effect fuel economy feedback devices will have in changing those behaviors. The data derived from this study will be used to provide the public with information that will enable them to achieve better fuel economy and thereby enable them to save money on fuel consumption reduce greenhouse gas emissions and petroleum consumption.

Unless this data is collected we will not have the information required to be able to provide the public with the accurate and reliable information they need in order to save money and reduce their petroleum consumption.

The U.S. Department of Energy/Environmental Protection Agency joint website, [www.fueleconomy.gov](http://www.fueleconomy.gov), is the official national source for fuel economy information, including driving and maintenance tips. Tens of millions of users visit the site each year for this information. In-vehicle fuel economy devices, if effective, could save individual consumers on the order of 10% of their fuel bills. Passenger cars and light trucks consume 130 billion gallons of fuel each year. For every 10% of vehicles on the road, that would be a savings of 1.3 billion gallons or approximately \$3 billion, not counting federal and state taxes. This could result in significant sales of such devices, increasing the value added of vehicles and increasing employment in the automobile industry, as well. Each gallon of gasoline produces approximately 8.8 kg of greenhouse gases. For each 1.3 billion gallons reduced, this would reduce greenhouse gas emissions by 11,000 metric tons per year.

The Department of Energy is required under U.S. Code, Title 49, Section 32908(c)(3) and (g)(2) (A) to publish and distribute the Fuel Economy Guide and associated website at

[www.fueleconomy.gov](http://www.fueleconomy.gov). The information obtained via this collection will be made available to the general public via the Fuel Economy Guide and associated website, [www.fueleconomy.gov](http://www.fueleconomy.gov).

**2. Indicate how, by whom, and for what purpose the information is to be used. Except for a new collection, indicate the actual use the agency has made of the information received from the current collection**

The U.S. Department of Energy (DOE) Clean Cities Program will endeavor to establish a rigorous scientific basis for informing consumers about the potential fuel economy benefits of in-vehicle fuel economy feedback devices. If the study and test confirm that fuel economy feedback devices can enable drivers to achieve measurable improvements in fuel economy, this information will be made available to the general public via the joint Department of Energy and Environmental Protection Agency website, [www.fueleconomy.gov](http://www.fueleconomy.gov).

The study is to be designed and carried out by the Institute of Transportation Studies at the University of California, Davis (UCD). The study is a without/with design, first only fuel economy data *without* information display to the driver of one of a household's vehicles for one month followed by one month of recording fuel economy data *with* information display to the driver. While a brief description follows here, screening and sampling are discussed further in section B1 of this document and the possible inferences based on the research design in B2.

Households will be screened based on demographics, geography, and their ownership of vehicles that currently do not display fuel-economy data. Researchers at the University of California, Davis, (UC Davis) will contact the volunteers and provide them with a screening questionnaire. Each respondent will be asked to complete a brief, on-line screening questionnaire prior to the study, as well as two on-line, website (electronic) surveys, one of which will be administered at the beginning of the data collection exercise, and a second on-line survey will which be administered at the conclusion of the exercise. Respondents will also be interviewed once by researchers at the conclusion of the two-month research project. Each respondent's personal vehicle will be equipped with an electronic device that will display and record fuel-economy related driving data and global-positioning system (GPS) data.

UC Davis will analyze the data from 150 volunteer drivers and prepare a report with the findings and description of the field experiment. In particular, the report will address the research questions:

- o What is the distribution of real-world fuel economy changes that can be expected from in-vehicle fuel economy displays?
- o How many people know driving style affects fuel economy?
  - o What do they think the range of effects is?
  - o What do they think other consequences are?
- o If the desired effect of in-vehicle fuel economy displays is something that could be called "eco-driving," then what proportion of the sample are already eco-driving in the absence of fuel economy feedback?

