

**GOVERNMENT OF PUERTO RICO  
PUERTO RICO PUBLIC SERVICE REGULATORY BOARD  
PUERTO RICO ENERGY BUREAU**

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| <b>NEPR</b><br><br><b>Received:</b><br><br><b>Jan 30, 2026</b><br><br><b>2:18 PM</b> |
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**IN RE: ELECTRIC VEHICLE  
CHARGING INFRASTRUCTURE  
DEPLOYMENT**

**CASE NO. NEPR-MI-2021-0013**

**SUBJECT: Informative Motion Regarding LUMA's  
Compliance with Resolution and Order of January 7,  
2026**

**INFORMATIVE MOTION REGARDING LUMA's COMPLIANCE WITH  
RESOLUTION AND ORDER OF JANUARY 7, 2026**

**TO THE HONORABLE PUERTO RICO ENERGY BUREAU:**

COME now LUMA Energy, LLC and LUMA Energy ServCo, LLC (collectively, "LUMA"), through the undersigned legal counsel, and respectfully states, submits and requests the following:

**I. Relevant Procedural Background**

1. On November 3, 2025, LUMA filed a revised Puerto Rico Electric Vehicle Adoption Plan (PR-EVAP) for Fiscal Years 2026, 2027 and 2028 ("Revised PR-EVAP") and a proposed semi-annual reporting template. *See Motion to Submit Revised PR-EVAP and Semi-Annual Report Template* ("November 3<sup>rd</sup> Motion").

2. On January 7, 2026, the Energy Bureau issued a Resolution and Order ("January 7<sup>th</sup> Order") indicating that it had reviewed LUMA's Revised PR-EVAP and directing LUMA to provide related responses to Requests for Information ("ROI") set forth in the January 7<sup>th</sup> Order ("January 7<sup>th</sup> ROIs") within ten (10) business days of the issuance of the January 7<sup>th</sup> Order. *See* January 7<sup>th</sup> Order, p. 2.

3. In compliance with the January 7<sup>th</sup> Order, on January 22, 2026, LUMA filed its responses to the January 7<sup>th</sup> ROI as an Exhibit 1 to a *Motion to submit LUMA's Responses to Requirements of Information in Compliance with Resolution and Order of January 9, 2026* ("January 22<sup>nd</sup> Motion"). LUMA also requested the Energy Bureau to approve the revised PR-EVAP and proposed semi-annual reporting template submitted in the November 3<sup>rd</sup> Motion, ahead of LUMA's February deadline to file the next semi-annual report. *See* January 9<sup>th</sup> Motion, pp. 3-4.

4. On January 27, 2026, the Energy Bureau issued a Resolution and Order ("January 27<sup>th</sup> Resolution") taking notice of LUMA's November 3<sup>rd</sup> Motion and informing that it would not make any further determinations on the PR-EVAP until completion of the Rate Case in Case No. NEPR-AP-2023-0003, which will inform the budget levels that can fund the Revised PR-EVAP. *See* January 27<sup>th</sup> Order Resolution, p. 2. The Energy Bureau also ordered LUMA to continue implementing the current PR-EVAP until the end of FY 2026 unless the Energy Bureau decides on the Revised PREVAP before that date. *See id.* The Energy Bureau then reminded LUMA that "it must still respond to the ROIs in the January 7<sup>th</sup> Resolution". *Id.*

## **II. Information on Compliance with January 7<sup>th</sup> Order**

5. As described above, LUMA did indeed submit its responses to the January 7<sup>th</sup> ROI within the timeline set forth in the January 7<sup>th</sup> Order, thereby duly complying with the January 7<sup>th</sup> Order. Accordingly, no responses are pending on LUMA's part. For clarity of the record, LUMA attaches the January 22<sup>nd</sup> Motion and its Exhibit 1 containing the January 7<sup>th</sup> ROIs. *See Exhibit 1.*

**WHEREFORE**, LUMA respectfully requests that the Energy Bureau **take notice** of the aforementioned and **deem** LUMA in compliance with the January 7<sup>th</sup> Order.

**RESPECTFULLY SUBMITTED**

In San Juan, Puerto Rico, this 30<sup>th</sup> day of January 2026.

We hereby certify that we filed this motion using the electronic filing system of this Energy Bureau and that we will send an electronic courtesy copy of this motion to the attorneys for PREPA, Mirelis Valle Cancel, mvalle@gmlex.net and Alexis Rivera, arivera@gmlex.net, and to the Independent Office of Consumer Protection by submittal to Hannia Rivera, hrivera@jrsp.pr.gov. LUMA understands that other participants or stakeholders in this proceeding will be notified as a result of the publicity of the filings in this process. Notwithstanding, LUMA will send a courtesy copy of the filing to the following stakeholders: agalloza@aggpr.com; alberto.cortes@warrendelcaribe.com; aldo@skootel.com; angel.d.rodriguez@outlook.com; antonio@velocicharge.com; apietrantoni@pmaalaw.com; azayas@azeng.net; bigwheelcorp@gmail.com; blazquezmalu@gmail.com; brightsunpr@gmail.com; carlosxcdeno@gmail.com; clrivera@caguasexpressway.com; flota@caguasexpressway.com; cnegrette@solrenew.com; CR.Tejera@ddec.pr.gov; dacosta@aggpr.com; daniel.perez@totalenergies.pr; dcordero@group-em.com; direxec@ciapr.org; divine.energy@hotmail.com; ecruz@pmaalaw.com; eduardo.pinera@toyota.com; Edwin.Acevedo@ddec.pr.gov; emelyies.torres@toyota.com; epenegypr@gmail.com; erica.cosme@gsonnell.com; Fberrios@peritoselectricistas.org; francisco.berrios@hotmail.com; franciscojrullan@yahoo.com; gerard.berlinski@toyota.com; gerardo\_cosme@solartekpr.net; gperez@solrenew.com; hamely@motorambar.net; ialsina@plazalasalasamericas.com; idiaz@glenninternational.com; info@carlosmatta.com; jack@pantekpartners.com; jameauxl@aim.com; jan.rodriguez@toyota.com; javrua@sesapr.org; jbouza@caguasexpressway.com; jcardona@aggpr.com; jmartinez@pmaalaw.com; jorrodriguez@motorambar.net; jortiz@caguasexpressway.com; jose.maeso@crowley.com; jpibernus@motorambar.com; JSantana@motorambar.com; jtosado@motorambar.net; juan.diaz.galarza@guidehouse.com; jvazquez905@gmail.com; kenan.d.davila@sargentlundy.com; kkoeh@tesla.com; l.marcano@aconer.org; lsundeen@tesla.com; luisgmoreno@gmail.com; Marangelly.Cruz@toyota.com; marilyn.maldonado@toyota.com; mlandron@plazaad.com; mpietrantoni@pmaalaw.com; nannette.berrios@solpetroleum.com; nmontes@ccmpr.com; nrodriguez@senado.pr.gov; Ochavez@Padigm.com; odette@grupofernandezpr.com; omundo@plazalasalasamericas.com; patlopez00@gmail.com; dany.oliva@toyota.com; pjcleanenergy@gmail.com; rdiaz@glenninternational.com; repagan@burnsmcd.com; rry@tcm.law; Ruben.Gonzalez@pumaenergy.com; rvega@guidehouse.com; salvadorlopez5@hotmail.com; shehaly.rosado@ddec.pr.gov; Veronica@pantekpartners.com; Victor.Aponte@toyota.com; victor.martinez@totalenergies.pr; wilfredsonllc@gmail.com; zlopez@efonalledas.com; mara.cruz@toyota.com; lizette.cotto@toyota.com.



**DLA Piper (Puerto Rico) LLC**  
 500 Calle de la Tanca, Suite 401  
 San Juan, PR 00901-1969  
 Tel. 787-945-9107  
 Fax 939-697-6147

/s/ Laura T. Rozas

Laura T. Rozas  
RUA Núm. 10,398  
laura.rozas@us.dlapiper.com

**Exhibit 1**

Stamped Copy of LUMA's January 22<sup>nd</sup> Motion and Exhibit

[Two Excel table attachments to be submitted via email]

**GOVERNMENT OF PUERTO RICO  
PUERTO RICO PUBLIC SERVICE REGULATORY BOARD  
PUERTO RICO ENERGY BUREAU**

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|---------------------|
| <b>NEPR</b>         |
| <b>Received:</b>    |
| <b>Jan 22, 2026</b> |
| <b>9:00 PM</b>      |

**IN RE: ELECTRIC VEHICLE  
CHARGING INFRASTRUCTURE  
DEPLOYMENT**

**CASE NO. NEPR-MI-2021-0013**

**SUBJECT: Motion to Submit Responses to Requests for  
Information in Compliance with Resolution and Order  
of January 7, 2026**

**MOTION TO SUBMIT RESPONSES TO REQUESTS FOR INFORMATION IN  
COMPLIANCE WITH RESOLUTION AND ORDER OF JANUARY 7, 2026**

**TO THE HONORABLE PUERTO RICO ENERGY BUREAU:**

COME now LUMA Energy, LLC and LUMA Energy ServCo, LLC (collectively, “LUMA”), through the undersigned legal counsel, and respectfully states, submits and requests the following:

**I. Introduction**

As per directives of the Puerto Rico Energy Bureau of the Public Service Regulatory Board (“Energy Bureau”), in 2023 LUMA issued the Puerto Rico Electric Vehicle Adoption Plan (“PR-EVAP”) (covering fiscal years (“FY”) 2024 to 2025), to accelerate the growth and infrastructure deployment for electric vehicles (“EV”), and launched in 2024 an EV Time of Use Rate pilot program. LUMA has also been filing since 2024 Semi-Annual Reports on the PR-EVAP.

On November 3, 2025, LUMA filed a revised PR-EVAP for FYs 2026, 2027 and 2028 and a proposed semi-annual reporting template. With this Motion, LUMA responds to Requests for Information from the Energy Bureau relating to the revised PR-EVAP, in compliance with a Resolution and Order from the Energy Bureau notified on January 7, 2026.

## II. Relevant Procedural Background

1. On January 13, 2023, the Energy Bureau issued a Resolution and Order (the “January 13<sup>th</sup> Order”) regarding the Draft Phase I EV Plan filed by LUMA on September 22, 2022<sup>1</sup> and a proposed Interim EV Time of Use pilot rate (“Interim TOU Rate”) filed by LUMA on July 21, 2022<sup>2</sup>. Among others, the Energy Bureau approved the Interim TOU Rate, subject to certain modifications, and directed LUMA to file a Final Phase I EV Plan and Semi-Annual Reports.

2. On May 1, 2023, LUMA submitted to the Energy Bureau the Final Phase I EV Plan in the form of a document titled Puerto Rico’s Electric Vehicle Adoption Plan (“PR-EVAP”).<sup>3</sup>

3. On June 6, 2023, the Energy Bureau issued a Resolution and Order taking notice of the filing of the PR-EVAP.

4. On February 29, 2024, LUMA filed the first PR-EVAP Semi-Annual Report for FY24.<sup>4</sup>

5. On April 23, 2024, the Energy Bureau issued a Resolution and Order directing LUMA to use a reporting template provided by the Energy Bureau for all PR-EVAP Semi-Annual Reports.

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<sup>1</sup> See Motion Submitting Draft Phase I EV Plan and Request to Postpone Compliance Technical Hearing No. 3 and Concomitant Deadline to Submit Revised Phase I EV Plan

<sup>2</sup> See Motion Submitting Revised EV Rate Design Proposal.

<sup>3</sup> See Motion to Submit Final Phase I EV Plan in Compliance with Resolution and Order of January 13, 2023.

<sup>4</sup> See Motion to Submit Semi-Annual Report in Compliance with Order of January 13, 2023.

6. On April 30, 2024, LUMA informed the Energy Bureau that it had completed the development and launch of the Interim EV TOU Rate.<sup>5</sup>

7. On May 24, 2024, LUMA submitted a revised version of its first PR-EVAP FY24 Semi-Annual Report using the reporting template provided by the Energy Bureau.<sup>6</sup>

8. On August 30, 2024, and February 28, 2025, LUMA filed its FY24 Second Semi-Annual Report and FY25 First Semi-Annual Report, respectively.<sup>7</sup>

9. On September 2, 2025, LUMA filed its FY25 Second Semi-Annual Report.<sup>8</sup>

10. On November 3, 2025, LUMA filed a revised PR-EVAP for Fiscal Years 2026, 2027 and 2028 (“Revised PR-EVAP”) and a proposed semi-annual reporting template.<sup>9</sup>

11. On January 7, 2026, the Energy Bureau issued a Resolution and Order (“January 7<sup>th</sup> Order”) indicating that it had reviewed LUMA’s Revised PR-EVAP and determining that additional information was required.<sup>10</sup> The Energy Bureau then ordered LUMA to provide responses to Requests for Information (“ROI”) set forth in the January 7<sup>th</sup> Order within ten (10) business days of the issuance of the January 7<sup>th</sup> Order.

### **III. Responses to January 7<sup>th</sup> ROI**

12. In compliance with the January 7<sup>th</sup> Order, LUMA hereby submits its responses to the January 7<sup>th</sup> ROI. *See Exhibit 1.* Additionally, LUMA requests for PREB's approval of the

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<sup>5</sup> See *Informative Motion Regarding Launch of Interim EV TOU Rate and Request of Release from Requirements to File Billing Integration Reports.*

<sup>6</sup> See *Motion to Submit a Revised Semi-Annual Report in Compliance with Order of April 23, 2024.* LUMA subsequently filed another version of the report to incorporate typographical and format corrections, the need for which was noticed after the report was filed. See *Motion to Submit Corrected Exhibit 1 to Motion to Submit a Revised Semi-Annual Report in Compliance with Order of April 23, 2024*, filed on May 24, 2024.

<sup>7</sup> See *Motion to Submit Second Semi-Annual Report for Fiscal Year 2024, in Compliance with Orders of January 13, 2023, and April 23, 2024*, and *Motion to Submit First Semi-Annual Report for Fiscal Year 2025.*

<sup>8</sup> See *Motion to Submit Second Semi-Annual Report for Fiscal Year 2025.*

<sup>9</sup> See *Motion to Submit Revised PR-EVAP and Semi-Annual Report Template.*

<sup>10</sup> See January 7<sup>th</sup> Order, p. 2.

revised PR-EVAP for Fiscal Years 2026, 2027 and 2028 (“Revised PR-EVAP”) and the proposed semi-annual reporting template as submitted on November 3, 2025, ahead of LUMA's February deadline to file the next semi-annual report.

**WHEREFORE**, LUMA respectfully requests that the Energy Bureau **take notice** of the aforementioned and **accept Exhibit 1** as LUMA’s responses to the January 7<sup>th</sup> ROI in compliance with the January 7<sup>th</sup> Order.

**RESPECTFULLY SUBMITTED**

In San Juan, Puerto Rico, this 22<sup>nd</sup> day of January 2026.

We hereby certify that we filed this motion using the electronic filing system of this Energy Bureau and that we will send an electronic courtesy copy of this motion to the attorneys for PREPA, Mirelis Valle Cancel, mvalle@gmlex.net and Alexis Rivera, arivera@gmlex.net, and to the Independent Office of Consumer Protection by submittal to Hannia Rivera, hrivera@jrsp.pr.gov. LUMA understands that other participants or stakeholders in this proceeding will be notified as a result of the publicity of the filings in this process. Notwithstanding, LUMA will send a courtesy copy of the filing to the following stakeholders: agalloza@aggpr.com; alberto.cortes@warrendelcaribe.com; aldo@skootel.com; angel.d.rodriguez@outlook.com; antonio@velocicharge.com; apietrantoni@pmalaw.com; azayas@azeng.net; bigwheelcorp@gmail.com; blazquezmalu@gmail.com; brightsunpr@gmail.com; carlosxcdeno@gmail.com; clrivera@caguasexpressway.com; flota@caguasexpressway.com; cnegrette@solrenew.com; CR.Tejera@ddec.pr.gov; dacosta@aggpr.com; daniel.perez@totalenergies.pr; dcordero@group-em.com; direxec@ciapr.org; divine.energy@hotmail.com; ecruz@pmalaw.com; eduardo.pinera@toyota.com; Edwin.Acevedo@ddec.pr.gov; emelyies.torres@toyota.com; epenergypr@gmail.com; erica.cosme@gsonnell.com; Fberrios@peritoselectricistas.org; francisco.berrios@hotmail.com; franciscojrullan@yahoo.com; gerard.berlinski@toyota.com; gerardo\_cosme@solartekpr.net; gperez@solrenew.com; hamely@motorambar.net; ialsina@plazalasamericas.com; idiaz@glenninternational.com; info@carlosmatta.com; jack@pantekpartners.com; jameauxl@aim.com; jan.rodriguez@toyota.com; javrua@sesapr.org; jbouza@caguasexpressway.com; jcardona@aggpr.com; jmartinez@pmalaw.com; jorrodriguez@motorambar.net; jortiz@caguasexpressway.com; jose.maeso@crowley.com; jpibernus@motorambar.com; JSantana@motorambar.com; jtosado@motorambar.net; juan.diaz.galarza@guidehouse.com; jvazquez905@gmail.com; kenan.d.davila@sargentlundy.com; kkoch@tesla.com; l.marcano@aconer.org; lsundeen@tesla.com; luisgmoreno@gmail.com; Marangelly.Cruz@toyota.com; marilyn.maldonado@toyota.com; mlandron@plazaad.com; mpietrantoni@pmalaw.com; nannette.berrios@solpetroleum.com; nmontes@ccmpr.com; nrodriguez@senado.pr.gov; Ochavez@Padigm.com; odette@grupofernandezpr.com; omundo@plazalasamericas.com; patlopez00@gmail.com; dany.oliva@toyota.com; pjcleanenergy@gmail.com;

rdiaz@glenninternational.com; repagan@burnsmcd.com; rry@tcm.law;  
Ruben.Gonzalez@pumaenergy.com; rvega@guidehouse.com; salvadorlopez5@hotmail.com;  
shehaly.rosado@ddec.pr.gov; Veronica@pantekpartners.com; Victor.Aponte@toyota.com;  
victor.martinez@totalenergies.pr; wilfredsonllc@gmail.com; zlopez@efonalledas.com;  
mara.cruz@toyota.com; lizette.cotto@toyota.com.



