Date:	Sep 30, 2024
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From:	"T. Donna Chen" tdchen@virginia.edu
Subject:	TRB Paper - TRBAM-25-01317 - Review Results

Ref.: Ms. No. TRBAM-25-01317

Measuring Consumer Willingness to Enroll in Battery Electric Vehicle Smart Charging Programs

Transportation Research Board

Dear Pingfan Hu,

Your paper, number TRBAM-25-01317, "Measuring Consumer Willingness to Enroll in Battery Electric Vehicle Smart Charging Programs", was peer reviewed by a TRB standing committee. Based on the review results, the committee is pleased to recommend your paper for presentation at the TRB Annual Meeting. The review results are summarized below. If your paper was also submitted for publication in the TRR, we are sorry, but the paper will not be moved forward in the process.

TRB will notify you in early November regarding where and when your paper will be presented. Your paper will be posted in the TRB 2025 online program and made available to our sponsors and attendees. If you do not want the full paper posted, you will have the ability to upload a Short Format Research Summary version via My TRB by November 20. Full papers and research summaries will not be indexed in the TRID database.

Thank you for submitting your paper for Presentation. Yours was one of more than 6,000 papers received this year. Approximately half of these papers will be presented at the Transportation Research Board 2025 Annual Meeting.

Sincerely,

T. Donna Chen

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Standing Committee on Alternative Fuels and Technologies

On Behalf of the Transportation Research Board Standing Committees

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Reviewers' comments:

Reviewer 1: The paper presents a mixed logit analysis of BEV owners and their willingness to participate in supplier-managed charging and V2G programs. The overall concept is good and the simulations near the end are especially useful in policy development. Even prior to presentation/publication, I have a few major recommendations. The contributions should be clearer, attributes and levels should be justified, the quality of the data needs to be inspected (especially given the demographics), and geography needs to be stated. For modeling, the mixed logit models should include demographics and p-values. Finally, the BEV owner sample should be emphasized in the title and introduction.

-The introduction is well-formed, but it is missing a clear indication of the contribution of the paper to the overall field. This

is especially important since other recent research (as noted later in the literature review) has used discrete choice models to understand smart charging program enrollment. Is there anything particularly unique about the study (i.e., theoretically, methodologically, empirically) that helps build the existing knowledge? Is the sample different compared to other studies? Are different incentives considered that are more realistic (for example)? Hopefully, one of these contributions is present and can be clarified in the introduction and abstract. A small note, there is probably no need to say "conjoint analysis" since the paper is within the transportation field.
- Reading through the literature review, it's clearer that the focus of the paper is on BEV owners only. This should be clarified in the title, abstract, and introduction as this seems to be the most clear contribution. I checked the most relevant literature and it should also be noted that the sampling procedure in Huang et al. (2021) and Wong et al. (2022) may be better than in this paper (though is debatable). Huang et al. (2021) conducted around 150 intercepts directly with EV owners (100% validation of an EV owner). Wong et al. (2022) used a panel via Qualtrics to get around 150 participants which is compared to other groups. It could be argued that both sample sizes are generally too low, but their sampling method may be better (or not). The authors should discuss this a bit further, since this could be a focus of the contribution.
- Related to the note above, the screening system is valuable, especially since there is no way to tip off the participant about the EV-based nature of the survey. I believe this is a large strength of the method. The setup of the experiment is also valuable compared to other papers. This should probably be discussed further. I also recommend that the authors justify the choice of the attributes and attribute levels. Currently, they seem somewhat arbitrary, though reasonable on inspection. The one exception is that V2G occurrence cash seems very high. Given that people were able to include their exact vehicle, why was the decision to use a hypothetical vehicle (300 miles) rather than their actual vehicle? The methods also state that randomization occurred. Was any form of factorial design put in place?
- Related to data collection, do the authors know about the relative quality of responses that come via Facebook or Instagram? This could help justify this process over the other studies. One important piece of missing information is the geographic range of the survey. I would guess it's nation-wide, but I actually don't know. This should also be added in the abstract. I am unable to determine the relative quality of the sample since there are no comparison statistics. Gender skew is incredibly high, age skew is also very high, and political affiliation is very heavy Democrats. The number of retired individuals and homeowners is also very high. It's unclear if this is because the sampling is of BEV owners or the sample is not good. Regardless, a comparison to BEV owner statistics is important.
- The models are missing demographic information, which could be particularly helpful. Unless there is a good reason to not include them (sometimes there is), they should be present and tested for heterogeneity in the mixed logit model. Please show p-value and significance in the table. I'm not 100% sure if all these variables are statistically significant. Please also discuss the results of the tables (including significance).
- A few small comments. Was the V2G process explained to participants? In other words, did they understand how it worked? While I understand that the % of enrollment is the focus of the simulations and sensitivity, I'm most intrigued about the minimum programs (specifically from the perspective of the third-party). There is evidence that people would enroll in smart charging without any incentive and it seems that this research backs that claim up. I'd be curious to know what is the "worst" program and how much it could still yield, especially since third-parties are trying to make this work economically for them.