The results will be made known to the public via the fueleconomy.gov website and via information provided to the media. The public is expected to use the information in deciding whether to seek out and purchase vehicles with fuel economy feedback devices and whether or not to use them to improve fuel economy. We expect that many millions of Americans will find this information directly via the website. We will also attempt to make the findings known to the national news media, especially those covering automotive issues.

**3. Describe whether, and to what extent, the collection of information involves the use of automated, electronic, mechanical, or other technological collection techniques or other forms of information technology, e.g., permitting electronic submission of responses.**

This survey process has been designed to be almost completely automated. Each respondent will be asked to complete a brief, on-line screening questionnaire prior to the study, as well as two on-line, website (electronic) surveys, one of which will be administered at the beginning of the data collection exercise, and a second on-line survey which will be administered at the conclusion of the exercise. Respondents will be interviewed once by researchers at the conclusion of the two-month research project in order to obtain their opinions and thoughts on the importance of maximizing their personal fuel economy, their potential for changing their driving habits, and whether the fuel economy display would be a major factor in changing their driving habits. Each respondent's personal vehicle will be equipped with an electronic device that will display and record fuel-economy related driving data and global-positioning system (GPS) data.

Data will be stored on-board the vehicles in the display-recording device and retrieved by researchers at the end of each participants' two-month experimental period. Participants will have no responsibility for collecting, transcribing, transmitting or processing these data: the participants' only role will be to indicate which household driver is driving by selecting an identifier at the start of trips. The collection, processing, and storage will be entirely automated and paperless. Servers at UC Davis will process and analyze the data using software developed by ITS-Davis for that purpose and tested on previous projects, such as PHEV demonstrations.

**4. Describe efforts to identify duplication.**

There are no known sources of available similar information. There is one known study testing the effects of energy feedback on drivers but it applies only to plug-in hybrid electric vehicles. The results cannot be reliably extended to drivers of conventional vehicles. Only one previous study examined the effect of fuel economy feedback in conventional vehicles in the U.S. but the sample size is too small to allow confident inferences and the design included personal coaching which will generally not be available to car buyers. Though nominally measuring an average increase in fuel economy of eight percentage points in going from without-instrumentation to with-instrumentation, the sample size is too small to rule out that this apparent difference was due to chance alone and the experimental design does not allow the apparent effect to be disaggregated into effects due to instrumentation, effects due to coaching, or to effects due to the interaction of instrumentation and coaching.

**5. If the collection of information impacts small businesses or other small entities, describe any methods used to minimize burden.**

This information collection will not impact small businesses or other small entities.

**6. Describe the consequence to Federal program or policy activities if the collection is not conducted or is conducted less frequently, as well as any technical or legal obstacles to reducing burden.**

The purpose of providing this information to the public is to reduce greenhouse gas emissions and reduce petroleum consumption by enabling the public to achieve better fuel economy thereby enabling them to save money on fuel consumption.

Unless this data is collected we will not have the information required to be able to provide the public with the accurate and reliable information they need in order to save money and reduce their petroleum consumption.

The literature on driving behavior and fuel economy suggests that the information developed by this study might allow the average driver to improve his fuel economy by 10%. If these devices do facilitate on-road fuel economy improvement then there would be a significant reduction in greenhouse gas emissions and petroleum consumption.

The collection is required in order to meet the Department of Energy's statutory requirement to provide the public with reliable Fuel Economy Information. Failure to complete the collection affects the ability of DOE to provide this information.