**DLA Piper (Puerto Rico) LLC**

500 Calle de la Tanca, Suite 401

San Juan, PR 00901-1969

Tel. 787-945-9107

Fax 939-697-6147

/s/ Laura T. Rozas

Laura T. Rozas

RUA Núm. 10,398

[laura.rozas@us.dlapiper.com](mailto:laura.rozas@us.dlapiper.com)

## **Exhibit 1**

Responses to January 7<sup>th</sup> ROI

[Two Excel table attachments to be submitted via email]

# Responses to January 7, 2026, RFIs regarding Electric Vehicles

NEPR-MI-2021-0013

January 22, 2026

## List of Responses and Attachments

| Response ID                              | Document Type       | Response Subject                        |
|------------------------------------------|---------------------|-----------------------------------------|
| RFI-LUMA-MI-2021-0013-20260107-PREB-#001 | Response in PDF     | Charging Infrastructure and Reliability |
|                                          | Attachment 1 in PDF |                                         |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#002 | Response in PDF     | Equitable Access                        |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#003 | Response in PDF     | EV Time-of-Use (TOU) Rate               |
|                                          | Attachment 1*       |                                         |
|                                          | Attachment 2*       |                                         |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#004 | Response in PDF     | Charging Behavior Study                 |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#005 | Response in PDF     | Fuel Cost Savings                       |
|                                          | Attachment 1 in PDF |                                         |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#006 | Response in PDF     | Grid Modernization                      |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#007 | Response in PDF     | EV Load Projections                     |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#008 | Response in PDF     | EV TOU Rate Pilot                       |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#009 | Response in PDF     | Smart Charging and Managed Charging     |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#010 | Response in PDF     | System Upgrades                         |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#011 | Response in PDF     | FY2026 Costs                            |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#012 | Response in PDF     | Education and Outreach                  |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#013 | Response in PDF     | Collaboration                           |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#014 | Response in PDF     | Fleet Electrification Surveys           |
| RFI-LUMA-MI-2021-0013-20260107-PREB-#015 | Response in PDF     | Fleet Electrification Barriers          |

Note: \*Denotes attachments that have been provided in Microsoft Excel format.

## Electric Vehicles

### NEPR-MI-2021-0013

#### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#001

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##### REQUEST

Refer to the customer survey responses on page 8 of the Revised PR-EVAP.

- a. Please list all the ways the Revised PR-EVAP will address the lack of charging infrastructure. Please answer for both private and public charging infrastructure.
- b. Please list all the ways the Revised PR-EVAP will address electrical system reliability.

##### RESPONSE

- a. LUMA does not contemplate the direct deployment, ownership, or operation of public electric vehicle charging infrastructure under the Revised PR-EVAP.

Consistent with its role as the operator of Puerto Rico's electric transmission and distribution system, LUMA's responsibility is to act as a facilitator for third-party entities seeking to develop public charging infrastructure across Puerto Rico. In this capacity, LUMA supports charging infrastructure development by:

- Providing transparent and non-discriminatory interconnection processes for electric vehicles (EV) charging developers
- Coordinating with relevant stakeholders to facilitate the safe and reliable integration of public charging infrastructure into the electric system

The revised PR-EVAP is designed to reduce barriers to market-driven charging infrastructure deployment through partnerships, education, and outreach, while ensuring that new public charging assets are integrated in a way that maintains system reliability and safety.

With respect to private charging infrastructure, the Revised PR-EVAP addresses this area through facilitation and technical support, consistent with LUMA's role.

LUMA maintains general interconnection guidelines applicable to any project requiring electrical interconnection and load integration. Refer to RFI-LUMA-MI-2021-0013-20260107-PREB-#001\_Attachment 1, Guidelines for New Connection Project Procedures. These guidelines are not exclusive to electric vehicle charging projects but are available to support all entities and companies, including those interested in the development and deployment of private EV charging infrastructure. Through these established processes, LUMA provides clarity on technical requirements, safety standards, and coordination steps necessary for interconnection.

Furthermore, LUMA has collaborated with the Puerto Rico Highways and Transportation Authority to perform high-level assessments identifying areas with potential electrical capacity to support EV chargers along designated Alternative Fuel Corridors, as part of the National Electric Vehicle Infrastructure initiative. These efforts support the market-led development of private charging infrastructure by reducing informational and technical barriers, while ensuring the safe and reliable integration of new loads into the electric system.

- b. LUMA recognizes that the continued adoption of electric vehicles has the potential to impact the electric distribution system, particularly as EV charging load increases and becomes more concentrated in certain areas.

At this time, the Revised PR-EVAP does not include a stand-alone initiative specifically dedicated to EV-driven system reliability improvements. However, this should not be interpreted as a lack of awareness or inaction. Rather, LUMA's approach reflects the need to balance EV-related considerations with broader system reliability priorities across the electric grid.

LUMA is actively executing numerous grid improvement and modernization efforts across the distribution system, targeting critical infrastructure needs that affect overall reliability, resiliency, and customer service. Given the extent of system vulnerabilities and the number of critical areas requiring attention, these improvements are being prioritized based on system risk, operational necessity, and available resources.

While these reliability enhancements are not currently driven by a discrete EV charging impact analysis, they nevertheless seek to contribute to strengthening the grid's ability to accommodate current and future load growth, including incremental demand associated with electric vehicle adoption.

# Electric Vehicles

## NEPR-MI-2021-0013

### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#002

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#### REQUEST

Refer to the discussion of promoting equitable access to EVs on page 8 of the Revised PR-EVAP.

- a. Explain how the Revised PR-EVAP will promote equitable access to EVs and how LUMA will track improved access to EVs?
- b. Please explain how the Revised PR-EVAP will support low-income customers.

#### RESPONSE

- a. The Revised PR-EVAP seeks to promote equitable access to electric vehicles through an information-driven approach designed to inform all customer segments on the opportunities to participate in the transition to electric transportation.

LUMA will provide clear and accessible information to customers regarding the economic and environmental benefits of electric vehicles. This includes education on potential fuel and maintenance cost savings, as well as the role of EV adoption in supporting emissions reductions and broader environmental goals. Future EV-related initiatives developed by LUMA will be guided by a framework with the objective of ensuring that program design, outreach strategies, and eligibility considerations do not inadvertently exclude or disadvantage any segment of the population.

To track progress toward improved access, LUMA will document customer engagement on EV-related initiatives as they are implemented.

- b. The Revised PR-EVAP seeks to support low-income customers primarily through targeted education and inclusive outreach strategies designed to improve awareness of electric vehicle opportunities and related benefits.

LUMA seeks to provide updated, relevant, and accessible information through its website and other communication strategies to enable customers to better understand available options, potential benefits, and emerging opportunities associated with electric vehicle adoption.

Through these efforts, the revised PR-EVAP seeks to support equity objectives by helping to address informational barriers and by promoting awareness among customer segments and transportation stakeholders.

# Electric Vehicles

## NEPR-MI-2021-0013

### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#003

#### REQUEST

Regarding LUMA's EV Time of Use (TOU) rate on pages 8 and 9 of the Revised PR-EVAP please answer the following:

- a. Provide all workpapers associated with Table 1 in Microsoft Excel format with formulas intact.
- b. Provide the percentage (%) of EV TOU charging that occurred during each period for the EV TOU rate.
- c. Provide the average 8760 EV charging load data for all EV TOU rate participants for each year of the pilot in Microsoft Excel format.
- d. Provide the average 8760 EV charging load data for customers not enrolled in the pilot in Microsoft Excel format.
- e. Please explain why only five (5) timestamps are provided.
- f. Did LUMA consider modifying on- and off-peak periods for the TOU rate? Please explain why or why not.

#### RESPONSE

- a. Please refer to RFI-LUMA-MI-2021-0013-20260107-PREB-#003\_Attachment 1 for the workpaper associated with Table 1. This table highlights the occurrence of simultaneous charging events. The methodology applied in this updated analysis offers improved temporal accuracy compared to the prior approach, which aggregated sessions into broader time intervals. As a result, the current data more accurately captures the recurring nature of concurrent charging activity within the network.
- b. Please refer to RFI-LUMA-MI-2021-0013-20260107-PREB-#003\_Attachment 2. The percentage (%) of EV TOU charging that occurred during each period for the EV TOU rate is as follows:

| EV TOU rate period | Percentage of EV TOU charging |
|--------------------|-------------------------------|
| Off Peak           | 45%                           |
| Mid Peak           | 38%                           |
| On Peak            | 17%                           |

- c. The average yearly charging load data from enrolled customers is 20.57 kWh. Please refer to RFI-LUMA-MI-2021-0013-20260107-PREB-#003\_Attachment 2.

- d. The average yearly charging load data from non-enrolled customers is 16.87 kWh. Please refer to RFI-LUMA-MI-2021-0013-20260107-PREB-#003\_Attachment 2.
- e. The five timestamps presented in the Revised PR-EVAP were selected during the development of the filing to illustrate periods in which the highest concentration of electric vehicles were charging simultaneously. These timestamps were chosen based on proximity to Revised PR-EVAP filing and were intended to serve as representative examples of coincident charging behavior, rather than an exhaustive depiction of all charging events.

The selection of these timestamps was not intended to limit the scope of analysis, but rather to highlight periods of greatest system relevance in a concise and illustrative manner.

LUMA has included with this submission the full dataset containing the entirety of available EV charging data in RFI-LUMA-MI-2021-0013-20260107-PREB-#003\_Attachment 2. The methodology applied in this updated analysis offers improved temporal accuracy compared to the prior approach, which aggregated sessions into broader time intervals. As a result, the current data more accurately captures the recurring nature of concurrent charging activity within the network.

- f. Yes, LUMA did consider modifying the on-peak and off-peak periods for the EV TOU rate.

This consideration was informed by direct feedback received through multiple conversations with existing and prospective EV customers, who indicated that the established off-peak period did not align with typical work schedules. Specifically, many customers noted that they are away from their residences between approximately 9:00 a.m. and 5:00 p.m., which limits their ability to charge their vehicles at home during portions of the off-peak window and reduces their ability to fully realize the intended benefits of the rate design.

While this feedback highlighted opportunities to improve customer alignment and program effectiveness, implementing modifications to the TOU periods would require additional analysis, system configuration changes, and supporting data infrastructure. Accordingly, the feedback received will be considered in future evaluations of TOU rate design, particularly as LUMA advances the implementation of Meter Data Management Systems (MDMS) and Advanced Metering Infrastructure (AMI), which are expected to enhance data granularity, billing flexibility, and rate design capabilities.

## Electric Vehicles

NEPR-MI-2021-0013

**Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#004**

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### REQUEST

Refer to LUMA's PR-EVAP FY2025 S1 Semi-Annual report on page 27. Please explain the status of the charging behavior study and explain if that will continue in FY26-28 as part of the Revised PR-EVAP.

### RESPONSE

LUMA does not plan to continue developing the electric vehicle charging behavior study as part of the Revised PR-EVAP.

The charging behavior study was originally proposed to support planning efforts for customers under the Net Energy Metering tariff structure, with the goal of improving LUMA's understanding of EV charging patterns within that customer segment.

## Electric Vehicles

### NEPR-MI-2021-0013

#### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#005

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##### REQUEST

Refer to page 9 of the Revised PR-EVAP. Does the statement that "residential customers can save over \$1,000 annually on fuel costs by switching from an ICE vehicle to an EV" based on Puerto Rico specific gasoline and electricity costs? Please provide all workpapers in Microsoft Excel with formulas intact and sources used to develop the fuel cost savings value.

##### RESPONSE

The statement indicating that residential customers can save over \$1,000 annually in fuel costs by switching from an internal combustion engine (ICE) vehicle to an electric vehicle (EV) is not derived from Puerto Rico specific gasoline or electricity cost data.

Rather, the estimate provided at that time was informed by national-level studies conducted across multiple U.S. jurisdictions which analyze comparative fuel and energy costs for ICE vehicles and EVs under a range of driving and pricing assumptions. Specifically, the estimate was based on publicly available research compiled by Coltura<sup>1</sup>, included as RFI-LUMA-MI-2021-0013-20260107-PREB-#005\_Attachment 1, to this response, which evaluated EV fuel cost savings using aggregated data from all 50 U.S. states.

At present, Puerto Rico specific, comprehensive charging behavior and cost datasets are limited, which constrains the ability to develop a statistically robust, island-specific savings estimate. In the absence of such localized data, LUMA relied on widely cited national research available to provide an illustrative estimate intended to communicate the order of magnitude of potential fuel cost savings, rather than a guaranteed or universal outcome for all customers.

LUMA notes that actual savings will vary based on individual driving behavior, vehicle efficiency, fuel prices, electricity rates, and charging patterns. Accordingly, the estimate is presented for informational and educational purposes and should be interpreted as indicative rather than prescriptive.

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<sup>1</sup> <https://coltura.org/ev-savings-report/>

# Electric Vehicles

## NEPR-MI-2021-0013

### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#006

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#### REQUEST

Referring to Action #2 on pages 10 and 11 of the Revised PR-EVAP, please answer the following:

- a. Explain why costs and actions related to grid modernization belong in the Revised PR-EVAP.
- b. Please list and describe which grid modernization technologies will be promoted.
- c. Does LUMA have technology in place to utilize EVs with vehicle-to-grid capabilities?
- d. Please describe the expected deliverables and outcomes from Action #2 for each year of the Revised PR-EVAP.

#### RESPONSE

- a. Costs and actions related to grid modernization do not belong in the Revised PR-EVAP. The focus of this iteration of the PR-EVAP is on education, research, analysis and plan development.
- b. The evaluation of grid-modernization technologies under the PR-EVAP framework, aimed at supporting and enabling vehicle electrification, is currently in progress and will become more defined once AMI is fully deployed.
- c. LUMA does not have the technology in place to utilize electric vehicles with vehicle-to-grid (V2G) capabilities.
- d. Expected Potential Deliverables and Outcomes (Years 1–3)
  1. Grid Modernization Awareness and Planning
    - Deliverables
      - Stakeholder workshops to align utilities, regulators, and municipalities on modernization needs
    - Outcomes
      - Improved stakeholder understanding of grid modernization requirements to support EV adoption
      - Increased alignment between EV planning efforts and broader grid modernization initiatives
  2. EV Charging Infrastructure Education
    - Deliverables
      - Educational materials on EV charging technologies and interconnection requirements

Outcomes

Greater awareness of charging infrastructure options and grid impacts

Reduced delays caused by knowledge gaps among stakeholders

3. Grid Resilience & Distributed Energy Resources (DER) Knowledge Sharing

Deliverables

Knowledge-sharing forums focused on EVs, DERs, and resilience strategies

Outcomes

Increased understanding of how EVs can support grid resilience when integrated with DERs

Enhanced collaboration across agencies and industry stakeholders

Foundational knowledge to support future resilient, electrified transportation solutions

# Electric Vehicles

## NEPR-MI-2021-0013

### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#007

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#### REQUEST

In LUMA's PR-EVAP FY2025 S1 Semi-Annual Report, Section 3.5 on page 19, LUMA states it will continue efforts to improve detailed EV load projections. Is that work complete? If yes, please provide the EV load projections and associated work papers and sources. If not, please explain why this effort is not included in the Revised PR-EVAP.

#### RESPONSE

Yes, the EV forecast was completed for the 2025 IRP. The forecast was based on the PR100 Study (developed by DOE Labs). The EV forecast is discussed in detail in the IRP report, Section 3.2.6<sup>2</sup>. In the foreseeable future LUMA does not plan to continue efforts related to EV load projections.

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<sup>2</sup> Refer to section 3.2.6 of the 2025 Integrated Resource Plan as submitted on October 17, 2025, under docket NEPR-AP-2023-0004. [https://setpr.com/wp-content/uploads/2025/10/0.00\\_IRP-Report\\_Main-Report\\_Revised\\_Redacted.pdf](https://setpr.com/wp-content/uploads/2025/10/0.00_IRP-Report_Main-Report_Revised_Redacted.pdf)

# Electric Vehicles

## NEPR-MI-2021-0013

### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#008

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#### REQUEST

Refer to Action #3: EV Rates and Load Management as included in the Revised PR-EVAP.

- a. Please explain why LUMA cannot continue the EV TOU rate pilot in its current form through FY2028.
- b. Can LUMA renew the contract with Weavegrid?
- c. How much would it cost to continue the EV TOU rate pilot for the current number of enrolled customers and if more customers enroll.
- d. Please confirm whether LUMA is aware that other jurisdictions provide EV TOU rates without advanced metering. If confirmed, please list each jurisdiction.
- e. Please confirm that LUMA's Constrained Budget for FY26-28 as proposed in Case No.: NEPR-AP-2023-0003 LUMA Ex. 7.00 was based on eliminating the EV TOU rate pilot. If not confirmed, please explain why not.
- f. Please explain why LUMA's proposed budget for the Revised PR-EVAP does not reflect the Constrained Budget as proposed in Case No. NEPR-AP-2023-0003 LUMA Ex. 7.00 because the EV TOU Rate pilot will be eliminated.

#### RESPONSE

- a. LUMA's conclusion is that there is limited value in continuing the pilot. In its current form, data quality and quantity is limited and there is a lack of customer interest due to program constraints and low EV penetration on the island. Additionally, pausing the current pilot provides an opportunity to reassess and refine the EV TOU rate design based on lessons learned to date. This includes evaluating potential improvements such as adjusting the TOU charging window to better align with customer charging behaviors. This approach allows LUMA to balance fiscal responsibility with thoughtful program development, ensuring that any future EV TOU offering is better aligned with customer needs, system considerations, and long-term program objectives.
- b. Yes, LUMA can renew its contract with Weavegrid. However, LUMA's conclusion is that there is limited value in continuing the pilot for reasons listed above in answer a of this question.
- c. The cost would remain the same but there is little value in the pilot in its given form.
- d. LUMA is generally aware that some jurisdictions have implemented EV-related rate structures or charging incentives without relying on fully deployed advanced metering infrastructure (AMI).

However, these approaches are highly jurisdiction-specific and depend on factors such as local regulatory frameworks, market structure, data availability, customer penetration of enabling technologies, and utility system capabilities. As a result, the design and implementation of such programs vary significantly across jurisdictions. LUMA has not conducted a comprehensive, formal benchmarking analysis to identify and validate each jurisdiction offering EV TOU rates without advanced metering, nor to assess the transferability of those models to Puerto Rico. Accordingly, LUMA is unable at this time to provide a definitive or exhaustive list of jurisdictions where such rate structures are in place.

- e. Both LUMA's Optimal and Constrained Budget for FY26-28 as proposed in Case No.: NEPR-AP-2023-0003 LUMA Ex. 7.00 assumed eliminating the EV TOU rate pilot as LUMA has concluded that there is limited value in continuing the pilot, regardless of budget.
- f. LUMA decided to present the Optimal budget, not the Constrained budget, in the revision to the PR-EVAP as the Optimal Budget represents all the system funding needs, without funding constraints.

## Electric Vehicles

NEPR-MI-2021-0013

### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#009

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#### REQUEST

Refer to the smart charging and managed charging strategies under Action #3: EV Rates and Load Management of the Revised PR-EVAP.

- a. Can LUMA implement automated demand response, smart charging, and managed charging during FY26–28?
- b. Please explain why the billing system and technological limitations impacting the EV TOU rate will not also limit smart charging and managed charging deployment.
- c. Please describe specific outcomes expected from smart charging and managed charging strategies in FY26, FY27, and FY28.

