National Center for Sustainable Transportation

POLICY BRIEF

# Best Practices for Electric Vehicle Cost Calculator User Interfaces

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## Issue

One of the potential consumer benefits of electric vehicles (EVs) is lower fuel and maintenance costs compared to internal combustion engine vehicles (ICEVs). Consumers tend to have difficulty recognizing these cost benefits, however, because of the complexity of comparing gasoline and electricity prices, and comparing long-term operating savings with EV purchase premiums. Online vehicle cost calculators may help consumers navigate this complexity by providing tailored cost estimates and enabling comparisons across vehicles. Of the several vehicle cost calculators available online, functionalities range widely. No existing research establishes the functionalities and features that determine the usefulness of vehicle cost calculators in promoting EV adoption. Researchers at the University of California, Davis drew upon a systematic review of vehicle cost calculators and findings from multiple user experience studies to articulate best practices for the user interface design of effective vehicle cost calculators. The researchers categorized best practices as those related to the vehicle cost calculator use cases, outputs, user experience, and user inputs.

## Use Cases

Vehicle cost calculators should support the following general uses:

- Exploratory: User may or may not have an EV; is seeking to learn about costs, range, and/or charging
- Computational: User may or may not have an EV; is seeking to quantify costs; may wish to compare across vehicles (same or different drivetrain) or different routes
- Confirmatory: User has an EV or wants an EV; is seeking to validate adoption decision

## Outputs

When presenting information to consumers, vehicle cost calculators should:

- Emphasize EV benefits, such as operating cost savings for an EV vs. similar ICEV (Figure 1)
- Compare acquisition costs separately, with tailored and precise information about incentives
- Compare cumulative total cost of ownership, highlighting breakeven time
- Present realistic and editable EV maintenance costs
- Exclude from default outputs costs that are not significant differentiators of EVs vs. ICEVs, such as insurance costs
- Define depreciation costs in layman's terms and not include them in total cost of ownership by default (allow as optional)
- Integrate salient, emotionally evocative information about environmental impacts
- Frame higher cost of EVs vs. ICEVs as payment toward environmental benefits
- Include and define life-cycle emissions estimates
- If including maps, use them to visualize EV range and public charging locations

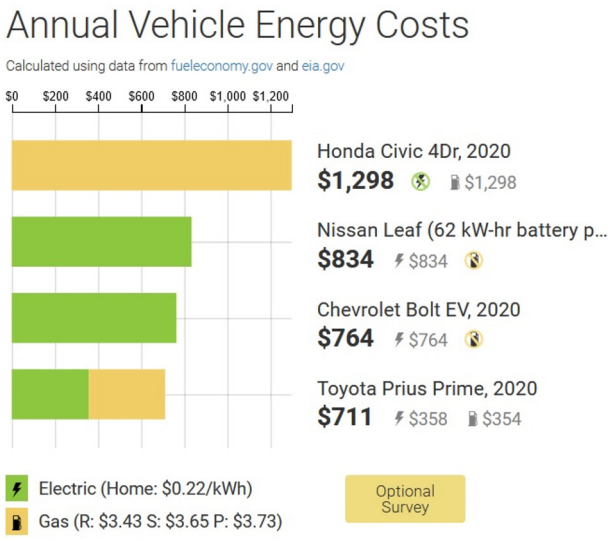


*Figure 1. A vehicle cost calculator output from EV Explorer that allows users to compare energy costs between an ICEV and several EVs*

## User Experience

The vehicle cost calculator should be intuitive and not demanding for the consumer to use.

- Required inputs should be relatively minimal and high-leverage in terms of tailoring output
- User inputs such as mileage should have flexible response formats to minimize cognitive demand
- The number and type of optional inputs should be maximized to take full advantage of the ability to tailor results
- Optional inputs should be separate from required inputs to lessen perceived demand
- Optional inputs should be salient when the output is displayed so the user is aware of them
- Optional inputs that are irrelevant based on other user inputs should not be displayed
- Default optional input values should be as tailored as possible, accurate, and explicitly labelled
- Input defaults should be annotated with sources and tips to help users decide whether and how to modify

## User Inputs

Vehicle cost calculators should allow users to personalize cost outputs according to their vehicles of interest, driving and fueling practices, and vehicle financing terms, considering the following best practices for each of those user input categories:

### Vehicle Selection and Specification

- Require some vehicle selection inputs, such as one make-model-year, body style, and price range
- Provide comprehensive selection of vehicle models and years (inclusive of all drivetrains)
- Provide link alongside vehicle selection inputs to a tool dedicated to EV shopping
- Enable comparison of at least four vehicles (more is better, but default at two for initial output)
- Allow users to modify efficiency-related specifications for chosen vehicles

### Driving

- Require some driving inputs, designed to estimate total mileage accurately or generously
- Communicate the implications of daily driving (between charges) for plug-in hybrid EV fuel costs
- Use flexible formats so users can easily estimate mileage in a way that makes sense to them
  - For mileage inputs, let the user specify the denominator, such as miles per day or year
  - For mileage inputs, allow both weekday and weekend daily profiles
  - For trip inputs, allow more than one trip, route specification, and waypoints
  - Supplement trip inputs with “other driving” and/or annual mileage inputs

### Fueling

- Include optional inputs for fuel prices with defaults as specific to user location as possible
- Only display optional inputs for prices of fuel types used by the vehicles being compared
- Label default prices so the data source is clear (e.g., a particular utility’s off-peak rate)
- Use off-peak rate as editable default for home charging price (with link to more rate information)
- Allow users to easily indicate exclusively home charging or exclusively public charging
- Provide optional charging inputs to factor in time-of-use and multiple public chargers
- Partner with charger companies to estimate level and cost for user-selected stations

### Financing

- Include optional inputs for new- and used-car acquisition costs
- Include different sets of inputs based on acquisition type – cash, loan, lease, and rent
- In default estimates of vehicle price, specify or note implications of different trim levels
- Estimate used car resale value (e.g., based on Kelley Blue Book or Consumer Reports)
- Include optional inputs for all relevant financing terms and state-specific taxes and fees
- Provide up-to-date federal, state, and local incentive estimates
- Include household income tax information inputs to help determine incentive eligibility
- Allow direct modification of vehicle price and incentives in addition to the above inputs

## Further Reading

This policy brief is drawn from “Facilitating Electric Vehicle Adoption with Vehicle Cost Calculators,” a report from the National Center for Sustainable Transportation, authored by Angela Sanguinetti, Eli Alston-Stepnitz, and Angelika Cimene of the University of California, Davis. The full report can be found on the NCST website at https://ncst.ucdavis.edu/project/facilitating-electric-vehicle-adoption-energy-cost-calculators. For more information about the findings presented in this brief, please contact Angela Sanguinetti at asanguinetti@ucdavis.edu.

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