**7. Explain any special circumstances that require the collection to be conducted in a manner inconsistent with OMB guidelines. (a) requiring respondents to report information to the agency more often than quarterly; (b) requiring respondents to prepare a written response to a collection of information in fewer than 30 days after receipt of it; (c) requiring respondents to submit more than an original and two copies of any document; (d) requiring respondents to retain records, other than health, medical government contract, grant-in-aid, or tax records, for more than three years; (e) in connection with a statistical survey, that is not designed to product valid and reliable results that can be generalized to the universe of study; (f) requiring the use of statistical data classification that has not been reviewed and approved by OMB; (g) that includes a pledge of confidentiality that is not supported by authority established in stature of regulation, that is not supported by disclosure and data security policies that are consistent with the pledge, or which unnecessarily impedes sharing of data with other agencies for compatible confidential use; (h) requiring respondents to submit proprietary trade secrets, or other confidential information unless the agency can demonstrate that it has instituted procedures to protect the information's confidentiality to the extent permitted by law.**

There are none. The package is consistent with OMB guidelines

**8. If applicable, provide a copy and identify the date and page number of publication in the Federal Register of the agency's notice, required by 5CFR 320.8(d), soliciting comments on the information collection prior to submission to OMB. Summarize public comments received in response to that notice and describe actions taken in response to the comments. Specifically address comments received on cost and hour burden. Describe efforts to consult with persons outside DOE to obtain their views on the availability of data, frequency of collection, the clarity of instructions and recordkeeping, disclosure, or reporting format (if any), and on the data elements to be recorded, disclosed, or report.**

The Department published a 60-day Federal Register Notice and Request for Comments concerning this collection in the Federal Register on Tuesday, February 2, 2010, Vol. 75, No. 21, and page 5304. The notice described the collection and invited interested parties to submit comments or recommendations regarding the collection. No comments were received.

**9. Explain any decision to provide any payment or gift to respondents, other than remuneration of contractors or grantees.**

Studies have shown that even a token monetary incentive leads to higher response rates and better cooperation from the public in participating in these types of research. We anticipate providing a token gift (gift card, gas card, etc.) to each participant with a value of approximately \$25.00.

**10. Describe any assurance of confidentiality provided to respondents and the basis for the assurance in statute, regulation, or agency policy.**

In accordance with Federal policy on the Protection of Human Subjects (DHHS Regulations 45 CFR Part 46, FDA Regulations 21 CFR Parts 50 and 56), the University of California, Davis (UCD) is responsible for the protection of the rights and welfare of human subjects in research conducted by, or under the supervision of, UCD faculty, staff, students, or agents. Therefore, the University of California Davis' Institutional Review Board (IRB) must approve all research that relies on human subjects—regardless of whether those subjects are completing simple questionnaires or undergoing experiments with medical technologies. One criterion for exemption from a full review by the IRB—as has been granted by UCD's IRB for the research proposed here—is the protection of the identity of participants and the confidentiality of information collected from them. These requirements are met through the use of identifiers other than respondents' names for all records and files, the control of access to all records and files in any manner in which they may be stored, and the storage of electronic records on a password protected server behind the University's firewall. IRB protocols require that respondents be informed of these conditions and protections prior to their agreement to participate in the research. IRB protocols also allow respondents to retire from the research at any time, without cause.

Further, no report or data released from this research will contain individually identifying information. Specifically, UCD expects to provide ORNL with a copy of some data. Rather than rely on a system of data separation, passwords, and keys the data provided to ORNL will simply

be stripped of all variables containing individually identifying information. In particular, the screening process requires prospective participants to provide contact information so that UCD may contact them to schedule the installation of the fuel economy data display and recording device. This contact information will not be included in the data provided to ORNL.

**11. Provide additional justification for any questions of a sensitive nature, such as sexual behavior and attitudes, religious beliefs, and other matters that are commonly considered private. This justification should include the reasons why DOE considers the questions necessary, the specific uses to be made of the information., the explanation to be given to persons from whom the information is requested, and any steps to be taken to obtain their consent.**

Not applicable. No questions of a personally sensitive nature are included in this information collection.