#### RESPONSE

- a. No, LUMA will not implement automated demand response, smart charging, or managed charging during FY2026–FY2028.

To clarify, LUMA's role in these activities is centered on education, outreach, and support—not on direct implementation or leadership of these initiatives at this stage. The actions outlined in Action #3 of the Revised PR-EVAP, such as exploring partnerships, collaborating on advanced charging technologies, and researching managed charging programs, are intended to foster awareness, share best practices, and enable coordination with automakers and charging network providers. These industry players will lead the development and deployment of technologies and programs, while LUMA's responsibility is to provide guidance, facilitate stakeholder engagement, and ensure that grid considerations are understood and incorporated.

- b. Please see above for answer a of this question.
- c. LUMA has not defined specific outcomes or year-by-year deliverables associated with the implementation of smart charging or managed charging strategies for FY2026, FY2027, or FY2028.

## Electric Vehicles

NEPR-MI-2021-0013

## Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#010

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### REQUEST

Please explain how LUMA can currently offer the EV TOU rate without the required upgrades to the rate engine within LUMA's Customer Care & Billing System (CC&B), completion of advanced metering infrastructure (AMI) meter deployment, and adoption of a Meter Data Management System.

### RESPONSE

LUMA is currently able to offer the EV TOU rate by leveraging data from a third-party aggregator. Because LUMA does not yet have the necessary meter infrastructure to capture this data directly, the process is being handled manually within CC&B. This involves manually entering the rate in CC&B and performing calculations using both the original meter data and the third-party aggregator data.

As noted by LUMA during the Technical Conference on May 7, 2025, a Meter Data Management System (MDMS) that plugs into the billing system is critical and necessary to implement dynamic pricing such as TOU rates. Currently, MDMS is still in the procurement phase and several more months of contracts and general procurement processes are expected. Industry standard MDMS implementation takes up to 24 months to ensure proper integration and testing with the billing engine. Even with a standard 24-month MDMS implementation, LUMA's island wide installation and deployment of Automated Metering Infrastructure (AMI) is not scheduled to be completed until the end of calendar year 2028. It is highly recommended that AMI be fully deployed for all customers before moving to TOU rates to ensure fair access across LUMA's customer base.

At the May 7th Technical Conference, LUMA also clarified that an upgrade to the rate engine within the CC&B system would be needed to be able to implement TOU rates. While funding for this upgrade is requested in the current rate review, it would be highly unlikely and cost prohibitive to implement TOU rates before 2028. Additionally, LUMA faces challenges in reconfiguring the system from the way it is highly customized today. As a result, LUMA anticipates dynamic pricing options would not be available before the next rate case.

## Electric Vehicles

### NEPR-MI-2021-0013

#### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#011

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##### REQUEST

Refer to the estimated costs for FY26 in Table 2 on page 11 of the Revised PR-EVAP.

- a. How much has LUMA spent on the PR-EVAP during FY26?
- b. Are the FY26 costs in Table 2 in addition to what has been spent so far in FY26?

##### RESPONSE

- a. FY2026 PR-EVAP Expenditures to Date - As of the end of November 2025, LUMA has incurred a total of \$26,423.71 in costs associated with the Electric Vehicle Program.

However, program execution during FY2026 to date and part of FY2025 has been materially reduced due to the energy system financial constraints given chronic underfunding. These limitations have curtailed planned activities, delayed certain initiatives and restricted the ability to deploy resources at the originally anticipated scale. This dollar figure is not reflective of the program's planned level of activity or expected annual cost profile.

- b. The FY2026 cost estimates presented in Table 2 of the Revised PR-EVAP are not incremental to amounts already spent for the Electric Vehicle Program during FY2026. Rather, the costs shown in Table 2 reflect the total estimated FY2026 program costs, inclusive of expenditures incurred to date.

## Electric Vehicles

### NEPR-MI-2021-0013

#### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#012

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##### REQUEST

Refer to Table 2 on page 11 of the Revised PR-EVAP that proposes an annual budget of \$189,000 per year for Education and Outreach.

- a. Please confirm that LUMA plan to utilize education and outreach materials developed during the FY2026.
- b. Please explain why an annual budget of \$189,000 is required when LUMA only spent \$94,145 in FY2024 and \$64,563 in FY2025 according to PR-EVAP Second Semi-Annual Reports for FY2024 and FY2025, respectively.
- c. Please describe all the ways in which Education and Outreach efforts will differ from those conducted in the previous PR-EVAP.
- d. Please explain how education and outreach can benefit low-income customers.

##### RESPONSE

- a. Yes. LUMA plans to utilize and build upon the outreach and education materials developed during FY2026. These materials will serve as a foundation for continued engagement and will be updated or expanded as needed to reflect evolving program objectives, stakeholder feedback, and lessons learned from prior implementation periods.
- b. The proposed \$189,000 budget reflects a more complete and optimized implementation of education and outreach activities compared to prior years. The increased budget accounts for a full fiscal year execution, expanded scope, improved quality of materials, broader stakeholder engagement, and the resources necessary to meet program requirements more effectively.
- c. Education and outreach under the revised PR EVAP will be more structured, targeted, and scalable than in previous years. Efforts will shift from primarily introductory awareness to more tailored content addressing specific customer segments, municipalities, fleet operators, and community organizations. Outreach will also place greater emphasis on practical guidance, grid impacts, charging options, and integration with distributed energy resources, informed by prior program experience.
- d. Education and outreach can benefit low-income customers by increasing awareness of EV related programs, incentives, and cost saving opportunities. Clear, accessible information can help reduce barriers to participation, support informed decision making, and ensure that the benefits of transportation electrification, such as lower fuel and maintenance costs and improved resilience, are more equitably accessible across communities

## Electric Vehicles

### NEPR-MI-2021-0013

#### **Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#013**

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##### **REQUEST**

Please explain how quarterly meetings with Hawaiian Electric during the previous PR-EVAP informed the development of the Revised PR-EVAP.

##### **RESPONSE**

Quarterly meetings with Hawaiian Electric (HECO) during the prior PR-EVAP period provided LUMA with valuable insights into electric vehicle adoption initiatives implemented within another islanded utility system.

Through these discussions, LUMA gained an understanding of key challenges encountered by HECO in advancing EV adoption, as well as the strategies and program structures used to address those challenges. Topics discussed included HECO's experience with multiple EV-related TOU rate designs, public charging initiatives, and various incentive programs supporting EV adoption.

This knowledge transfer brings LUMA a better understanding of how certain elements of these initiatives could potentially be considered or adapted in the future, taking into account LUMA's own operational capabilities, system conditions, regulatory framework, and resource constraints. These exchanges supported informed planning and helped shape LUMA's assessment of practical considerations and emerging best practices relevant to the development of the Revised PR-EVAP, while recognizing that program implementation must be tailored to Puerto Rico's specific context.

# Electric Vehicles

## NEPR-MI-2021-0013

### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#014

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#### REQUEST

As part of the previous PR-EVAP, LUMA conducted fleet electrification surveys. Please explain how LUMA used responses and findings from those surveys to inform the actions and offerings in the Revised PR-EVAP.

#### RESPONSE

Responses received through the fleet electrification surveys conducted under the prior PR-EVAP provided LUMA with direct insight into stakeholder perspectives, enabling a clearer understanding of prevailing challenges, concerns, and expectations related to mobility electrification in Puerto Rico.

Survey feedback highlighted, among other themes, a strong interest in incentive-based programs and the development of charging infrastructure as key factors influencing fleet electrification decisions. These findings informed LUMA's understanding of market needs.

LUMA has not implemented additional programmatic measures beyond education and information-based initiatives. In response to survey findings, LUMA focused on expanding access to educational materials and outreach efforts through existing communication channels.

These efforts were intended to address informational gaps identified through the surveys while remaining aligned with available resources.

## Electric Vehicles

NEPR-MI-2021-0013

### Response: RFI-LUMA-MI-2021-0013-20260107-PREB-#015

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#### REQUEST

How does LUMA plan to address barriers to the electrifications of fleets in the Revised PR-EVAP?

#### RESPONSE

Under the Revised PR-EVAP, LUMA's role in addressing barriers to fleet electrification is primarily facilitative and informational.

LUMA will provide relevant and accessible information to organizations operating vehicle fleets to help them better understand the economic, operational, and environmental benefits associated with electric vehicle adoption. This includes sharing best practices related to fleet charging strategies, operational considerations, and general guidance to support informed decision-making.

In addition, LUMA will work collaboratively with its internal planning teams. This coordination is intended to support awareness of potential requirements and facilitate consideration of system improvements where warranted.

## Descripción General

El proceso de Nuevas Conexiones de Proyectos se compone de tres fases para conectar un cliente a la red eléctrica principal. Este proceso se aplica a nuevas conexiones de servicio y actualizaciones en conexiones de servicio existentes para clientes comerciales, gubernamentales y primarios.

Jan 22, 2026

### RC - TOMO IX: INFRAESTRUCTURA Y AMBIENTE REGLA 9.1.1

9:01 PM

#### Incluye, pero no se limita a:

- Infraestructura eléctrica a mantenerse y operarse por PREPA\LUMA.
- Instalación de bases de medidores de doscientos (200) A o bases múltiples de tres o más medidores.
- Servicios con tomas soterradas.
- Proyectos con carga de cincuenta (50) KVA o más.
- Proyectos afectados por servidumbres de la AEE o que propongan el uso o modificación de las mismas.
- Todos los servicios que requieran actualizaciones para servir al cliente.
- Servicios menores a 50KVA que no cuentan con la infraestructura adecuada.
  - Toda extensión que requiera registrar alguna nueva servidumbre en terreno privado.
  - Toda extensión de facilidades soterradas.
  - Todo trabajo que requiera la extensión de facilidades para cumplir con 3% de la caída de voltaje.
  - Cualquier evaluación que por su nivel de complejidad requiera coordinaciones mayores.

**Ejemplo:** No cumple con Ley ADA, no cumple con despeje en áreas urbanas, no se tenga definido los límites de los lotes, etc.

## Fase 1: Trámite Evaluación (NPC)

El proceso de evaluación es fundamental para el éxito de cualquier proyecto. Aquí identificamos el Punto de Conexión (POC) y los requerimientos necesarios al sistema. El objetivo es permitirle al proponente completar un diseño detallado con todos los requisitos.

## Fase 2: Trámite Endoso De Planos (NPC)

Verificar que el diseño sometido cumple con los reglamentos, manuales, código y leyes aplicables según requeridos en la Evaluación. Evaluando que se pueda ejecutar la construcción eléctrica.

## Fase 3: Trámite Inspección de la obra (NPC)

Administración y Fiscalización periódica de la construcción de obras eléctricas que realice un ingeniero, arquitecto o técnico especializado que para tales fines haya asignado la Autoridad (LUMA) o el inspector privado que haya designado el dueño del proyecto, para garantizar que fueron realizadas conforme a las leyes, reglamentos y normas para la construcción eléctrica y el Plano Vigente Endosado. Administrar, evaluar y aprobar toda la documentación requerida que aplique al Proyecto.

Esta parte del proceso consiste en verificar y aprobar la construcción de campo del desarrollador. Cualquier proyecto que el cliente solicite, la inspección debe tener un diseño avalado actual y válido. Una vez completada la inspección final el cliente está listo para ser conectado.

## ¿Cuándo revisar una evaluación o endoso por OGPE?

- Caducidad del plano endosado o evaluación (1 año)
- Solicitud de Cambio de punto de conexión y/o entrega
- Variación en la carga eléctrica
- Cambios durante la construcción

## Manual del cliente para nuevas conexiones de proyectos

### Fase 1: Trámite evaluación

1. Envíe la solicitud de su proyecto a través de OGPe Single Business Portal: [www.sbp.pr.gov](http://www.sbp.pr.gov)

#### Requisitos Básicos:

- Formulario Solicitud de Recomendación de Infraestructura (4375.001)
- Plano de situación de la obra proyectada georeferenciado en formato dxf o dwg.
- Memorial Explicativo indicando el alcance del proyecto en referencia con relación a la infraestructura, debe estar en formato PDF, conforme al plano de situación y al Formulario LUMA-SRI.
  - Identificar si fue previamente evaluado e incluir su # Proyecto
  - Proyectos por fase deberán incluir censo de carga por fase e itinerario de cargas
  - Incluir perfil de carga (Ej. Residencial, Comercial, Industrial, Turístico, híbrido, etc.)

### Fase 2: Trámite endoso de planos

1. Envíe la solicitud de su proyecto a través de OGPe Single Business Portal: [www.sbp.pr.gov](http://www.sbp.pr.gov)

#### Requisitos Básicos:

- Formulario Solicitud de Recomendación de Infraestructura (4375.001)
- Memorial Explicativo indicando el alcance del proyecto en referencia con relación a la infraestructura, debe estar en formato PDF, conforme al plano de situación y al Formulario LUMA-SRI.
- Certificación de Planos LUMA en su versión más actualizada. (4375.004)
- Archivo que contenga el diseño eléctrico geo-referenciado en formato DXF o DWG, dibujado a escala y orientado al norte.
- Planos para endoso; todas las hojas del plano deben tener NUEVO sello de Certificación de Diseñador en su versión más actualizada.
- Estampilla Digital Especial EDE.
- De ser necesario otras certificaciones, cómputos y cartas relevantes (ej. OEPPE, Recomendaciones de Medición, Certificación ROW)

### Fase 3: Trámite inspección de la obra

1. Notificación del Inicio de Construcción
  - El cliente debe enviar formulario de Solicitud de Inspección (4375.002) al email de Ingeniería de la región correspondiente 15 días laborables antes del inicio de la construcción.
2. Reunión de Pre-Construcción. (Asistencia requerida Inspector Privado, Contratista y representante del dueño)

#### Se discute y levanta minuta sobre los siguientes asuntos:

- Punto de Conexión
- Diseño
- Aportación (Entregar Carta para pago)
- Programa de Trabajo
- Identificar Trabajos cerca de Líneas Energizadas y aplicar Procedimiento TD-815
- Gestión para Equipo de Medición
- Información de Contacto (e-mail & Teléfonos) y Asistencia
- Proceso de Aprobación, Conexión, Endosos y Certificaciones.

#### Responsabilidades de las partes:

- Estimados a producirse
  - Pagos a realizarse (Estimados, Aportación, etc.)
  - Notificación de Excavaciones
  - Permisos de Excavaciones
  - Contrato para proyectos con servicio al por mayor
  - Tramites solicitar, instalar y alambrado de Equipos de Medición (Una vez solicitados los Equipos de medición por el contratista, tendrá 10 días para recogido en almacén)
- Otros L & P:
  - Permisos Condicionados
  - Modificación & Cancelaciones de Servidumbre
  - Servidumbres requeridas
  - Cesión Traspaso y Garantía

## Manual del cliente para nuevas conexiones de proyectos

### Fase 3: Trámite inspección de la obra (continuación)

#### 3. Pagos del Cliente o Contratista

- Aportación
- Estimados Extramuros (para garantizar una buena planificación recomendamos pagar estos trabajos adicionales a la brevedad posible) Interno (2 días KPI)
- Estimado POC
- Estimado Global (Si aplica)

#### 4. Informes Parciales o Finales (5días) Interno KPI

- Inspector Privado** envía Informe de Inspección de Obras (4375.005) al Técnico LUMA asignado al caso.
- Inspección LUMA** De haber deficiencias se genera reporte de deficiencias (4375.024) y se notifican mediante e-mail a todas las partes del Proyecto.
- Inspector Privado** Una vez corregidas contesta la corrección.
- Inspección LUMA:** Re-inspección de ser requerida.

#### Notas Importantes:

- Mensualmente se deberá someter un Informe de Inspección Parcial.
- Toda comunicación oficial del Proyecto se requiere copiar a todas las partes del Proyecto)
- Cualquier variación durante la construcción será requerido someter un As-built antes de energizar el Proyecto.
- Tramites de Constitución de Servidumbres o Cesión Traspaso y Garantía deberán completarse previo a la Conexión.
- Una vez la Etapa o la totalidad del Proyecto sea aprobada será referido para Conexión. La Carta de Endoso para tramites de Permiso de Uso será entregada y cargada al SRI vigente del Proyecto Endosado al Portal OGPe (SBP).
- Las Certificaciones Eléctricas serán entregadas una vez aprobada la etapa o Inspección final.
- Proyecto que requieran contrato al por mayor luego de completado el tramite de alambrado de Equipos de Medición, se realice inspección final y sea aceptada. Se le notificará al Equipo de Cuentas Claves LUMA para establecer los Requisitos para servicio nuevo al por mayor con el cliente.

## Información de contacto

### ARECIBO

(787) 521-5170

[Ingenieria.DistribucionArecibo@lumapr.com](mailto:Ingenieria.DistribucionArecibo@lumapr.com)

Edificio Regional Ave. Juan Rosado #196  
Arecibo, PR 00613

### MAYAGÜEZ

(787) 521-0930

[Ingenieria.DistribucionMayaguez@lumapr.com](mailto:Ingenieria.DistribucionMayaguez@lumapr.com)

Edificio Keller Calle McKinley #108 Esquina  
Calle Dr. Vadi, Mayagüez, PR 00680

### BAYAMÓN

(787) 521-1625

[Ingenieria.DistribucionBayamon@lumapr.com](mailto:Ingenieria.DistribucionBayamon@lumapr.com)

Carr. 174 Esquina Ave. Laurel Minillas, Bayamón, PR 00961

### SAN JUAN

(787) 521-6443

[Ingenieria.DistribucionSanJuan@lumapr.com](mailto:Ingenieria.DistribucionSanJuan@lumapr.com)

Carr. 8838 Km. 5.6 Monacillos, San Juan, PR 00926

### CAGUAS

(787) 521-7918

[Ingenieria.DistribucionCaguas@lumapr.com](mailto:Ingenieria.DistribucionCaguas@lumapr.com)

Carr. #1 Ave. José R. Mercado (final) Esquina Rafael  
Cordero, Caguas, PR 00726

### PONCE

(787) 521-5621

[Ingenieria.DistribucionPonce@lumapr.com](mailto:Ingenieria.DistribucionPonce@lumapr.com)

Centro del Sur Shopping Center  
Blvd Miguel A. Pou Int. Ave. Fagot, Ponce PR 00731





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### Executive Summary

Up-front purchase price is only part of the cost consumers pay to own their vehicle. Over the lifetime of a conventional gas-powered vehicle, fuel and maintenance costs can add up to even more than the original purchase price. While electric vehicles (EVs) typically have higher up-front purchase prices, they can save consumers a lot on operating expenses. This study relies on new data on electric vehicle depreciation rates and maintenance and repair costs, along with real world average vehicle prices, to estimate how much today's most popular EVs can save consumers when compared with similar ICE vehicles.

