

*PRA Application Supporting Statement*

**Generic Clearance for Decision Science Data Collections**

**OMB CONTROL NO. 0693-0089**

**Expiration Date 9/30/2024**

**“Household Vehicle Decision” Survey**

**1. Explain who will be surveyed and why the group is appropriate to survey describing the specific goals and purposes of the study as well as the specific research questions that the study will address. Describe whether this study will be used strictly as feedback for internal programmatic use only, or whether it will provide performance measures for Congress or OMB, inform policy, inform agency rulemaking, or be published as an agency report or a report to Congress. Include a discussion of the strengths and weaknesses of the proposed design and its suitability for the intended uses.**

Under a new effort in the Circular Economy Program, the Applied Economics Office in the Engineering Laboratory at the National Institute of Standards and Technology created a brief survey to assess the perspectives of current battery electric vehicle (BEV) owners on their battery performance as well as perspectives of recent or potential vehicle purchasers on new and pre-owned BEVs. Additionally, the survey examines how potential battery degradation of BEVs impacts a household’s likelihood of purchasing a BEV.

This effort is aligned with Executive Order on Tackling the Climate Crisis at Home and Abroad, specifically Sec. 205. Federal Clean Electricity and Vehicle Procurement Strategy. Findings will be used for NIST internal programmatic guidance and are planned to be reported in NIST publications and potential journal publications. This survey is a first step towards better understanding the US public’s perceptions on battery electric vehicles (BEVs). A BEV is a fully electric vehicle or all-electric vehicle that is a subgroup of electric vehicles that exclusively uses chemical energy stored in rechargeable battery packs, with no secondary source of propulsion (a hydrogen fuel cell, internal combustion engine, etc.).

To date there has been minimal research conducted as to whether battery degradation is a barrier to greater uptake of BEV technology by the US public. Christensen et al. (2021) examines the risks associated with batteries including the disposal of batteries, recycling, accidents, and potential to reuse batteries as an energy storage system. An increase in education and legal processes are needed to address the safety risks associated with BEV adoption (Christensen et al. 2021). In a series of in-depth interviews Pedrosa and Nobre (2018) finds that risks associated with the battery of an electric vehicle are a major barrier to second-hand electric vehicle adoption. Since BEV batteries are so expensive to replace, and many consumers will notice the impact due to the range decrease of the vehicle, consumers are more likely to purchase a used BEV if it has a new battery than with the original battery (Pedrosa and Nobre, 2018); however, greater understanding is critical to fostering competitiveness in the US manufacturing sector for BEVs. NIST’s Circular Economy Program along with NIST’s Applied Economics Office is interested

in better understanding these concerns and fostering development of decision support tools, such as a “Battery Passport” to facilitate the purchase of new and pre-owned BEVs. (A “Battery Passport” is a real-time monitoring service, providing recommendations on extending battery life and detailed battery history which can be shared with second-life market.)

This proposed online, electronic survey will collect data relevant to answering the following research questions:

1. To what extent do current BEV owners experience battery degradation?
2. Is expected battery degradation of BEV batteries a barrier to BEV adoption?
3. What additional information on the battery of a BEV may be useful to consumers in their decision-making process to purchase a BEV (or not)?

In order to collect high-quality data to answer these research questions, the survey should be filled out by a representative sample of the US population who 1. Own a BEV at present and 2. Are considering purchase of a BEV within the next five years.

It is critical that the survey questions be answered truthfully and thoroughly. We have contracted with a sampling service (Qualtrics) to host the survey and provide a sample of participants curated to be as demographically representative of the US population as possible, in terms of 2,000 adult (18+ year old). Half of the total sample will be BEV owners and half will be non-BEV owners. Within the confines of these groups, efforts will be made to recruit individuals who are representative of the US demographically (i.e., approximating most recent available Census data) in terms of age, gender, income, region, and race. Since there is greater BEV ownership by males in the U.S.(Fuels Institute, 2021), the NIST researchers have requested an oversampling of female BEV owners to try to balance the respondents to be 50/50 male/female. As data collection progresses, the contractor will monitor incoming data and participant demographics and adjust new contacts as necessary to ensure that the two subgroup respondent numbers are achieved.

As a part of this process, participants asked to take the survey by the sampling service will be incentivized to participate with payment ranging from \$1 to \$7.5; the value of individual payments is at the discretion of the contractor. The reasons for this are twofold. First, related to data quality and reliability, the use of incentives are justified due to the burden and length of the survey (over 10 minutes) which is expected to experience significant participant drop-off if incentives are not used to compensate for participant’s time. Second, survey methods research strongly support the use of incentives to reduce nonresponse bias in self-administered survey data collection. In our case, incentives will help to ensure that our sample is representative of the US public and not only obtained from those willing to respond for little to no compensation. The use of different incentive levels will be determined by the contractor on a flexible basis; this flexibility allows responses to be obtained from certain groups that prove more difficult to reach, but are nevertheless important members of our target sample groups. Without such incentives, study goals would not be met due to a high preponderance of incomplete responses from a non-representative sample of the US public.