**12. Provide estimates of the hour burden of the collection of information. The statement should indicate the number of respondents, frequency of response, annual hour burden, and an explanation of how the burden was estimated. Unless directed to do so, DOE should not conduct special surveys to obtain information on which to base hour burden estimates. Consultation with a sample fewer than 10 potential respondents is desirable.**

The estimate of burden of the information collection is as follows:

Total number of unduplicated respondents: 150

Number of questionnaires per respondent: 3

Number of in-home interviews per respondent: 1

Number of minutes per respondent:

On-line screening questionnaire:	12 minutes
On-line pre-questionnaire:	24 minutes
On-line post-questionnaire:	24 minutes
In-home interview	60 minutes

Total = 120 minutes or 2 hours per respondent.

Total time: 2 hours x 150 respondents = 300 hours

**13. Provide an estimate for the total annual cost burden to respondents or recordkeepers resulting from the collection of information.**

No costs are known to be associated with this collection.

**14. Provide estimates of annualized cost to the Federal government.**

The estimated total cost for this study is approximately \$350,000.00:

Salaries/Benefits/Resident Fees	\$ 198K
Equipment	\$ 54K
Travel	\$ 19K
Overhead	\$ 75K
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Total	\$ 346K

**15. Explain the reasons for any program changes or adjustments reported in Items 13 (or 14) of OMB Form 83-I.**

Not applicable. This information collection is a new collection of information.

**16. For collections whose results will be published, outline the plans for tabulation and publication.**

Results will be published in two or three research papers and standard statistical techniques will be used to evaluate this data. We will not publish the raw data. Researchers at the UCD will collect the data via internet. Automated data processing will occur within the computers. The results of the statistical analysis and summary statistics will be published in both a scholarly peer-reviewed journal and as a technical report.

The bottom line results, effects of the feed-back devices on fuel economy, and the magnitude of the qualifying information will be made available to the public via the website, [www.fueleconomy.gov](http://www.fueleconomy.gov).

**17. If seeking approval to not display the expiration date for OMB approval of the information collection, explain the reasons why display would be inappropriate.**

Not applicable. DOE is not seeking approval to not display the expiration date for OMB approval of this information collection.

**18. Explain each exception to the certification statement identified in Item 19 of OMB Form 83-I.**

Not applicable. There are no exceptions to the certification statement.

**B. Collections of Information Employing Statistical Methods.**

**1. Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection methods to be used.**

Automobile drivers in the United States number approximately 200 million.

A non-random sample of 150 drivers will complete the research. Respondents will be screened according to several criteria, i.e., a random sample will not be taken, and rather a stratified sample will be constructed. The sample will be selected from a variety of urban, suburban, and rural land uses in northern California and Nevada. The sample will include buyers of new and used vehicles; buyers of cars and trucks; younger and older drivers; men and women. Potential respondents who will be excluded include those who drive vehicles that already display fuel economy information to drivers, such as several of the hybrid vehicles, especially those from Toyota and Ford.

In order to simplify insurance issues and control costs, UCD will work with the insurer AAA Northern California, Nevada & Utah (AAA NCNU) to create the sample. AAA NCNU will mail an invitation to a subset of their automotive policyholders. (The letter text, not yet printed on AAA NCNU letterhead, is in the UCD IRB approval included with this document.) The invitation will direct volunteers to an on-line screening questionnaire hosted on a UCD server. From the point the potential respondents answer the screening questionnaire, UCD will begin to construct the respondent sample. AAA NCNU will mail an invitation letter to their automotive insurance policy holders who 1) carry at least a minimum specified level of automotive liability and property insurance agreed upon by AAA and the University of California, Davis and 2) live within US Postal zip codes provided by UCD.

The sampling frame designed by UCD is a non-probability sample designed to insure the sample contains desired distributions of household vehicle ownership, i.e., number of vehicles per household, types of vehicles especially so as to exclude vehicles that already have fuel economy displays, and driving patterns, this last to be achieved through distributions of employment status and residential land use types. The screening questionnaire includes the necessary questions to conduct this screening and, should the prospective participant wish to participate, collect their contact information.