New data obtained by CR from ALG, a data and analytics subsidiary of automotive pricing and information website TrueCar, shows that when adjusted for federal purchase incentives, both battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) are expected to depreciate at the same rate as ICE vehicles in the same class over the first five years of ownership. In addition, new data extracted from recent Consumer Reports reliability surveys shows that both BEV and PHEV drivers are saving 50 percent on their repair and maintenance costs, when averaged over a typical vehicle lifetime.

Based on average driving habits, fuel costs for BEVs were estimated assuming mostly home charging and an estimated six fast-charging sessions required per year for BEVs with a range of 250 miles. Overall, BEVs were estimated to save consumers about 60 percent on fuel costs compared with the average vehicle in their class. Fuel costs were also analyzed by state, with the majority of states falling within 10 percent of the national average.

The nine most popular EVs on the market under \$50,000 were compared to (1) the best-selling, (2) the top-rated, and (3) the most efficient vehicles in their class. For six of the nine EVs analyzed, the first-owner ownership costs are estimated to be lower than those of all three comparable ICE vehicles in their class. For all nine EVs analyzed, the first-owner ownership costs are estimated to be lower for at least one of the three comparable ICE vehicles. In many cases, the EVs matched or exceeded the performance of some of the top-performing ICE vehicles in their class. For all EVs analyzed, the lifetime ownership costs were many thousands of dollars lower than all comparable ICE vehicles' costs, with most EVs offering savings of between \$6,000 and \$10,000. While new EVs were found to offer significant cost savings over comparable ICE vehicles, the cost savings of 5- to 7-year-old used EVs was found to be two or three times larger on a percentage savings basis.

Overall, these results show that the latest generation of mainstream EVs typically cost less to own than similar gas-powered vehicles, a new development in the automotive marketplace with serious potential consumer benefits.

## Key Terms

**Battery electric vehicle (BEV):** A vehicle that operates only on electric power.

**Depreciation:** The portion of the initial value of an asset (such as a vehicle) that has been lost after a given amount of time. Depreciation is the inverse of the *residual value*.

**Discount rate:** An interest rate used for discounting future income and expenditures relative to the present value.

**Electric vehicle (EV):** A vehicle capable of operating on electricity only for an extended period of time. Includes battery electric vehicles, plug-in hybrid electric vehicles and fuel cell electric vehicles<sup>1</sup>.

**Internal combustion engine vehicle (ICE):** A conventional vehicle fueled only by gasoline.

**Plug-in hybrid electric vehicle (PHEV):** A vehicle that can operate on either electricity or gasoline.

**Present value (PV):** A sum of future income and expenditures discounted to current year using a discount rate to take into account the fact that costs and expenditures further into the future have a lower value in the present.

**Residual value:** The portion of the original purchase price of a vehicle remaining after a certain number of years. Residual value is the inverse of *depreciation*.

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<sup>1</sup> There are currently no high-volume mainstream fuel cell electric vehicles.

## **Chapter 1—Resale Value: Long-Range Electric Vehicles Expected to Hold Value As Well As Internal Combustion Engine Vehicles**

### **Introduction**

The electric vehicle market is rapidly changing, largely because the cost of batteries has decreased dramatically over the past decade.<sup>2</sup> One of the most significant changes is extended driving range. The 2011 Nissan Leaf, for example, had a single-charge range of only 73 miles, whereas the 2019 version had three times that range, at 226 miles. As of model year 2020, at least 11 electric vehicles on the market have a range of 200 miles or more. This sharp improvement in range delivers far more utility for many consumers.

This increased utility is likely to be reflected in higher resale values for the current model year of the Leaf and other higher-range EV models. The purposes of this chapter are to test this hypothesis and estimate how the values of these electric vehicles will hold up over time. The analysis relies on data from proprietary algorithms developed by ALG based on real-world vehicle transaction prices adjusted by CR to account for government purchase incentives.

### **Key Findings**

- Current longer-range battery electric vehicles (BEVs) are expected to maintain their value about as well as comparable internal combustion engine (ICE) vehicles, on average, over the next five years.
- Plug-in hybrid electric vehicles (PHEVs) are expected to hold their value about as well as conventional hybrids of the same vehicle class, on average, over the same period.

### **Approach**

ALG, a data and analytics subsidiary of automotive pricing and information website TrueCar provided CR with projected residual values of all model year 2019 vehicles after five years of ownership as a percentage of the average original price for each model. These projections were made using proprietary algorithms and data from millions of real-world new and used vehicle transactions.

These residual value estimates were then adjusted to take into account the effect of purchase incentives available at the state and federal level on the original price of battery electric and plug-in electric vehicles. This was necessary because the net price after incentives represents

---

<sup>2</sup> <https://www.bloomberg.com/news/articles/2020-03-17/an-economic-crash-will-slow-down-the-electric-vehicle-revolution-but-not-for-long>

the true price paid by consumers for these vehicles, and it is expected that both the new- and used-car markets will reflect the availability of these incentives.

ALG provided estimates of residual values based on the month of purchase, and the data were updated every two months throughout the year, resulting in six data points per year. Because incentives were phased out for some automakers—General Motors and Tesla, for example—at different points throughout the year, the incentives were applied only for the months in which they were offered, and the resulting residual values were averaged across the six data points for each vehicle for the year.

The value of the federal tax credit for each vehicle model was taken from [fueleconomy.gov](https://www.fueleconomy.gov).<sup>3</sup> For state incentives, a weighted average incentive for all BEVs was derived by multiplying the percentage of EV sales in 2019 in a given state<sup>4</sup> by the value of the state purchase incentive for BEVs.<sup>5</sup> Ten states provided purchase incentives for BEVs in 2019, and those states accounted for 65 percent of national EV sales. From this, it was calculated that, on average, BEV vehicles sold in 2019 each received \$1,400 in state purchase incentives. Because vehicles are often sold across state lines, we used this weighted average to approximate the effect of state incentives on the overall market. State tax credits were not calculated for PHEVs because of the complexity of how different state incentives apply to different specific PHEV models based on battery size.

### Detailed Results

Electric vehicles were grouped into different segments, based on range and price, for analysis. Vehicles were segmented by whether they were classified as luxury or mainstream by TrueCar, and the mainstream EVs were divided by range: greater than 200 miles, between 100 and 200 miles, and under 100 miles. All luxury BEVs had a range of over 200 miles.

Table 1.1 shows a summary of the predicted five-year residual values for each category, with different levels of adjustment (adjusted for federal tax credit, and adjusted for both federal and state tax credits). These values are then compared with the predicted average residual values for comparable conventional internal combustion engine (ICE) vehicle segments. The residual values in the table represent the portion of the effective initial purchase price that is retained after five years of ownership, which is the inverse of depreciation. For example, a residual value of 0.45 indicates that the vehicle has depreciated by 55 percent.

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<sup>3</sup> <https://www.fueleconomy.gov/feg/taxevb.shtml>.

<sup>4</sup> <https://www.atlasevhub.com/materials/state-ev-sales-and-model-availability>.

<sup>5</sup> <https://afdc.energy.gov/laws/state>.

The data show that with the exception of mainstream BEVs with less than 100 miles of range, all EV categories are expected to hold their value approximately as well as comparable internal combustion engine vehicles.

It should be noted that every vehicle in the under-100-mile category is a low-volume car with sales of less than 1,000 units in 2019<sup>6</sup> and available only in states with zero-emissions vehicle mandates. This indicates that these vehicles were likely sold largely for compliance reasons, not as mass-market vehicles that were compelling to a broad cross-section of consumers.

**Table 1.1.** Average Predicted 5-Year Residual Values for EVs Compared with ICE Vehicles

| <b>EV/PHEV Category</b>                 | <b>Adjusted for Federal Tax Credit</b> | <b>Adjusted for Federal and State Tax Credits</b> | <b>Comparable ICE</b> | <b>ICE Segment Comparison</b>              |
|-----------------------------------------|----------------------------------------|---------------------------------------------------|-----------------------|--------------------------------------------|
| Luxury EV (n=6)                         | 0.47                                   | 0.48                                              | 0.46                  | Luxury car, luxury SUV, luxury performance |
| Mainstream 200-plus-mile range (n=4)    | 0.44                                   | 0.46                                              | 0.45                  | Compact car                                |
| Mainstream 100- to 200-mile range (n=4) | 0.43                                   | 0.45                                              | 0.45                  | Compact car                                |
| Mainstream <100-mile range (n=3)        | 0.28                                   | 0.29                                              | 0.36                  | Subcompact car                             |
| PHEV (n=12)                             | 0.47                                   |                                                   | 0.48                  | Hybrid                                     |
| Luxury PHEV (n=10)                      | 0.43                                   |                                                   | 0.45                  | Luxury hybrid                              |

<sup>6</sup> <https://insideevs.com/news/343998/monthly-plug-in-ev-sales-scorecard>.

The predicted residual data adjusted for federal tax credits are also shown as a scatter plot of all vehicles in each category in Figure 1.1. ICE values are shown for comparison as the average (represented by ◆), +/- one standard deviation (+ and - symbols), and +/- two standard deviations (\*) by combining the compact car, midsize car, and compact-utility categories. This illustrates that, like ICE vehicles, not all EVs are expected to hold their value the same, and that other vehicle- and manufacturer-specific factors, such as style, features, reliability, and manufacturer reputation, still affect the relative depreciation of different vehicles.



**Figure 1.1.** Scatter Plot of Predicted 5-Year Residual Values for EVs by Type and Range Adjusted for Federal Tax Credit

## Chapter 2—Maintenance: EVs Cost Half as Much to Maintain

### Introduction

Electric vehicles (EVs) are generally expected to cost less to maintain because their electric motors and other drivetrain components have fewer moving parts than internal combustion engines, and they don't require fluid changes.<sup>7</sup> However, because EVs are relatively new, little hard data are available to put numbers to these claims, and most estimates in the literature are based on predicted repair and maintenance costs.<sup>8</sup> However, each year CR surveys hundreds of thousands of our members about the reliability and maintenance costs of their vehicles. In recent years this survey sample has included more and more electric vehicles, including thousands of both battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). This data was analyzed to estimate average real-world repair and maintenance costs for BEVs, PHEVs, and internal combustion engine (ICE) vehicles.

### Key Findings

- Analysis of real-world maintenance and repair cost data from thousands of CR members shows that BEV and PHEV owners are paying half as much as ICE owners are paying to repair and maintain their vehicles.

### Approach

Data for this analysis came from Consumer Reports' 2019 and 2020 spring reliability surveys.<sup>9</sup> This comprehensive survey is sent to hundreds of thousands of CR members and is used as the basis for CR's reliability ratings. Among many other questions, individual drivers are asked to estimate how much they spent on repairing and maintaining their vehicle over the past 12 months, as well as how many miles they drove in the past 12 months, and how many total miles their vehicle has on it.

The data were filtered to remove:

- Incomplete responses.
- Vehicles that reported traveling less than 2,000 miles in the past 12 months.
- Vehicles that reported traveling more than 60,000 miles in the past 12 months.
- Vehicles that reported maintenance costs of over \$20,000 over the past 12 months.
- Vehicles with more than 200,000 total miles.

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<sup>7</sup> <https://www.consumerreports.org/hybrids-evs/your-ev-questions-answered-electric-vehicle-faq/#reliable>

<sup>8</sup> [https://theicct.org/sites/default/files/publications/EV\\_cost\\_2020\\_2030\\_20190401.pdf](https://theicct.org/sites/default/files/publications/EV_cost_2020_2030_20190401.pdf)

<sup>9</sup> <https://www.consumerreports.org/car-reliability-owner-satisfaction/consumer-reports-car-reliability-faq/>

These filters on the data were used to eliminate outliers and keep the sample within the range of reasonably likely consumer experience while retaining as much of the original data set as possible. While 60,000 miles is a lot of driving for one year, it's within the range of possibilities for, for example, a salesman with a large territory, or someone who drives full-time for a ride-hailing company, such as Uber or Lyft. Similarly \$20,000 is a lot to spend on vehicle repairs but may represent the cost of major repairs on a luxury vehicle.

The final data set was then sorted by total vehicle mileage. Average maintenance costs were estimated in three mileage bins: 0 to 50,000 miles, 50,000 to 100,000 miles, and 100,000 to 200,000 miles. For each bin, a vehicle-miles-traveled (VMT) weighted average repair and maintenance cost per mile was calculated. To account for any bias in the data based on the brands of vehicles purchased by CR members, for ICE vehicles the estimates were reweighted based on calculated average maintenance costs for each automaker and the average market share over the past five years for each brand, using data from auto industry analyst Wards Intelligence.<sup>10</sup> The sample size for PHEVs and BEVs was not large enough to do a similar automaker weighted average calculation, but for ICE vehicles the difference between the automaker weighting and the total average sample for each mileage bin was negligible.

### Detailed Findings

The results of the analysis are shown in Table 2.1, binned by mileage range and averaged over a 200,000-mile vehicle lifetime. Notable results are that estimated lifetime average repair and maintenance costs for BEVs and PHEVs are approximately half the cost for ICE vehicles. This is generally consistent with other sources that have estimated the relative repair and maintenance costs of EVs at 40 percent<sup>11</sup> and 47 percent.<sup>12</sup>

The data show that repair and maintenance costs are slightly higher for PHEVs than for BEVs until the 100,000-mile mark, and slightly lower beyond 100,000 miles. It should be noted, however, that there is a higher degree of uncertainty in these numbers because of a lower sample size: A little over 200 PHEV vehicles with more than 100,000 miles, and only 55 BEVs. Furthermore, the 55 BEVs with more than 100,000 miles were predominantly early versions of the Nissan Leaf and Tesla Model S, suggesting that our projections may overestimate the long-term maintenance costs expected from current-generation BEVs as automakers learn from their early models. These estimates will continue to be refined over the next few years as more data

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<sup>10</sup> Wards Intelligence, U.S. Vehicle Sales by Company, 2015-2019 data series.  
<https://wardsintelligence.informa.com/WI060875/US-Vehicle-Sales-by-Company-20152019>.

<sup>11</sup> <https://neo.ubs.com/shared/d1ZTxnvF2k>.

<sup>12</sup>

[https://www.2degreesinstitute.org/reports/comparing\\_fuel\\_and\\_maintenance\\_costs\\_of\\_electric\\_and\\_gas\\_powered\\_vehicles\\_in\\_canada.pdf](https://www.2degreesinstitute.org/reports/comparing_fuel_and_maintenance_costs_of_electric_and_gas_powered_vehicles_in_canada.pdf).

on more electric vehicles at higher mileages become available in Consumer Reports' survey sample.

**Table 2.1.** Estimated Per-Mile Repair and Maintenance Costs by Powertrain

| Powertrain Type | 0-50K Miles | 50K-100K Miles | 100K-200K Miles       | Lifetime Average |
|-----------------|-------------|----------------|-----------------------|------------------|
| BEV             | \$0.012     | \$0.028        | \$0.043 <sup>13</sup> | \$0.031          |
| PHEV            | \$0.021     | \$0.031        | \$0.033 <sup>5</sup>  | \$0.030          |
| ICE             | \$0.028     | \$0.060        | \$0.079               | \$0.061          |

The results are put into the context of consumer budgets in Table 2.2, which shows the lifetime repair and maintenance costs for vehicles of the different powertrain types. They show that BEVs and PHEVs will both cost consumers about \$4,600 less to repair and maintain over their lifetimes, compared with ICE models when discounted to the present value.

**Table 2.2.** Lifetime Maintenance Costs by Powertrain<sup>14</sup>

| Powertrain Type | Lifetime Maintenance and Repair Cost | Lifetime Savings vs. ICE |
|-----------------|--------------------------------------|--------------------------|
| ICE             | \$9,200                              |                          |
| BEV             | \$4,600                              | \$4,600                  |
| PHEV            | \$4,600                              | \$4,600                  |

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<sup>13</sup> Lower confidence in this value because of the small sample size.

<sup>14</sup> Present value at 3 percent discount rate in 2019 dollars over a 200,000-mile lifetime.

## Chapter 3—Fuel Costs: No More Trips to the Gas Station

### Introduction

Home charging has the potential to provide several benefits for consumers, one of which is simply the convenience of not needing to stop at a gas station multiple times per month. Further, charging a BEV at home is much less expensive than paying for gasoline. Longer trips will still require occasional stops at stations equipped with DC fast chargers—or Superchargers, as Tesla calls them<sup>15</sup>—which can recharge your battery in 30 to 45 minutes, or about the time it takes to eat a quick meal.<sup>16</sup> This chapter estimates how much of a consumer's typical charging can be done at home vs. on the road at a DC fast-charging station. Then it estimates the total fuel cost savings a consumer can expect for different classes of BEVs compared with internal combustion engine vehicles.

### Key Findings

- EV owners will spend 60 percent less to fuel their vehicle.
- While there is variability among states because of differing gasoline and electricity prices, electric vehicle drivers will save on fuel in every state, with consumers in the majority of states saving within 10 percent of the national average savings.
- Owners of BEVs with a range of 250 miles or greater will be able to do 92 percent of their charging at home, requiring only six stops at a DC fast-charging station per year.

### Approach

The first step in this analysis was determining what fraction of a consumer's charging could typically be done at home. One commonly used approach is to calculate what's called a utility factor, which is an estimate of the fraction of total miles driven by a typical driver that could be completed by an EV that charges only at home once a day. Using data from over 100,000 consumer trips, researchers at the Argonne National Laboratory developed an equation for a BEV utility factor as a function of that EV's range.<sup>17</sup> The utility factors calculated by ANL are shown in Table 3.1.

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<sup>15</sup> <https://www.tesla.com/supercharger>.

<sup>16</sup> <https://www.consumerreports.org/hybrids-evs/electric-car-charging-network-is-expanding>.

<sup>17</sup> Duoba, M., "Developing a Utility Factor for Battery Electric Vehicles," *SAE Int. J. Alt. Power.* 2(2):362-368, 2013 (<https://doi.org/10.4271/2013-01-1474>).

These numbers were then adjusted to account for the fact that consumers are unlikely to drive their BEV until its charge is fully depleted. Using a safety factor of 20 percent, we determined the number of trips to a public charging station required for every 15,000 miles of driving.<sup>18</sup>

**Table 3.1** BEV Utility Factor as a Function of BEV Range

| BEV Range | Utility Factor | Percentage of Charging at Home <sup>19</sup> | Estimated DC Fast-Charging Sessions for 15K Miles <sup>20</sup> |
|-----------|----------------|----------------------------------------------|-----------------------------------------------------------------|
| 100       | 78%            | 70%                                          | 56                                                              |
| 150       | 88%            | 84%                                          | 20                                                              |
| 200       | 92%            | 89%                                          | 11                                                              |
| 250       | 95%            | 92%                                          | 6                                                               |
| 300       | 96%            | 94%                                          | 4                                                               |

To estimate charging expenses, costs were split between home charging and public DC fast charging (DCFC) based on the figures in Table 3.1.<sup>21</sup> Home charging costs were taken from the Energy Information Administration's (EIA) Annual Energy Outlook (AEO) 2020 baseline scenario.<sup>22</sup> State-by-state charging costs were also estimated, but the AEO does not project state-level costs, so average residential electric costs were drawn from the EIA State Energy Data System over the past five years (2014 to 2018) of data that were available.<sup>23</sup> For the cost of DC fast chargers, a value of 40 cents per kilowatt-hour was used, based on data from multiple sources.<sup>24</sup> The same methodology and EIA sources were used for both national and state gasoline prices for comparison with ICE fueling costs.