Reviewer 2: It is a well written and structured paper. Also the method is very well explained and well performed. The study outcomes seem very plausible to me. My only problem with this paper is that I find the outcome not very exciting and new. Sure, respondents want to have some form of monetary incentives and, sure, they are most worried about sufficient battery charge levels in the morning. This was already shown in previous studies. I do not want to say that this study is superfluous (I think the SMC part is new and I like their Tornado plot presentations) but they could emphasize maybe a bit more the novelty of their work.

Reviewer 3: Overall: the topics of V2G and smart charging are important, and there are still few investigations into the consumer side of these technologies. The study is generally well-done, and the writing is quite strong. However, I have a number of concerns, including the lack of novelty in these particular findings. (Note that I'll just write V2G for now, but I mean both smart charging and V2G.)

1) My largest concern is the lack of novel contribution. While this topic is understudied, there are handfuls of consumer survey studies from the US, UK, and Canada. I'm not clear on how these new results expand upon past studies. The finding that people are happy to have more money is not novel at all. No surprise that people want to keep more BEV driving range. These are obvious findings that don't need a study. Take it further: do people value these things as much as expected, as found in past literature? Or more, or less? And what about all the other complex motives of consumers? (See related points below)

2) Who is the target population? The study focuses on BEV owners in the US. But these are the earliest buyers, which some call innovators, early adopter, pioneers. Countless studies show how this segment is unique from later buyers. If the purpose is to learn about the future potential of V2G in the US, one must surely study those that have not yet purchased a ZEV. There is past research that directly studies and quantifies these differences. For example: Axsen, J., Goldberg, S., Bailey, J., 2016. How might potential future plug-in electric vehicle buyers differ from current "Pioneer" owners? Transportation Research Part D: Transport and Environment 47, 357-370.

3) Why focus only on financial and functional attributes of V2G? Some of the authors' cited studies point to the importance of "green" and symbolic motives in relation to V2G. The noted Sovacool et al. review paper also provides a helpful overview of the many facets V2G interests - which ventures far beyond financial and functional motives. Consider some

qualitative research on this topic also: Axsen, J., Langman, B., Goldberg, S., 2017. Confusion of innovations: Mainstream consumer perceptions and misperceptions of electric-drive vehicles and charging programs in Canada. Energy Research & Social Science 27, 163-173.

4) I'm curious about how V2G etc was explained to respondents. Especially in terms of frames. Is this just information about function and finances? What information was given about battery degradation, if any? And what "Frames" were used - the goal of such a program. For climate change? For the Economy? For the consumer's financial gain? Such frames can be enormously influential on consumer response.

5) Why just use MXL? My understanding is that it can be a statistically high-performing method. But I also find that latent class modeling can be more interesting in terms of segmenting consumers and learning about their different characteristics and motives. Identifying different consumer segments can be quite helpful for understanding heterogeneity. While MXL gives helpful distributions, I don't see much useful discussion here about what that means for consumer heterogeneity. But then again, perhaps the select sample of BEV owners is quite homogeneous.

6) The MXL results table is very unusual. There should be further information, such as p-values, WTP calculations, overall model diagnostics.

7) The sensitivity figures are helpful I think. I don't think the Tornado figures add much. And the Tornadoes also mislead interpretation a bit. They compare results with much different scales/units, and I don't think it is meaningful to say that one attribute is more important than another.

8) There are other metrics that can aid comparison to past literature. WTP is one. Another is to calculate an implied discount rate, comparing upfront versus ongoing costs.