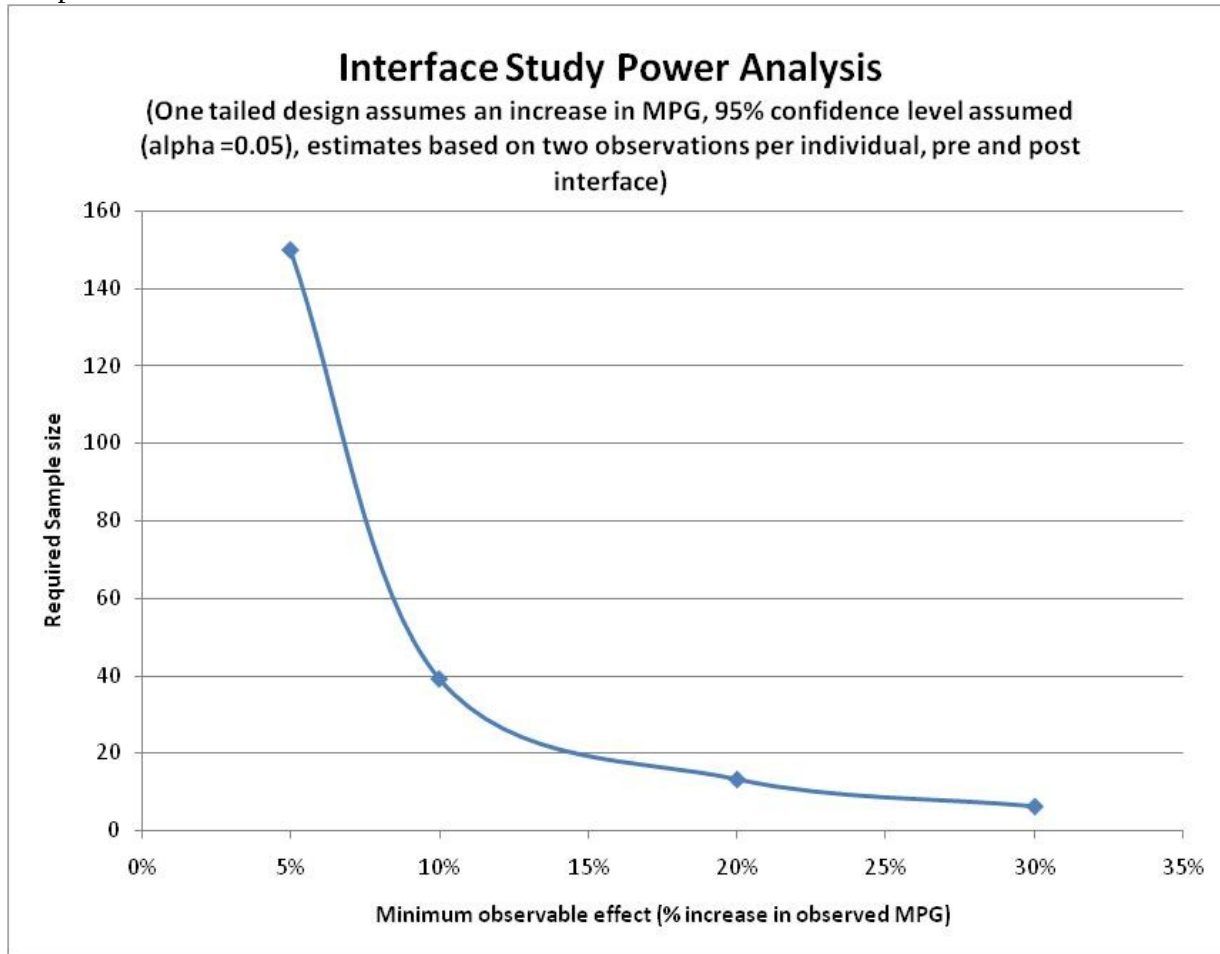
A probability sample of all car-owning households would be prohibitively difficult to collect in the present context as UCD would have to negotiate the terms of insurance for each participating household with any and all insurance companies from which all the sampled households might purchase automotive insurance. Further, should any insurer decline to participate, the strict basis for a random sample of (insured) automobile drivers would be compromised.