<sup>18</sup> Approximately the average annual distance driven over the first seven years of a vehicle lifetime for an SUV or crossover. Cars tend to be driven slightly fewer miles and pickup trucks slightly more. National Highway Traffic Safety Administration Final Regulatory Impact Analysis, Table VI-212 ([https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final\\_safe\\_fria\\_web\\_version\\_200701.pdf](https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final_safe_fria_web_version_200701.pdf)).

<sup>19</sup> Assumes a 20 percent safety factor. For example, a 100-mile range is treated as effectively an 80-mile range for the purposes of this calculation.

<sup>20</sup> Number of sessions is calculated by dividing the number of miles needing public charging by 80 percent of the range of the vehicle, assuming consumers charge up 80 percent of their total range at each charging stop.

<sup>21</sup> This analysis assumes that consumers do not opportunistically take advantage of the over 15,000 free Level 2 chargers that are available around the country (<https://www.ucsusa.org/sites/default/files/attach/2017/11/cv-report-ev-savings.pdf>).

<sup>22</sup> <https://www.eia.gov/outlooks/aeo>.

<sup>23</sup> <https://www.eia.gov/state/seds/seds-data-complete.php?sid=US#PricesExpenditures>.

<sup>24</sup> Union of Concerned Scientists found the majority of DCFCs cost between 36 cents and 48 cents per kilowatt-hour (<https://www.ucsusa.org/sites/default/files/attach/2017/11/cv-report-ev-savings.pdf>). NREL found an average cost of 35 cents/kWh (<https://www.nrel.gov/docs/fy19osti/72326.pdf>). Tesla DCFC costs 28 cents/kWh (<https://www.tesla.com/support/supercharging>). Elektrek estimate of 41 cents/kWh (<https://electrek.co/2019/08/12/kwh-pricing-ev-drivers-miss-benefits>).

For comparison, average vehicle efficiency levels were assumed for each of three vehicle classes (car, crossover/SUV,<sup>25</sup> and pickup). Efficiency levels for ICE vehicles were taken from the 2020 Environmental Protection Agency trends report for model year 2019 vehicles.<sup>26</sup> These efficiencies were then adjusted to increase them to account for the increase in fuel-economy standards between 2019 and 2020.<sup>27</sup> For BEVs an average efficiency level was calculated for cars based on the average efficiency of the seven BEV cars available on the market with at least 150 miles of range and costing less than \$100,000.<sup>28</sup> Efficiency levels for BEVs in other classes were estimated by assuming the same relative efficiency for BEVs as ICE vehicles between classes.<sup>29</sup> The efficiencies used in the analysis are shown in Table 3.2.

**Table 3.2.** Average Vehicle Efficiencies by Vehicle Class

| Class         | Electric Efficiency (MPGe <sup>30</sup> ) | Gasoline Efficiency (mpg) |
|---------------|-------------------------------------------|---------------------------|
| Car           | 120                                       | 32                        |
| Crossover/SUV | 97                                        | 24                        |
| Pickup        | 76                                        | 20                        |

### Detailed Findings

For analysis in this chapter, a single standard-range EV was selected for estimation of charging costs. Based on the best-selling EVs on the market, a value of 250 miles was selected for the range. The numbers in Table 3.1 may help explain why many automakers are targeting EVs with a range of around 250 miles per charge. At that range, even with a 20 percent safety factor, a typical consumer could do 92 percent of their driving with home charging and would require an average of only six stops at a fast charger per year. This compares with around 40 stops at gas

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<sup>25</sup> Utility includes both crossovers and SUVs, given the difficulty in clearly differentiating these two vehicle classes.

<sup>26</sup> The utility class is based on a sales weighted average of the “car SUV” and “truck SUV” classes defined by EPA (<https://www.epa.gov/automotive-trends/explore-automotive-trends-data#DetailedData>).

<sup>27</sup> Based on the current Corporate Average Fuel Economy (CAFE) and greenhouse gas standards, an estimated improvement of 4 percent improvement in car fuel economy and 1.7 percent improvement in light truck fuel economy was required for model year 2020 as compared with model year 2019. Based on analysis from:

<https://advocacy.consumerreports.org/wp-content/uploads/2019/08/The-Un-SAFE-Rule-How-a-Fuel-Economy-Rollback-Costs-Americans-Billions-in-Fuel-Savings-and-Does-Not-Improve-Safety-2.pdf>.

<sup>28</sup> Tesla Model 3, Tesla Model S, Nissan Leaf, Chevrolet Bolt, Hyundai Ioniq, Hyundai Kona, and Kia Niro.

<sup>29</sup> This assumption was tested by calculating the ratio of the efficiency of Tesla Model 3 and Model S (car) to the Model Y and Model X (utility), and the results were found to be within a few percentage points of each other for both vehicle classes.

<sup>30</sup> Miles-per-gallon equivalent.

stations every year for the same driving distance in an ICE vehicle. Moving from 250 to 300 miles of range per charge adds 20 percent to the cost, weight, and volume of batteries but reduces the percentage of total annual miles that require public charging by only 2 percent. At ranges below 200 miles per charge, the number of annual charging trips for the typical driver increases much more quickly, potentially indicating why earlier, lower-range EVs were less popular.

The estimated fuel savings a consumer will experience from buying an EV is illustrated in Figures 3.1 to 3.3. Figure 3.1 shows the fuel cost for ICE vehicles compared with BEV vehicles over 15,000 miles, the approximate average annual mileage for owners of new vehicles.<sup>31</sup> This shows that even factoring in some charging at relatively expensive DC fast chargers, BEVs are expected to cost about 60 percent less to fuel than comparable ICE vehicles, resulting in \$800 to \$1,300 in annual savings, depending on vehicle class.

**Figure 3.1.** Estimated Fuel Cost for 15,000 Miles by Vehicle Class

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<sup>31</sup> Based on recent NHTSA VMT schedules. See Tables VI-212-214 ([https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final\\_safe\\_fria\\_web\\_version\\_200701.pdf](https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final_safe_fria_web_version_200701.pdf)).

Figures 3.2 and 3.3 are based on a discounted cash-flow analysis<sup>32</sup> of typical vehicles over the first ownership period<sup>33</sup> and vehicle lifetime.<sup>34</sup> These values represent the present value (at the time of purchase) of future fuel savings from the vehicle.

A number of sensitivities were run with different gas-price assumptions, which are detailed in Appendix A. Even at fairly low gas prices, BEVs offer very large savings over comparable ICE vehicles in all classes. Using the EIA's low-gas-price scenario, which projects an average gas price of \$2.33 per gallon over the next 10 years, consumers can still expect to save around one-third of their fuel costs. However, the recent history of gas prices and economic activity indicates that dramatic gas-price declines during challenging economic times tend to be relatively short-lived, while most new vehicles last 15 to 20 years.<sup>35</sup> Because a return to gas prices closer to what we have experienced over the past decade is likely over the next year or two, as the economy recovers from its current downturn, consumers are likely to save a lot more over the first seven years and lifetime of the vehicle than estimated assuming using today's fuel prices.

Another thing to note is that gasoline and electricity prices can vary significantly from state to state. We analyzed costs by state; the results are summarized in Appendix B. This analysis showed that the fuel savings for EVs for 48 of the 50 states were within 30 percent of the average, with the majority of states falling within 10 percent of the average. The only two states outside of the 30 percent range were Oregon and Washington, where consumers who switch to a BEV can expect to see increased savings of 32 percent and 38 percent, respectively, compared with the national average. The high savings in these states result from a combination of higher-than-average gas prices and lower-than-average electricity prices because of the abundance of cheap hydropower in the Pacific Northwest.

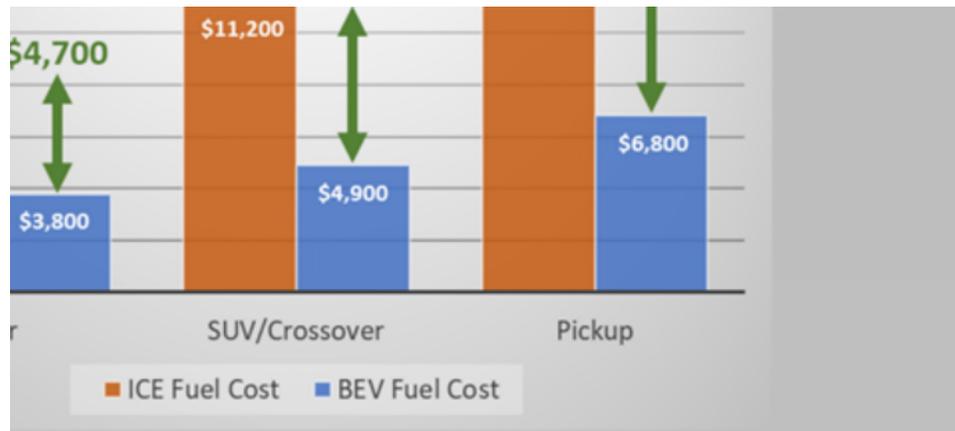
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<sup>32</sup> Present value at a 3 percent discount rate in 2019 dollars.

<sup>33</sup> Assumed to be seven years, based on data from IHS Markit ([https://news.ihsmarket.com/prviewer/release\\_only/slug/automotive-vehicles-getting-older-average-age-light-cars-and-trucks-us-rises-again-201](https://news.ihsmarket.com/prviewer/release_only/slug/automotive-vehicles-getting-older-average-age-light-cars-and-trucks-us-rises-again-201)).

<sup>34</sup> VMT schedules in Tables VI-212-214. Survival weighted average lifetime mileage in Table VI-219. Lifetime miles rounded down to 200,000 for all vehicle classes from 210,000 for cars and 230,000 for light trucks ([https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final\\_safe\\_fria\\_web\\_version\\_200701.pdf](https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final_safe_fria_web_version_200701.pdf)).

<sup>35</sup> Antonio Bento, Kevin Roth, Yiou Zuo, "Vehicle Lifetime Trends and Scrappage Behavior in the U.S. Used Car Market" (Jan. 18, 2016). Available at [http://faculty.sites.uci.edu/kevinroth/files/2011/03/Scrappage\\_18Jan2016.pdf](http://faculty.sites.uci.edu/kevinroth/files/2011/03/Scrappage_18Jan2016.pdf).



**Figure 3.2.** Discounted First Owner Fuel Costs for Average BEV and ICE by Vehicle Class<sup>36</sup>

**Figure 3.3.** Discounted Lifetime Fuel Costs for Average BEV and ICE by Vehicle Class<sup>37</sup>

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<sup>36</sup> Present value at 3 percent discount rate 2019 dollars for the first seven years and 200,000-mile, 15-year lifetime.

<sup>37</sup> Present value at 3 percent discount rate 2019 dollars for the first seven years and 200,000-mile, 15-year lifetime.

## **Chapter 4—Current EV Ownership Costs: Adding Up the Savings**

### **Introduction**

This section applies the findings of the previous three chapters to estimate the relative ownership costs of currently available battery electric vehicles, plug-in hybrid electric vehicles, and comparable internal combustion engine vehicles.

While EVs save consumers money through lower fuel and maintenance costs, most EVs on the market today are priced higher than most comparable ICE models in their class, even after accounting for federal purchase incentives. So this chapter compares the most popular EVs (both BEVs and PHEVs) that consumers can buy today with the best-selling, top-rated, and most efficient non-EVs in their class to determine whether, on net, EVs will save consumers money. It also compares high-performing EVs with the least expensive ICE vehicle in their class that achieves the same 0-to-60-mph acceleration performance to understand the value that certain EVs may provide to the subset of consumers who place value on performance.<sup>38</sup>

### **Key Findings**

- Seven of the nine most popular EVs on the market cost first-time owners less than the best-selling, and top-rated ICE vehicles in their class, in many cases matching or exceeding the performance of some of the top-performing ICE vehicles in their class.
- Lifetime ownership costs for all nine of the most popular EVs on the market under \$50,000 are many thousands of dollars cheaper than the best-selling and top-rated ICE vehicles in their class, with typical savings ranging between \$6,000 and \$10,000.

### **Approach**

This analysis focuses on model year 2020 and 2021 BEVs and PHEVs. It brings together depreciation, financing, fuel, and repair and maintenance costs, and compares them with similar ICE vehicles. It does not include other vehicle ownership costs, such as sales or property taxes, registration fees, and insurance. These costs are also important, but they vary much more by location and driver demographics and history, and are more challenging to generalize. Furthermore, the cost of installing a home Level 2 charger is also not included. Common chargers cost between \$300 and \$700, with an additional \$750 for installation if a 240v outlet is

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<sup>38</sup> In our 2019 fuel economy survey, only 12 percent of consumers said that performance was one of the top three attributes they wanted to see improved in their current vehicle as compared to 37 percent who wanted better fuel economy and 26 percent who wanted lower maintenance costs.  
<https://advocacy.consumerreports.org/wp-content/uploads/2019/08/Consumer-Reports-Fuel-Economy-Survey-Report-2019-1.pdf>.

not available.<sup>39</sup> This is not an insignificant cost, and it will have to be factored into a purchasing decision, but it is a one-time cost that will not have to be repeated for future BEV purchases. Furthermore, many utilities offer rebates to help reduce the cost of installing an EV charger, and there is a 30 percent federal tax credit on the purchase and installation of home EV chargers.<sup>40</sup> Also, most PHEVs have small enough batteries that they can often be charged directly from a standard wall outlet and don't require a special charger.<sup>41</sup>

The EVs included in this analysis were selected based on popularity and price. They fall into a few categories: BEVs and PHEVs that sold at least 10,000 units in 2019,<sup>42</sup> recently released EV models (Tesla Model Y and Ford Escape PHEV), and models that are expected to arrive in dealerships within two months and can currently be ordered (Ford Mach E and Toyota RAV4 Prime). A price cap of \$50,000 was also applied, which eliminated Tesla's Model X and Model S. This left five BEVs and four PHEVs. These vehicles were then sorted into five vehicle classes: hatchbacks, sedans, crossovers, luxury sedans, and luxury crossovers.

For each category, four comparable ICE vehicles were selected. For each vehicle class, three vehicles were selected: the most efficient ICE vehicle, the best-selling ICE vehicle, and the top-rated by Consumer Reports. Furthermore, all five BEVs and one PHEV had near-class-leading acceleration performance. To account for this, these vehicles were also matched against a fourth vehicle, an ICE vehicle selected as having similar 0-to-60-mph acceleration performance. For all vehicles the lowest trim was selected for comparison, except for the performance category, where specific trims were selected to find the lowest-cost vehicle in the class that matched the EV performance level. A summary of the vehicles selected for analysis is shown in Table 4.1. Detailed characteristics of the individual vehicles can be found in Appendix C.

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<sup>39</sup> <https://www.consumerreports.org/hybrids-evs/how-to-choose-the-best-home-wall-charger-for-your-electric-vehicle/>

<sup>40</sup> <https://www.chargepoint.com/incentives/home>.

<sup>41</sup> <https://www.energy.gov/eere/electricvehicles/charging-home#:~:text=Level%201%20adds%20about%202,even%20some%20all%20Delectric%20vehicles>.

<sup>42</sup> <https://insideevs.com/news/343998/monthly-plug-in-ev-sales-scorecard>.

**Table 4.1.** Summary of Vehicles Selected for Analysis and Comparison

| Vehicle Category | Hatchback                 | Sedan               | Crossover                             | Luxury Sedan      | Luxury Crossover |
|------------------|---------------------------|---------------------|---------------------------------------|-------------------|------------------|
| BEV              | Chevy Bolt<br>Nissan Leaf |                     | Ford Mach E                           | Tesla Model 3     | Tesla Model Y    |
| PHEV             | Toyota Prius Prime        | Honda Clarity       | Ford Escape PHEV<br>Toyota RAV4 Prime |                   |                  |
| Most Efficient   | Toyota Prius              | Toyota Camry Hybrid | Toyota RAV4 Hybrid                    | Lexus LS 300h     | Lexus NX300h     |
| Best-Selling     | Honda Civic Hatchback     | Toyota Camry        | Toyota RAV4                           | N/A <sup>43</sup> | Lexus RX350      |
| Top-Rated        | Hyundai Elantra GT        | Subaru Legacy       | Mazda CX5                             | Audi A4           | Infinity QX50    |
| Performance      | VW Golf GTI               |                     | Mazda CX5 GTR Turbo                   | BMW 330i          | BMW x3 m40i      |

All ownership costs were calculated as a present value at a discount rate of 3 percent. Costs were calculated separately as capital costs (depreciation and financing) and operating and maintenance (O&M) costs (fuel and repair and maintenance). Ownership costs were calculated for two time periods: the first ownership period and vehicle lifetime. For the first owner an ownership period of seven years was used.<sup>44</sup> For lifetime costs a total lifetime mileage of 200,000 miles was used.<sup>45</sup> For all ownership periods the VMT-per-year figure was determined using the National Highway Traffic Safety Administration's recently updated VMT schedules for cars, SUVs, and pickup trucks.<sup>46</sup>

<sup>43</sup> The Tesla Model 3 is the best-selling luxury sedan. The BMW 3-series is the best selling ICE vehicle in the class so the 330i is used as both the best-selling and performance comparison for the Model 3.

<sup>44</sup> [https://news.ihsmarket.com/prviewer/release\\_only/slug/automotive-vehicles-getting-older-average-age-light-cars-and-trucks-us-rises-again-201](https://news.ihsmarket.com/prviewer/release_only/slug/automotive-vehicles-getting-older-average-age-light-cars-and-trucks-us-rises-again-201).

<sup>45</sup> NHTSA projects survival weighted average lifetime mileage of 210,000 miles for cars and 230,000 miles for light trucks. See Table VI-219 ([https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final\\_safe\\_fria\\_web\\_version\\_200701.pdf](https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final_safe_fria_web_version_200701.pdf)).

<sup>46</sup> See Tables VI-212-214 ([https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final\\_safe\\_fria\\_web\\_version\\_200701.pdf](https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final_safe_fria_web_version_200701.pdf)).