The contracting service will remunerate participants as compensation for their participation, which we expect will improve response rates to nearly 100%. The contractor will also be responsible for checking the validity, completeness, and quality of participant responses. As a result, we are confident that we will be able to obtain high-quality data from the sample of interest. However, as limitations exist in data collection, some sample bias may still be present, as the study will be online only (e.g., participants must have internet access), and volunteer to partake in the study for a relatively small remuneration.

## **2. Explain how the survey was developed including consultation with interested parties, pretesting, and responses to suggestions for improvement.**

This survey instrument was created by a team of economists, specializing in behavioral economics and training in decision science. Detailed input was provided by members of NIST's Circular Economy Program who study BEVs. Development and decisions on the research questions and sections of the survey were informed first by a literature review focused on previous work on BEV uptake. Notably little literature is available on the secondary market for BEVs, which is critical to better understand as the BEV market continues to grow. Where possible, this previous work and other established scales (e.g., risk scales) informed the question text and response options implemented.

The survey begins with a few demographic questions, which is then followed by questions about each of the vehicles that a household owns. For BEV owners, there are more questions about their driving and battery charging behavior with their BEV, since these are critical data to control for in improving our understanding BEV battery degradation. The survey then asks a few questions about households' recent and/or future intentions to purchase a vehicle. The next section of the survey asks about perceptions and knowledge of BEVs. The survey then asks about different battery information and information sources that may be useful to respondents in their vehicle decision making process, specifically their consideration of purchasing a BEV. We additionally include questions about the perception of range (distance that can be driven on a fully charged battery) and resale of BEVs, since these factors are likely to also impact BEV adoption decisions and are related to the battery of a BEV. The survey concludes with additional demographic questions.

The draft survey instrument was shared with several collaborators within the Circular Economy Program, Applied Economics Office, and Community Resilience Program at NIST, as well as selected topic area experts outside of NIST. Their invaluable feedback was incorporated to better answer our research questions and make it easier for members of the public to understand and respond to questions. This included changes to information included in the message prompts and the wording of dependent variable explanations.

**3. Explain how the survey will be conducted, how customers will be sampled if fewer than all customers will be surveyed, expected response rate, and actions your agency plans to take to improve the response rate.**

The proposed survey will be hosted on and conducted online via the survey platform Qualtrics. NIST researchers will be responsible for developing the final survey instrument and obtaining appropriate IRB and PRA approvals, as well as conducting analysis on the final collected dataset. Qualtrics will only participate in data collection alone; participants will be identified, contacted, and provided remuneration for their time by Qualtrics professionals through their Federal government national panel services.

Qualtrics states that they recruit participants from various sources, including website intercept recruitment, member referrals, targeted email lists, gaming sites, customer loyalty web portals, permission-based networks, and social media. Consumer panel members' names, addresses, and dates of birth are typically validated via third-party verification measures prior to their joining a panel. This PII will not be provided to NIST researchers and will not be kept in a federal Systems of Record. Therefore, a Privacy Act Statement is not required. Selected panel members are sent an email invitation or prompted on the survey platform to proceed with a given survey. The typical survey invitation is simple and provides a hyperlink which will take the respondent to the survey; there is also mention of the remuneration offered for their time. Interested participants will be routed to our survey, where they will be provided with more information and allowed to consent to proceed with the survey or decline. After completing the survey, participants will be compensated for their time in the agreed-upon amount by Qualtrics. NIST plays no role in the remuneration. Per the contract agreement we are guaranteed 2,000 complete responses of the targeted samples.

The survey is expected to take 15 minutes to complete on average. This results in a total of 30,000 minutes, which is 500 total burden hours.

**4. Describe how the results of the survey will be analyzed and used to generalize the results to the entire customer population. Also, will this information be used by other Federal agencies? If so, for what purposes? Are there any privacy concerns related to this information sharing? If so, how have these been addressed?**

Data received from Qualtrics will be checked for quality and cleaned in accordance with our data requirements. No PII will be delivered in the dataset. Data will be analyzed in the statistical analysis programs, such as STATA and SPSS. Data and decision-making information will be analyzed in accordance with the identified research questions. Descriptive statistics and regression analyses will be used to answer the research questions.

While there are no current plans to share results with other Federal agencies; however, results may be of interest to agencies that work on issues related to BEVs. We do not plan to share raw data outside of NIST and do not have privacy concerns related to information sharing. NIST's

Institutional Review Board (IRB) is reviewing the study plan. Any results that are shared (via resulting NIST reports, journal publications) will be aggregated and no PII will be available.

**5. Peer Review: If there is a reasonable likelihood that the results of this information collection will constitute “influential scientific information” under the Information Quality Bulletin for Peer Review, has NIST developed a peer review plan that will be posted on its peer review agenda?**

The findings and recommendations resulting from the unique results of this research do not constitute influential scientific information but will nevertheless be subject to standard peer review processes at NIST prior to publication. This includes NIST Publication System (NPS) review for all NIST internal products (e.g., NIST Technical Notes), as well as planned submissions to archival academic journals. This process will include review by a non-coauthor area expert within the Applied Economics Office, one from outside of the Applied Economics Office, the AEO group leader, and division chief. The manuscript must receive approval from all of these parties before it can be published, presented publicly, or submitted to journals.

For resultant journal articles, the manuscript will then be subject to a second round of peer-review based on the policies of the specific Journal, following their typical review processes before publication.

Statement added to survey:

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