## **2. Describe the procedures for the collection of information including:**

There are two issues of measurement and inference to distinguish: one is the ability of the experiment to detect differences within the sample; the other is the extrapolation of the sample to a larger population, say the U.S. driver population. The research is designed primarily to address the first, i.e., to detect differences at a specified probability level for participants in the sample. There are many sources of variability in on-road fuel economy data. Therefore, the research design reduces within driver variance by collecting data over longer periods of driving, i.e., one month without and with feedback, and the sample size allows for the detection of effects on the order reported by other studies, i.e., five to ten percent.



The second, extension of any result reported for this sample to the population of all US automobile drivers, cannot be made within a probabilistic framework because of the non-random sample.



### **3. Describe methods to maximize response rates and to deal with issues of non-response.**

As proposed in a comment above, we think a small but symbolic incentive will be helpful in respondent recruitment and retention (though probably more so with retention).

Non-response could occur in any of the three data sets through distinct mechanisms. Each has distinct methods to overcome non-response.

1) On-line surveys can produce non-responses through poor understanding by respondents (sometimes stemming from poor design by researchers), poor-quality internet connections, out-dated web browsers, and other reasons. The recruitment process relies on a progressively more difficult test—though by no means ever an onerous test—of potential respondents capability to access and complete internet-based questionnaires. First, they must be able to enter a web-address, or follow a hypertext link from an e-mail, to the screening questionnaire. Second, they must be able to complete and submit that questionnaire. Only after they accomplish these do they

enter the pool of potential respondents. If the respondent is capable of entering the potential pool, they have demonstrated their capabilities (and our web-design skills) are not a barrier to their completing the remaining two internet-based questionnaires.

2) Data may be lost from the on-board devices should the device become disconnected from the OBDII port. The devices will be pre-installed in many different types of vehicles by the researchers to test for the security of their installation and usability by drivers. Appropriate fixes will be devised; if need be, a small number of makes and models of vehicles may be excluded from the study if no secure installation of the device can be effected.

3) Drivers may self-terminate their experimental, i.e., with instrumentation, phase or decline to complete surveys, or cooperate in the final interview. As regards self-termination of the experiment or failure to complete other research tasks entirely, this is a fundamental right afforded to all research participants and there is no intention of attempting to retain such respondents. Subject to time and budget conditions, new respondents will be recruited to replace respondents who terminate their participation.

#### **4. Describe any tests of procedures or methods to be undertaken.**

All forms of data collection and analysis have been or will be pre-tested, either as demonstrated in other projects or as part of an explicit pilot test of sampling procedures and data collection methods to be deployed in this study. UC Davis has already worked with AAA in the manner described to recruit drivers to vehicle demonstration projects lasting several weeks. The recruitment procedures, from recruitment letters through the on-line screening questionnaire have already been successfully deployed. Researchers at UC Davis have a long history of successfully engaging households in multi-method data collection, e.g., questionnaires, interviews, and vehicle data loggers. The specific in-vehicle collection and display devices to be used in this research are new to these researchers. Prior to full-scale deployment and as described above, the researchers will install examples of the devices in several vehicles, test their data storage and display capabilities, durability to the little foibles of driving such as spilled coffee, gum, and inadvertent thumps. Further, the ability of nine (9) drivers to install and uninstall the devices will be assessed. Their experience will be compared to the time and expense of researchers doing all installations and retrievals in the balance of the vehicles.

#### **5. Provide the name and telephone number of individuals consulted on statistical aspects of the design and the name of the agency unit, contractor(s), grantee(s) or other person(s) who will actually collect and/or analyze the information for the agency.**

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