For estimating capital costs the vehicle was assumed to be purchased with a six-year loan.<sup>47</sup> The interest rate on the loan was 4.7 percent.<sup>48</sup> The initial purchase price for each vehicle was obtained from CR partner TrueCar. TrueCar provides an estimated market average price, based on recent real-world transaction prices, for any vehicle you select. This accounts for the fact that vehicles rarely sell for their manufacturer's suggested retail price (MSRP). For EVs for which federal tax credits were available, the value of the federal tax credit was subtracted from the vehicle purchase price. Any state tax incentives were not factored into the analysis. For the first owner, the owner was then assumed to recover the residual value of the vehicle at the time of sale. A single depreciation curve was applied uniformly to all vehicles based on the analysis in Chapter 1. The specifics of the depreciation curve are described in Appendix D.

Operating and maintenance costs were calculated based on the approaches laid out in Chapters 2 and 3. Maintenance costs were calculated each year based on the per-mile numbers in Table 2.1. Fuel costs were calculated as described in Chapter 3 for BEVs and ICE vehicles using the EIA's AEO 2020 baseline scenario gasoline and electricity cost projections into the future. Vehicle efficiencies were taken from CR's real-world fuel-economy tests, where available; EPA ratings were used for vehicles not yet tested by CR.<sup>49</sup>

For BEVs the fraction of miles charged at home vs. public fast charging was adjusted for their actual EPA-rated range, and the range was reduced by 10 percent after five years and 20 percent after 10 years to account for battery degradation.<sup>50</sup> This results in some small increases in average per-mile charging costs for BEVs over time. For PHEVs the average miles driven on electricity vs. gasoline was estimated using the Society of Automotive Engineers' Standard J2841 Multi-Day Individual Utility Factor.<sup>51</sup> It was developed based on real-world driving data from individual consumers and estimates the percentage of miles that individuals are likely to drive on electric vs. gasoline, based on the electric range of their vehicle. All charging for PHEVs is assumed to be home charging because PHEVs can easily run on gasoline for longer trips.

### Detailed Findings

Across all ownership periods almost all BEVs and PHEVs showed significant savings over all comparable vehicles. In general, savings were greater relative to the best-selling and Consumer

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<sup>47</sup> The average new-car loan in June 2020 was 70 months (<https://www.edmunds.com/industry/press/auto-loan-interest-rates-see-a-slight-lift-in-june-according-to-edmunds.html>).

<sup>48</sup> Based on rates for consumers with a credit score between 660 and 720 (<https://www.experian.com/blogs/ask-experian/auto-loan-rates-by-credit-score>).

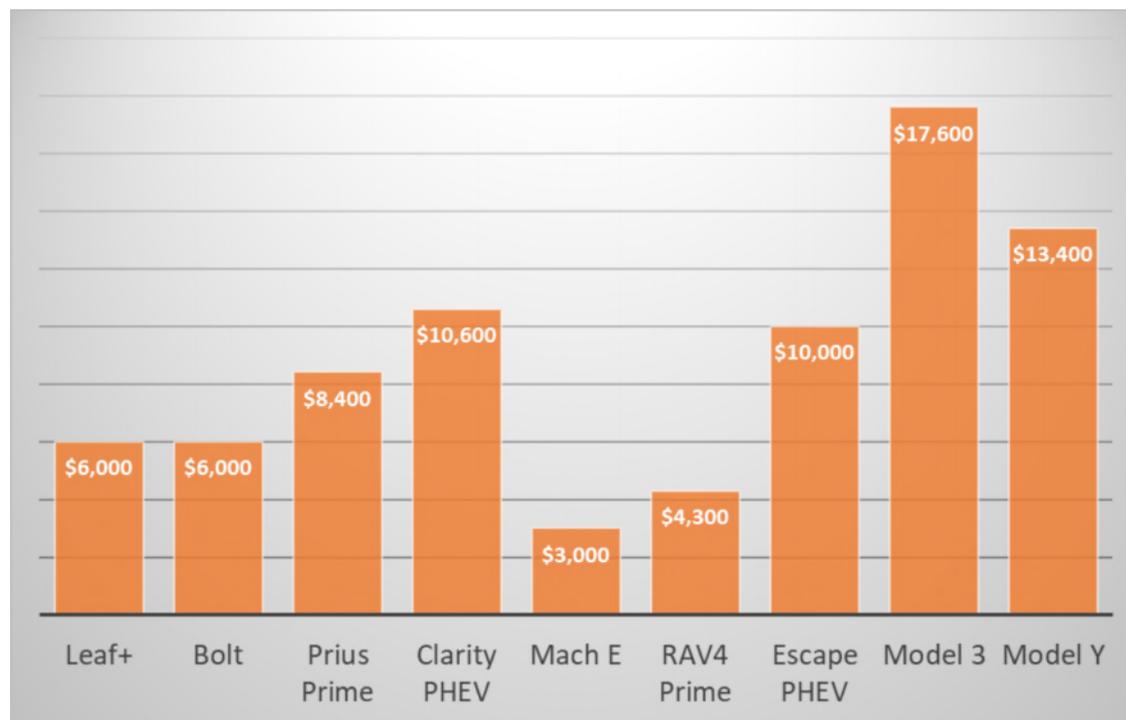
<sup>49</sup> Fueleconomy.gov.

<sup>50</sup> Based on data on battery degradation from real-world values averaging 2 percent per year (<https://storage.googleapis.com/geotab-sandbox/ev-battery-degradation/index.html>).

<sup>51</sup> [https://www.sae.org/standards/content/j2841\\_200903](https://www.sae.org/standards/content/j2841_200903).

Reports' top-rated vehicles than when compared with the most efficient vehicles. This is expected because most fuel-efficiency technologies for ICE vehicles are known to pay for themselves many times over in increased fuel savings, reducing the ownership costs of these vehicles.<sup>52</sup> Alternatively, savings really ramp up when buyers seek an ICE vehicle that achieves the same acceleration performance as an EV. This reflects the fact that achieving high performance in an ICE vehicle requires a larger, more expensive engine that is also much less efficient, increasing both the capital and operating costs of the vehicle compared with a more typical vehicle in the class. While most PHEVs are not tuned to perform better than most ICE vehicles in their class, all BEVs had near-class-leading acceleration performance.

A summary of the present-value lifetime savings for all nine EVs compared with the best-selling vehicle in their class is presented in Figure 4.1. It shows that in all cases the EV provides lifetime savings worth thousands of dollars at the time of purchase. This general conclusion also holds for comparisons with the top-rated and most efficient ICE vehicle<sup>53</sup> in their class. Detailed cost breakdowns, as well as sensitivity cases, are available for all vehicles in Appendix E.



**Figure 4.1.** Lifetime Savings From EVs vs. Best-Selling ICE Vehicles in Class<sup>54</sup>

<sup>52</sup> On average, fuel-efficiency technology was found to provide a 3-to-1 return on investment (<https://advocacy.consumerreports.org/wp-content/uploads/2019/08/The-Un-SAFE-Rule-How-a-Fuel-Economy-Rollback-Costs-Americans-Billions-in-Fuel-Savings-and-Does-Not-Improve-Safety-2.pdf>).

<sup>53</sup> For the Ford Mach E, it only breaks even with Toyota RAV4 Hybrid, which costs over \$10,000 less and is highly efficient.

<sup>54</sup> Costs as present value at a 3 percent discount rate in 2019 dollars.

Detailed results for the first owner in the hatchback and crossover class are shown in Figures 4.2 and 4.3. These figures break out the capital and O&M costs in addition to the totals. They illustrate that while in all these cases the EVs had higher capital costs, the cumulative fuel, repair, and maintenance savings close the ownership cost gap, resulting in overall savings in most comparisons. The two exceptions are the Toyota RAV4 Prime, which only roughly breaks even with the base RAV4 LE and the efficient RAV4 hybrid. However the RAV4 prime is currently selling for an average of more than \$1,300 over MSRP,<sup>55</sup> likely indicating that demand is outpacing supply, which makes sense because it offers a higher trim level and higher performance at roughly the same net price as the base model. The other vehicle with lower savings is the Ford Mach E, which is available for preorder at around MSRP and expected to hit dealer lots in the coming months.<sup>56</sup> This vehicle is designed and marketed to be more of a performance/semi-luxury vehicle, and its buyers are more likely to be cross shopping for other higher performance or luxury vehicles than for the base model crossovers it is compared with here.

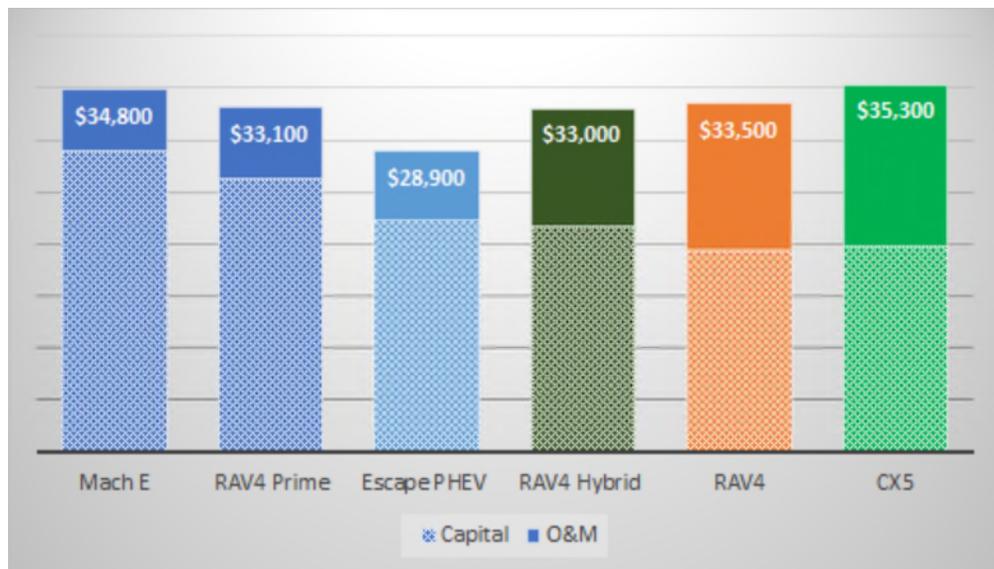


**Figure 4.2.** First Owner Capital, O&M, and Total Costs for Hatchbacks<sup>57</sup>

<sup>55</sup> This higher purchase price is included in the analysis, so consumers who can buy the vehicle at MSRP or less will see savings vs. other RAV4 trim levels.

<sup>56</sup> Rumored preorder numbers range from fewer than 10,000 to more than 40,000 of an estimated 20,000 model year 2021 vehicles expected to be available in the U.S. (<https://electrek.co/2019/11/27/ford-mustang-mach-e-first-edition-sold-out-year-early/#:~:text=All%20we%20know%20is%20that,electric%20car%20revealed%20last%20week,https://www.torquenews.com/9539/2021-ford-mustang-mach-e-order-bank-opens-may-11>).

<sup>57</sup> Costs as present value at a 3 percent discount rate in 2019 dollars.



**Figure 4.3.** First Owner Capital, O&M, and Total Costs for Crossovers<sup>58</sup>

CR surveys have consistently shown that most consumers are satisfied with average performance and that more consumers would prefer increased fuel economy (37 percent of consumers) or lower maintenance costs (26 percent) than would prefer more horsepower (12 percent).<sup>59</sup>

Automakers, however, focus most of their marketing on performance, making it a key theme in almost half of their advertisements.<sup>60</sup> Given this heavy industry focus on performance, high-performing EVs were compared with ICE vehicles that achieve similar 0-to-60-mph acceleration performance. The results, shown in Figure 4.4, illustrate the first owner and lifetime savings of high-performing EVs relative to ICE vehicles that achieve similar acceleration levels. The results are stark: In most cases new-car buyers who care a lot about performance can get that performance for around \$10,000 less by buying an EV.

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<sup>58</sup> Costs as present value at a 3 percent discount rate in 2019 dollars.

<sup>59</sup> <https://advocacy.consumerreports.org/wp-content/uploads/2019/08/Consumer-Reports-Fuel-Economy-Survey-Report-2019-1.pdf>.

<sup>60</sup> <https://advocacy.consumerreports.org/wp-content/uploads/2018/09/auto-ad-content-fact-sheet-9.19.18.pdf>.



**Figure 4.4.** First Owner and Lifetime Savings From EVs vs. ICE That Matches Acceleration<sup>61</sup>

Overall, these results show that many EVs on the market today can provide consumers the two features they say they most want improved in their next vehicle—lower fuel and maintenance costs—in addition to the feature the auto industry advertises most often —performance—all at a lower overall cost.

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<sup>61</sup> Costs as present value at a 3 percent discount rate in 2019 dollars.

## Chapter 5—Used EVs: A Pathway Toward More Affordable Transportation

### Introduction

While new cars get most of the attention in the automotive industry, used cars account for most car purchases—70 percent of them in 2019.<sup>62</sup> This is not surprising because used cars can offer consumers tremendous value: The first owner bears the brunt of the steepest period of depreciation, while new vehicles today are expected to run for an average of over 200,000 miles.<sup>63</sup> Hence, used-car buyers capture a large fraction of the lifetime utility of a vehicle while paying a relatively low percentage of the new-car price.

For ICE vehicles this used-car savings is partially offset by higher expected repair and maintenance costs for older vehicles, and the need to continue to pay for fuel, which makes up a large fraction of the total lifetime ownership costs for ICE vehicles. However, as shown in the previous chapters, EVs significantly reduce these costs, while their biggest drawback—higher purchase prices—is partially offset by depreciation. This chapter explores how the savings opportunities of EVs only increase for their subsequent owners, offering a potential pathway toward lowering the cost of transportation for lower-income drivers.

### Key Findings

- While new EVs offer significant cost savings over comparable ICE vehicles, the relative cost savings of an EV purchased when it is 5 to 7 years old can be two or three times as large.

### Approach

The same ownership cost model described in Chapter 4 was used to estimate the potential savings for used-EV buyers—with a few modifications. Used vehicles were assumed to cost the residual value plus a dealer markup of 15 percent for 3-year-old vehicles and 20 percent for 5-year-old and older vehicles.<sup>64</sup> The loan and ownership period were also changed to five years

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<sup>62</sup> There were 41 million used-car purchases in 2019, according to Edmunds.com, compared with 17 million new-car sales (<https://www.edmunds.com/industry/press/used-vehicle-market-poised-for-record-sales-in-2019-according-to-new-report-from-edmunds.html>, <https://www.caranddriver.com/news/a30416492/us-auto-sales-2019>).

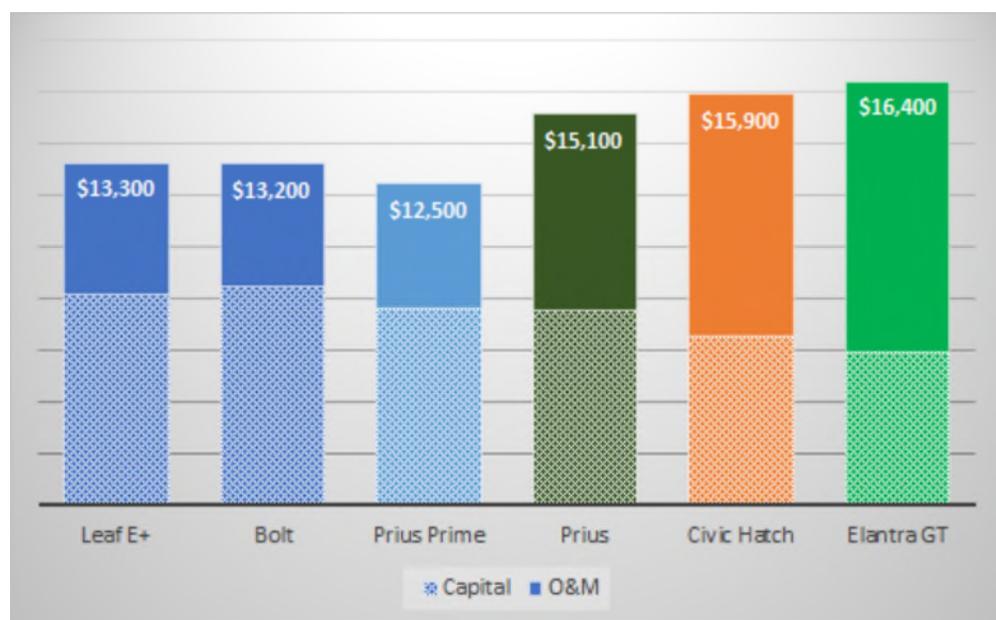
<sup>63</sup> NHTSA projects survival weighted average lifetime mileage of 210,000 miles for cars and 230,000 miles for light trucks, with the average vehicle surviving around 15 years. See Table VI-219 ([https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final\\_safe\\_fria\\_web\\_version\\_200701.pdf](https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final_safe_fria_web_version_200701.pdf)).

<sup>64</sup> Based on analysis of the difference between private party and dealer retail value estimates at Edmunds.com for the vehicles in the hatchback class included in table 4.1.

each to reflect the typically shorter ownership period of used cars.<sup>65</sup> And the interest rate was increased to 6 percent to reflect higher rates on used cars.<sup>66</sup> Used vehicles were then analyzed for vehicles that were purchased when they were 3, 5, and 7 years old.

### Detailed Findings

Detailed cost breakdowns are shown in Figure 5.1 for the ownership cost of purchasing a 7-year-old hatchback. It shows that operation and maintenance costs make up a much larger percentage of the total ownership costs for used EVs when compared to the new cars analyzed in the previous chapter. This results in even greater total savings for used EVs vs. comparable ICE vehicles.



**Figure 5.1.** 7-Year-Old Used-Vehicle Capital, O&M, and Total Costs for Hatchbacks<sup>67</sup>

This increase in savings is better illustrated in Figure 5.2, which shows the percentage savings for EVs relative to the best-selling vehicle in the class at different purchase times, from new to 7 years old. It shows that while purchasing a new EV saves consumers money, the savings increase significantly as the vehicle's age when purchased increases. The reason is that depreciation reduces the capital cost, increasing the portion of the total cost of ownership from

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<sup>65</sup> Average ownership period of used cars almost 66 months ([https://news.ihsmarket.com/prviewer/release\\_only/slug/automotive-vehicles-getting-older-average-age-light-cars-and-trucks-us-rises-again-201](https://news.ihsmarket.com/prviewer/release_only/slug/automotive-vehicles-getting-older-average-age-light-cars-and-trucks-us-rises-again-201)).

<sup>66</sup> Based on rates for consumers with a credit score between 660 and 720 (<https://www.experian.com/blogs/ask-experian/auto-loan-rates-by-credit-score>).

<sup>67</sup> Present value in the year of initial vehicle purchase at a 3 percent discount rate in 2019 dollars.

operation and maintenance, where EVs have a significant advantage. In fact, the relative savings from buying an EV are two to three times as high if the EV is a 5- to 7-year-old used model, compared with purchasing a new EV.

Overall, these results show that used EVs are likely to be a major boon for used-car buyers, especially lower-income buyers. It will take time until these savings are available to a large number of consumers, both for the volume of EV sales in the new-car market to increase and for new EVs to be transferred from their first owners to the secondary market. Unfortunately, both of these factors will delay the realization of these savings to large numbers of potential used-car buyers for a number of years.

— LEAT+ — BOIT — PRIUS PRIME

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**Figure 5.2.** EV Percent Savings Compared With Best-Selling ICE by Vehicle Age at Purchase

**Appendix A—Fuel-Cost Sensitivities**

**Table A.1.** Discounted Fuel Savings for an Average BEV Compared With Average ICE, by Class, Assuming National Average Gasoline and Electricity Prices From AEO 2020 Low-Gas-Price Scenario

| Class   | 15,000 miles | First Owner Savings | Lifetime Savings |
|---------|--------------|---------------------|------------------|
| Car     | \$470        | \$3,100             | \$5,200          |
| Utility | \$610        | \$4,200             | \$6,900          |
| Pickup  | \$790        | \$5,900             | \$9,100          |

**Table A.2.** Discounted Fuel Savings for an Average BEV Compared With Average ICE, by Class, Assuming National Average Electricity Prices From AEO 2020 Baseline and Gas Price From AAA on Aug. 18, 2020<sup>68</sup>

| Class   | 15,000 miles | First Owner Savings | Lifetime Savings |
|---------|--------------|---------------------|------------------|
| Car     | \$400        | \$2,600             | \$4,300          |
| Utility | \$520        | \$3,600             | \$5,800          |
| Pickup  | \$670        | \$5,100             | \$7,700          |

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<sup>68</sup> National average gas price on Aug. 18, 2020, was \$2.18 per gallon (<https://gasprices.aaa.com>).

**Appendix B—Fuel Costs by State**

**Table B.1.** Savings from an Average BEV vs. an Average ICE per 15,000 Miles of Driving, by State

| State             | Car      |          |         | Crossover/SUV |          |         | Pickup   |          |         | Relative Savings vs. National Average |
|-------------------|----------|----------|---------|---------------|----------|---------|----------|----------|---------|---------------------------------------|
|                   | Gasoline | Electric | Savings | Gasoline      | Electric | Savings | Gasoline | Electric | Savings |                                       |
| Alabama           | \$1,294  | \$591    | \$703   | \$1,648       | \$742    | \$906   | \$2,101  | \$940    | \$1,161 | -12%                                  |
| Alaska            | \$1,863  | \$917    | \$946   | \$2,373       | \$1,150  | \$1,223 | \$3,026  | \$1,458  | \$1,568 | 19%                                   |
| Arizona           | \$1,499  | \$602    | \$896   | \$1,909       | \$756    | \$1,153 | \$2,434  | \$958    | \$1,476 | 12%                                   |
| Arkansas          | \$1,309  | \$510    | \$799   | \$1,667       | \$640    | \$1,027 | \$2,126  | \$811    | \$1,315 | 0%                                    |
| California        | \$1,693  | \$804    | \$889   | \$2,157       | \$1,009  | \$1,148 | \$2,750  | \$1,279  | \$1,471 | 12%                                   |
| Colorado          | \$1,388  | \$597    | \$791   | \$1,769       | \$749    | \$1,020 | \$2,255  | \$950    | \$1,306 | -1%                                   |
| Connecticut       | \$1,475  | \$914    | \$561   | \$1,880       | \$1,148  | \$732   | \$2,397  | \$1,454  | \$942   | -28%                                  |
| Delaware          | \$1,439  | \$638    | \$801   | \$1,833       | \$800    | \$1,032 | \$2,337  | \$1,014  | \$1,323 | 1%                                    |
| Dist. of Columbia | \$1,513  | \$621    | \$892   | \$1,927       | \$779    | \$1,148 | \$2,458  | \$987    | \$1,470 | 12%                                   |
| Florida           | \$1,337  | \$573    | \$763   | \$1,703       | \$720    | \$983   | \$2,171  | \$912    | \$1,259 | -4%                                   |
| Georgia           | \$1,296  | \$577    | \$719   | \$1,651       | \$724    | \$927   | \$2,105  | \$918    | \$1,187 | -10%                                  |
| Hawaii            | \$1,863  | \$1,327  | \$537   | \$2,374       | \$1,665  | \$709   | \$3,027  | \$2,110  | \$917   | -30%                                  |
| Idaho             | \$1,479  | \$514    | \$965   | \$1,884       | \$645    | \$1,240 | \$2,403  | \$817    | \$1,586 | 21%                                   |
| Illinois          | \$1,378  | \$612    | \$765   | \$1,755       | \$768    | \$987   | \$2,238  | \$974    | \$1,264 | -4%                                   |
| Indiana           | \$1,331  | \$587    | \$744   | \$1,696       | \$737    | \$959   | \$2,162  | \$933    | \$1,229 | -6%                                   |

**Electric Vehicle Ownership Costs:** Today's Electric Vehicles Offer Big Savings for Consumers

| State         | Car      |          |         | Crossover/SUV |          |         | Pickup   |          |         | Relative Savings |
|---------------|----------|----------|---------|---------------|----------|---------|----------|----------|---------|------------------|
|               | Gasoline | Electric | Savings | Gasoline      | Electric | Savings | Gasoline | Electric | Savings |                  |
| Iowa          | \$1,354  | \$587    | \$767   | \$1,725       | \$736    | \$988   | \$2,199  | \$933    | \$1,266 | -4%              |
| Kansas        | \$1,345  | \$624    | \$720   | \$1,713       | \$783    | \$930   | \$2,184  | \$993    | \$1,191 | -9%              |
| Kentucky      | \$1,376  | \$533    | \$843   | \$1,753       | \$669    | \$1,084 | \$2,236  | \$848    | \$1,388 | 6%               |
| Louisiana     | \$1,301  | \$497    | \$804   | \$1,657       | \$623    | \$1,034 | \$2,113  | \$790    | \$1,323 | 1%               |
| Maine         | \$1,467  | \$741    | \$725   | \$1,868       | \$930    | \$938   | \$2,382  | \$1,179  | \$1,204 | -8%              |
| Maryland      | \$1,446  | \$660    | \$785   | \$1,842       | \$828    | \$1,013 | \$2,348  | \$1,050  | \$1,298 | -1%              |
| Massachusetts | \$1,436  | \$882    | \$555   | \$1,830       | \$1,106  | \$723   | \$2,333  | \$1,402  | \$931   | -29%             |
| Michigan      | \$1,345  | \$706    | \$639   | \$1,714       | \$886    | \$828   | \$2,185  | \$1,123  | \$1,062 | -19%             |
| Minnesota     | \$1,382  | \$615    | \$767   | \$1,761       | \$771    | \$989   | \$2,245  | \$978    | \$1,267 | -3%              |
| Mississippi   | \$1,298  | \$555    | \$742   | \$1,654       | \$697    | \$956   | \$2,108  | \$883    | \$1,225 | -7%              |
| Missouri      | \$1,314  | \$561    | \$752   | \$1,674       | \$705    | \$969   | \$2,134  | \$893    | \$1,241 | -5%              |
| Montana       | \$1,473  | \$545    | \$927   | \$1,876       | \$684    | \$1,192 | \$2,392  | \$867    | \$1,525 | 16%              |
| Nebraska      | \$1,391  | \$542    | \$849   | \$1,772       | \$680    | \$1,092 | \$2,259  | \$862    | \$1,397 | 6%               |
| Nevada        | \$1,560  | \$599    | \$961   | \$1,988       | \$752    | \$1,236 | \$2,534  | \$952    | \$1,582 | 20%              |
| New Hampshire | \$1,424  | \$847    | \$577   | \$1,814       | \$1,062  | \$752   | \$2,313  | \$1,346  | \$967   | -26%             |
| New Jersey    | \$1,393  | \$732    | \$661   | \$1,775       | \$919    | \$856   | \$2,263  | \$1,165  | \$1,098 | -16%             |
| New Mexico    | \$1,350  | \$610    | \$741   | \$1,720       | \$765    | \$955   | \$2,194  | \$970    | \$1,224 | -7%              |
| New York      | \$1,425  | \$842    | \$582   | \$1,815       | \$1,057  | \$758   | \$2,314  | \$1,339  | \$975   | -26%             |

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| State          | Car      |          |         | Crossover/SUV |          |         | Pickup   |          |         | Relative Savings |
|----------------|----------|----------|---------|---------------|----------|---------|----------|----------|---------|------------------|
|                | Gasoline | Electric | Savings | Gasoline      | Electric | Savings | Gasoline | Electric | Savings |                  |
| North Carolina | \$1,396  | \$557    | \$839   | \$1,778       | \$699    | \$1,079 | \$2,267  | \$886    | \$1,382 | 5%               |
| North Dakota   | \$1,437  | \$511    | \$926   | \$1,831       | \$642    | \$1,189 | \$2,335  | \$813    | \$1,521 | 16%              |
| Ohio           | \$1,389  | \$614    | \$775   | \$1,770       | \$771    | \$999   | \$2,256  | \$977    | \$1,279 | -3%              |
| Oklahoma       | \$1,317  | \$525    | \$792   | \$1,678       | \$659    | \$1,019 | \$2,139  | \$835    | \$1,304 | -1%              |
| Oregon         | \$1,600  | \$542    | \$1,059 | \$2,039       | \$680    | \$1,359 | \$2,599  | \$861    | \$1,738 | 32%              |
| Pennsylvania   | \$1,477  | \$660    | \$817   | \$1,882       | \$829    | \$1,053 | \$2,399  | \$1,050  | \$1,349 | 3%               |
| Rhode Island   | \$1,463  | \$851    | \$612   | \$1,864       | \$1,068  | \$795   | \$2,376  | \$1,354  | \$1,022 | -22%             |
| South Carolina | \$1,314  | \$616    | \$698   | \$1,673       | \$773    | \$901   | \$2,134  | \$979    | \$1,154 | -12%             |
| South Dakota   | \$1,401  | \$564    | \$837   | \$1,784       | \$708    | \$1,076 | \$2,275  | \$897    | \$1,378 | 5%               |
| Tennessee      | \$1,336  | \$534    | \$802   | \$1,702       | \$670    | \$1,032 | \$2,170  | \$850    | \$1,321 | 1%               |
| Texas          | \$1,298  | \$566    | \$732   | \$1,654       | \$710    | \$944   | \$2,109  | \$900    | \$1,209 | -8%              |
| Utah           | \$1,472  | \$545    | \$927   | \$1,875       | \$684    | \$1,191 | \$2,391  | \$867    | \$1,524 | 16%              |
| Vermont        | \$1,474  | \$803    | \$670   | \$1,877       | \$1,008  | \$870   | \$2,394  | \$1,277  | \$1,116 | -15%             |
| Virginia       | \$1,355  | \$570    | \$786   | \$1,727       | \$715    | \$1,012 | \$2,202  | \$906    | \$1,296 | -1%              |
| Washington     | \$1,594  | \$490    | \$1,104 | \$2,031       | \$615    | \$1,416 | \$2,589  | \$779    | \$1,810 | 38%              |
| West Virginia  | \$1,463  | \$543    | \$920   | \$1,864       | \$682    | \$1,182 | \$2,377  | \$864    | \$1,513 | 15%              |
| Wisconsin      | \$1,422  | \$670    | \$752   | \$1,812       | \$841    | \$971   | \$2,310  | \$1,065  | \$1,244 | -5%              |
| Wyoming        | \$1,379  | \$556    | \$823   | \$1,757       | \$697    | \$1,059 | \$2,240  | \$883    | \$1,356 | 3%               |

**Appendix C—Vehicle Characteristics**

**Table C.1.** Selected Vehicle Characteristics

|                       | Trim         | Purchase Price <sup>69</sup> | Fuel Efficiency (mpg) <sup>70</sup> | Electric Efficiency (miles/kWh) <sup>71</sup> | Electric Range (miles) | 0-60 Acceleration (s) <sup>72</sup> |
|-----------------------|--------------|------------------------------|-------------------------------------|-----------------------------------------------|------------------------|-------------------------------------|
| <b>Hatchbacks</b>     |              |                              |                                     |                                               |                        |                                     |
| Nissan Leaf E+        | S Plus       | \$25,398                     |                                     | 3.2                                           | 226                    | 7.0                                 |
| Chevy Bolt            | LT           | \$26,304                     |                                     | 3.5                                           | 259                    | 6.8                                 |
| Toyota Prius Prime    | LE           | \$23,885                     | 54                                  | 4                                             | 25                     | 10.8                                |
| Toyota Prius          | LE           | \$23,443                     | 52                                  |                                               |                        | 10.3                                |
| Honda Civic Hatchback | LX           | \$20,363                     | 34                                  |                                               |                        | 7.1                                 |
| Hyundai Elantra GT    | GT Automatic | \$18,555                     | 28                                  |                                               |                        | 8.7                                 |
| VW Golf GTI           | 2.0T S DSG   | \$27,879                     | 27                                  |                                               |                        | 6.6                                 |
| <b>Sedans</b>         |              |                              |                                     |                                               |                        |                                     |
| Honda Clarity PHEV    | Base         | \$23,345                     | 42                                  | 3.3                                           | 48                     | 8.3                                 |
| Toyota Camry Hybrid   | LE           | \$24,846                     | 47                                  |                                               |                        | 7.8                                 |
| Toyota Camry          | LE           | \$21,690                     | 32                                  |                                               |                        | 8.0                                 |
| Subaru Legacy         | 2.5i         | \$21,168                     | 28                                  |                                               |                        | 8.9                                 |

<sup>69</sup> Based on TrueCar.com market average price for Arlington, VA in August 2020 for specified trim with no options.

<sup>70</sup> Based on CR test results when available or EPA when not.

<sup>71</sup> Based upon EPA MPGe rating.

<sup>72</sup> Numbers from CR tests when available, but based on manufacturer spec or other automotive testing and rating websites. In general 0-60 times are imprecise measures, with CR numbers often a little higher than manufacturer spec when available.

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|                          | Trim            | Purchase Price | Fuel Efficiency (mpg) | Electric Efficiency (miles/kWh) | Electric Range (miles) | 0-60 Acceleration (s) |
|--------------------------|-----------------|----------------|-----------------------|---------------------------------|------------------------|-----------------------|
| <b>Crossovers</b>        |                 |                |                       |                                 |                        |                       |
| Ford Mach E              | Select          | \$36,495       |                       | 3.4                             | 230                    | <6                    |
| Toyota RAV4 Prime        | SE              | \$33,105       | 38                    | 2.8                             | 42                     | 5.7                   |
| Ford Escape PHEV         | SE              | \$28,087       | 41                    | 3                               | 38                     | 8.7                   |
| Toyota RAV4 Hybrid       | LE              | \$27,301       | 37                    |                                 |                        | 7.8                   |
| Toyota RAV4              | LE              | \$24,369       | 27                    |                                 |                        | 8.3                   |
| Mazda CX5                | Sport           | \$25,021       | 24                    |                                 |                        | 8.6                   |
| Mazda CX5 GTR turbo      | GTR Turbo       | \$34,670       | 24                    |                                 |                        | 6.2                   |
| <b>Luxury Sedan</b>      |                 |                |                       |                                 |                        |                       |
| Tesla Model 3            | SR Plus         | \$37,990       |                       | 4.2                             | 250                    | 5.3                   |
| Lexus ES 300h            | 300h            | \$41,159       | 44                    |                                 |                        | 8.3                   |
| Audi A4                  | Premium 40 TFSI | \$35,953       | 27                    |                                 |                        | 6.3                   |
| BMW 330i <sup>73</sup>   | 330i RWD        | \$39,003       | 28                    |                                 |                        | 6.4 <sup>74</sup>     |
| <b>Luxury Crossovers</b> |                 |                |                       |                                 |                        |                       |
| Tesla Model Y            | Long Range      | \$49,990       |                       | 3.6                             | 316                    | 4.8                   |
| Lexus NX hybrid          | 300h AWD        | \$38,493       | 29                    |                                 |                        | 8.9                   |
| Lexus RX                 | 350 FWD         | \$42,885       | 22                    |                                 |                        | 7.5                   |
| Infiniti QX50            | Pure            | \$33,918       | 22                    |                                 |                        | 7.2                   |
| BMW X3 m40i              | xDrive M40i     | \$53,105       | 23                    |                                 |                        | 4.8                   |

<sup>73</sup> The model 3 is the best selling vehicle in this class, but the BMW 3 series is the best selling ICE vehicle in the class, so it is used for both the performance and best selling category.

<sup>74</sup> CR test result, although rated at around 5.3 seconds elsewhere.

Appendix D—Depreciation Curve

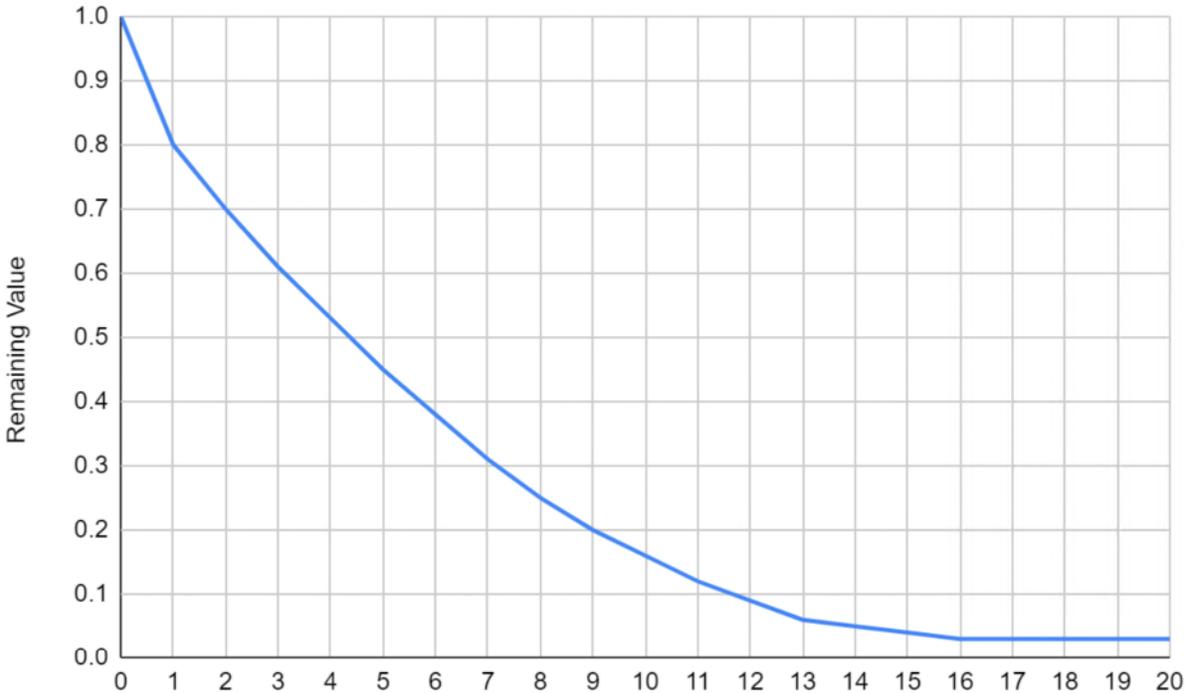


Figure D.1. Depreciation Curve

**Appendix E—Detailed Results of New-Car Ownership Cost Analysis**

**Table E.1.** Detailed Results of New-Car Ownership Cost Analysis for All Vehicles

|                   | Initial Ownership Period |          |          | Lifetime |          |          |
|-------------------|--------------------------|----------|----------|----------|----------|----------|
|                   | Capital                  | O&M      | Total    | Capital  | O&M      | Total    |
| <b>Hatchbacks</b> |                          |          |          |          |          |          |
| Leaf E+           | \$20,100                 | \$5,900  | \$26,100 | \$26,400 | \$12,500 | \$38,900 |
| Bolt              | \$20,900                 | \$5,400  | \$26,300 | \$27,300 | \$11,600 | \$38,900 |
| Prius Prime       | \$18,900                 | \$5,500  | \$24,400 | \$24,800 | \$11,700 | \$36,500 |
| Prius             | \$18,600                 | \$8,800  | \$27,400 | \$24,300 | \$18,700 | \$43,000 |
| Civic Hatchback   | \$16,200                 | \$11,600 | \$27,700 | \$21,100 | \$23,700 | \$44,900 |
| Elantra GT        | \$14,700                 | \$13,300 | \$28,000 | \$19,300 | \$26,900 | \$46,100 |
| Golf GTI          | \$22,100                 | \$13,600 | \$35,800 | \$28,900 | \$27,500 | \$56,500 |
| <b>Sedans</b>     |                          |          |          |          |          |          |
| Clarity PHEV      | \$18,500                 | \$6,500  | \$25,000 | \$24,200 | \$12,300 | \$36,500 |
| Camry Hybrid      | \$19,700                 | \$9,400  | \$29,100 | \$25,800 | \$19,700 | \$45,500 |
| Camry             | \$17,200                 | \$12,100 | \$29,300 | \$22,500 | \$24,700 | \$47,200 |
| Legacy            | \$16,800                 | \$13,300 | \$30,100 | \$22,000 | \$26,900 | \$48,800 |
| <b>Crossovers</b> |                          |          |          |          |          |          |
| Mach E            | \$28,900                 | \$5,900  | \$34,800 | \$37,900 | \$12,100 | \$50,000 |
| RAV4 Prime        | \$26,300                 | \$6,900  | \$33,100 | \$34,400 | \$14,300 | \$48,600 |
| Escape PHEV       | \$22,300                 | \$6,600  | \$28,900 | \$29,200 | \$13,800 | \$42,900 |
| RAV4 Hybrid       | \$21,700                 | \$11,300 | \$33,000 | \$28,300 | \$22,600 | \$51,000 |
| RAV4              | \$19,300                 | \$14,100 | \$33,500 | \$25,300 | \$27,600 | \$52,900 |
| CX5               | \$19,800                 | \$15,400 | \$35,300 | \$26,000 | \$29,900 | \$55,900 |
| CX5 GTR turbo     | \$27,500                 | \$15,400 | \$42,900 | \$36,000 | \$29,900 | \$65,900 |

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|                          | Initial Ownership Period |          |          | Lifetime |          |          |
|--------------------------|--------------------------|----------|----------|----------|----------|----------|
|                          | Capital                  | O&M      | Total    | Capital  | O&M      | Total    |
| <b>Luxury Sedan</b>      |                          |          |          |          |          |          |
| Model 3                  | \$30,100                 | \$4,700  | \$34,800 | \$39,400 | \$10,300 | \$49,800 |
| ES 300h                  | \$32,600                 | \$9,800  | \$42,400 | \$42,700 | \$20,400 | \$63,200 |
| A4                       | \$28,500                 | \$13,600 | \$42,200 | \$37,300 | \$27,500 | \$64,800 |
| 330i                     | \$30,900                 | \$13,300 | \$44,200 | \$40,500 | \$26,900 | \$67,400 |
| <b>Luxury Crossovers</b> |                          |          |          |          |          |          |
| Model Y                  | \$39,700                 | \$5,200  | \$44,900 | \$51,900 | \$11,000 | \$62,900 |
| NX hybrid                | \$30,500                 | \$13,400 | \$44,000 | \$40,000 | \$26,400 | \$66,300 |
| RX                       | \$34,000                 | \$16,500 | \$50,500 | \$44,500 | \$31,800 | \$76,300 |
| QX50                     | \$26,900                 | \$16,500 | \$43,400 | \$35,200 | \$31,800 | \$67,000 |
| X3 m40i                  | \$42,100                 | \$16,000 | \$58,100 | \$55,100 | \$30,800 | \$86,000 |

**Appendix F—Sensitivity Cases for New-Car Ownership Cost Analysis**

This section includes three primary sensitivity cases:

- **Gas Prices**-This sensitivity case relates to the gas price assumptions. Instead of the AEO 2020 baseline, the gas prices are changed to match the AEO 2020 low gas price scenario.
- **Vehicle Ownership Period**-This sensitivity case changes the initial ownership period from 7 years to 5 years. In addition, the loan length is changed from 6 years to 5 years.
- **Discount Rate**-This sensitivity case changes the discount rate from 3% to 7%.

**Table F.1.** Results of Gas Price Sensitivity, AEO 2020 Low Gas Price

|                   | Initial Ownership Period |          |          | Lifetime |          |          |
|-------------------|--------------------------|----------|----------|----------|----------|----------|
|                   | Capital                  | O&M      | Total    | Capital  | O&M      | Total    |
| <b>Hatchbacks</b> |                          |          |          |          |          |          |
| Leaf E+           | \$20,100                 | \$5,900  | \$26,100 | \$26,400 | \$12,500 | \$38,900 |
| Bolt              | \$20,900                 | \$5,400  | \$26,300 | \$27,300 | \$11,600 | \$38,900 |
| Prius Prime       | \$18,900                 | \$5,600  | \$24,500 | \$24,800 | \$10,600 | \$35,400 |
| Prius             | \$18,600                 | \$7,700  | \$26,300 | \$24,300 | \$16,400 | \$40,800 |
| Civic Hatchback   | \$16,200                 | \$9,800  | \$26,000 | \$21,100 | \$20,300 | \$41,400 |
| Elantra GT        | \$14,700                 | \$11,200 | \$25,900 | \$19,300 | \$22,700 | \$41,900 |
| Golf GTI          | \$22,100                 | \$11,400 | \$33,600 | \$28,900 | \$23,200 | \$52,100 |
| <b>Sedans</b>     |                          |          |          |          |          |          |
| Clarity PHEV      | \$18,500                 | \$6,100  | \$24,600 | \$24,200 | \$11,500 | \$35,800 |
| Camry Hybrid      | \$19,700                 | \$8,100  | \$27,800 | \$25,800 | \$17,200 | \$43,000 |
| Camry             | \$17,200                 | \$10,200 | \$27,400 | \$22,500 | \$21,000 | \$43,500 |
| Legacy            | \$16,800                 | \$11,200 | \$28,000 | \$22,000 | \$22,700 | \$44,600 |

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|                          | Initial Ownership Period |          |          | Lifetime |          |          |
|--------------------------|--------------------------|----------|----------|----------|----------|----------|
|                          | Capital                  | O&M      | Total    | Capital  | O&M      | Total    |
| <b>Crossovers</b>        |                          |          |          |          |          |          |
| Mach E                   | \$28,900                 | \$5,900  | \$34,800 | \$38,900 | \$12,100 | \$51,000 |
| RAV4 Prime               | \$26,300                 | \$7,500  | \$33,800 | \$34,400 | \$13,700 | \$48,100 |
| Escape PHEV              | \$22,300                 | \$7,200  | \$29,500 | \$29,200 | \$13,300 | \$42,400 |
| RAV4 Hybrid              | \$21,700                 | \$9,700  | \$31,300 | \$28,300 | \$19,500 | \$47,800 |
| RAV4                     | \$19,300                 | \$11,900 | \$31,200 | \$25,300 | \$23,300 | \$48,600 |
| CX5                      | \$19,800                 | \$12,900 | \$32,700 | \$26,000 | \$25,000 | \$51,000 |
| CX5 GTR turbo            | \$27,500                 | \$12,900 | \$40,400 | \$36,000 | \$25,000 | \$61,000 |
| <b>Luxury Sedan</b>      |                          |          |          |          |          |          |
| Model 3                  | \$30,100                 | \$4,700  | \$34,800 | \$39,400 | \$10,300 | \$49,800 |
| ES 300h                  | \$32,600                 | \$8,400  | \$41,100 | \$42,700 | \$17,700 | \$60,500 |
| A4                       | \$28,500                 | \$11,400 | \$40,000 | \$37,300 | \$23,200 | \$60,500 |
| 330i                     | \$30,900                 | \$11,200 | \$42,100 | \$40,500 | \$22,700 | \$63,100 |
| <b>Luxury Crossovers</b> |                          |          |          |          |          |          |
| Model Y                  | \$39,700                 | \$5,200  | \$44,900 | \$51,900 | \$11,000 | \$62,900 |
| NX hybrid                | \$30,500                 | \$11,300 | \$41,800 | \$40,000 | \$22,300 | \$62,200 |
| RX                       | \$34,000                 | \$13,700 | \$47,700 | \$44,500 | \$26,500 | \$71,000 |
| QX50                     | \$26,900                 | \$13,700 | \$40,600 | \$35,200 | \$26,500 | \$61,700 |
| X3 m40i                  | \$42,100                 | \$13,300 | \$55,400 | \$55,100 | \$25,700 | \$80,800 |

**Table F.2.** Results of Ownership Period Sensitivity, 5 year Initial Ownership Period

|                   | Initial Ownership Period |          |          |
|-------------------|--------------------------|----------|----------|
|                   | Capital                  | O&M      | Total    |
| <b>Hatchbacks</b> |                          |          |          |
| Leaf E+           | \$16,600                 | \$4,200  | \$20,800 |
| Bolt              | \$17,200                 | \$3,900  | \$21,000 |
| Prius Prime       | \$15,600                 | \$4,600  | \$20,200 |
| Prius             | \$15,300                 | \$6,200  | \$21,500 |
| Civic Hatchback   | \$13,300                 | \$8,300  | \$21,600 |
| Elantra GT        | \$12,100                 | \$9,600  | \$21,700 |
| Golf GTI          | \$18,200                 | \$9,900  | \$28,100 |
| <b>Sedans</b>     |                          |          |          |
| Clarity PHEV      | \$15,200                 | \$4,800  | \$20,000 |
| Camry Hybrid      | \$16,200                 | \$6,700  | \$22,900 |
| Camry             | \$14,200                 | \$8,700  | \$22,900 |
| Legacy            | \$13,800                 | \$9,600  | \$23,400 |
| <b>Crossovers</b> |                          |          |          |
| Mach E            | \$23,800                 | \$4,100  | \$28,000 |
| RAV4 Prime        | \$21,600                 | \$5,500  | \$27,100 |
| Escape PHEV       | \$18,300                 | \$5,300  | \$23,600 |
| RAV4 Hybrid       | \$17,800                 | \$8,100  | \$25,900 |
| RAV4              | \$15,900                 | \$10,200 | \$26,100 |
| CX5               | \$16,300                 | \$11,200 | \$27,500 |
| CX5 GTR turbo     | \$22,600                 | \$11,200 | \$33,800 |

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|                          | Initial Ownership Period |          |          |
|--------------------------|--------------------------|----------|----------|
|                          | Capital                  | O&M      | Total    |
| <b>Luxury Sedan</b>      |                          |          |          |
| Model 3                  | \$24,800                 | \$3,200  | \$28,000 |
| ES 300h                  | \$26,900                 | \$7,000  | \$33,800 |
| A4                       | \$23,500                 | \$9,900  | \$33,400 |
| 330i                     | \$25,500                 | \$9,600  | \$35,100 |
| <b>Luxury Crossovers</b> |                          |          |          |
| Model Y                  | \$32,600                 | \$3,700  | \$36,300 |
| NX hybrid                | \$25,100                 | \$9,600  | \$34,800 |
| RX                       | \$28,000                 | \$12,000 | \$39,900 |
| QX50                     | \$22,100                 | \$12,000 | \$34,100 |
| X3 m40i                  | \$34,700                 | \$11,500 | \$46,200 |

**Table F.3.** Results of Discount Rate Sensitivity, 7% Discount Rate

|                   | Initial Ownership Period |          |          | Lifetime |          |          |
|-------------------|--------------------------|----------|----------|----------|----------|----------|
|                   | Capital                  | O&M      | Total    | Capital  | O&M      | Total    |
| <b>Hatchbacks</b> |                          |          |          |          |          |          |
| Leaf E+           | \$18,600                 | \$5,100  | \$23,700 | \$23,200 | \$9,400  | \$32,600 |
| Bolt              | \$19,300                 | \$4,700  | \$24,000 | \$24,000 | \$8,700  | \$32,700 |
| Prius Prime       | \$17,500                 | \$5,500  | \$23,000 | \$21,800 | \$9,000  | \$30,800 |
| Prius             | \$17,200                 | \$7,600  | \$24,800 | \$21,400 | \$14,000 | \$35,400 |
| Civic Hatchback   | \$14,900                 | \$10,000 | \$24,900 | \$18,600 | \$17,900 | \$36,500 |
| Elantra GT        | \$13,600                 | \$11,500 | \$25,100 | \$16,900 | \$20,300 | \$37,200 |
| Golf GTI          | \$20,400                 | \$11,800 | \$32,200 | \$25,500 | \$20,800 | \$46,200 |

## Electric Vehicle Ownership Costs: Today's Electric Vehicles Offer Big Savings for Consumers

|                          | Initial Ownership Period |          |          | Lifetime |          |          |
|--------------------------|--------------------------|----------|----------|----------|----------|----------|
|                          | Capital                  | O&M      | Total    | Capital  | O&M      | Total    |
| <b>Sedans</b>            |                          |          |          |          |          |          |
| Clarity PHEV             | \$17,100                 | \$5,600  | \$22,700 | \$21,300 | \$9,400  | \$30,700 |
| Camry Hybrid             | \$18,200                 | \$8,100  | \$26,300 | \$22,700 | \$14,800 | \$37,500 |
| Camry                    | \$15,900                 | \$10,400 | \$26,300 | \$19,800 | \$18,600 | \$38,400 |
| Legacy                   | \$15,500                 | \$11,500 | \$27,000 | \$19,300 | \$20,300 | \$39,600 |
| <b>Crossovers</b>        |                          |          |          |          |          |          |
| Mach E                   | \$26,700                 | \$5,100  | \$31,800 | \$33,300 | \$9,100  | \$42,500 |
| RAV4 Prime               | \$24,300                 | \$6,500  | \$30,800 | \$30,200 | \$10,600 | \$40,800 |
| Escape PHEV              | \$20,600                 | \$6,300  | \$26,800 | \$25,700 | \$10,200 | \$35,900 |
| RAV4 Hybrid              | \$20,000                 | \$9,800  | \$29,800 | \$24,900 | \$17,200 | \$42,100 |
| RAV4                     | \$17,900                 | \$12,200 | \$30,100 | \$22,300 | \$21,000 | \$43,300 |
| CX5                      | \$18,300                 | \$13,300 | \$31,700 | \$22,900 | \$22,800 | \$45,700 |
| CX5 GTR turbo            | \$25,400                 | \$13,300 | \$38,700 | \$31,700 | \$22,800 | \$54,500 |
| <b>Luxury Sedan</b>      |                          |          |          |          |          |          |
| Model 3                  | \$27,800                 | \$4,000  | \$31,900 | \$34,700 | \$7,700  | \$42,400 |
| ES 300h                  | \$30,200                 | \$8,400  | \$38,600 | \$37,600 | \$15,300 | \$52,900 |
| A4                       | \$26,300                 | \$11,800 | \$38,100 | \$32,800 | \$20,800 | \$53,600 |
| 330i                     | \$28,600                 | \$11,500 | \$40,100 | \$35,600 | \$20,300 | \$55,900 |
| <b>Luxury Crossovers</b> |                          |          |          |          |          |          |
| Model Y                  | \$36,600                 | \$4,500  | \$41,100 | \$45,700 | \$8,300  | \$54,000 |
| NX hybrid                | \$28,200                 | \$11,600 | \$39,800 | \$35,200 | \$20,100 | \$55,200 |
| RX                       | \$31,400                 | \$14,300 | \$45,700 | \$39,200 | \$24,300 | \$63,500 |
| QX50                     | \$24,900                 | \$14,300 | \$39,100 | \$31,000 | \$24,300 | \$55,300 |
| X3 m40i                  | \$38,900                 | \$13,800 | \$52,700 | \$48,500 | \$23,500 | \$72,000 |







## Rozas, Laura

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**From:** Rozas, Laura  
**Sent:** Thursday, January 22, 2026 9:14 PM  
**To:** Secretaria; [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** NEPR-MI-2021-0013  
**Attachments:** 2026.1.22 Motion to Submit Responses to 1.7.26 RFI (Filed w Exh 1).pdf; RFI-LUMA-MI-2021-0013-20260107-PREB-#001\_Attachment1 (of Exhibit 1 to Motion to Respond to 1.7.26 RFI).pdf; RFI-LUMA-MI-2021-0013-20260107-PREB-#005\_Attachment1 (of Exhibit 1 of Motion to Respond to 1.7.26 RFI).pdf; Copy of RFI-LUMA-MI-2021-0013-20260107-PREB-#003\_Attachment1 (of Exh 1 of Motion to Respond to 1.7.26 RFI).xlsx; Copy of RFI-LUMA-MI-2021-0013-20260107-PREB-#003\_Attachment2 (of Exhibit 1 of Motion to Respond to 1.7.26 RFI).xlsx

To the Honorable Energy Bureau,

LUMA filed today a *Motion to Submit Responses to Requests for Information in Compliance with Resolution and Order of January 7, 2026* in the referenced case with its Exhibit 1 and two pdf attachments, stamped copy of which is attached to this email. Exhibit 1 of this motion also includes two Excel tables which we are submitting via this email. We respectfully request that these two Excel attachments be accepted and deemed filed with the attached motion.

Cordially,

**Laura Theresa Rozas**

Of Counsel

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T +1 787 945 9147  
laura.rozas@us.dlapiper.com

**DLA Piper (Puerto Rico) LLC**  
500 Calle de la Tanca, Suite 401  
San Juan, PR 00901-1969



[dlapiper.com](http://dlapiper.com)