

EV and EVSE Metering Accuracy Testing

Request for Information

Prepared and Distributed by the Joint Utilities of New York

Table 1. Request for Information (RFI) Schedule

Action Item	Deadline
RFI Published	May 15
Intent to respond requested by JU	May 19
Pre-RFI questions due	May 26
JU responses to pre-RFI questions will be circulated to all respondents	June 2
RFI responses due	June 12
<i>Please send all questions and responses to info@jointutilitiesofny.org, with the subject “EV Metering Accuracy RFI Response – [your organization name]”</i>	

Introduction and Background

On July 14, 2022, the New York Public Service Commission (Commission) issued an Order¹ that directed the Joint Utilities² to propose a method for testing the accuracy of managed charging enabling technologies by January 10, 2023. Managed charging enabling devices include (1) networked Level 2 Electric Vehicle Supply Equipment (EVSE), focusing on residential EVSE, and (2) electric vehicle (EV) telematics. As part of the Joint Utilities’ continuing investigation, the utilities recognize that telematics can be used in at least two ways to obtain data directly from the vehicle: one method that leverages the vehicle on-board energy measuring and computing systems, and a second that periodically reads the vehicle’s battery state-of-charge and remotely infers kWh readings from how the state-of-charge changes over time.

Since then, the Joint Utilities and the New York Department of Public Service Staff (DPS Staff) have held several public meetings to engage stakeholders and continue to refine the implementation plans for this testing initiative. The Technical Standards Working Group, composed of the Joint Utilities and DPS Staff with active participation from stakeholders, must first propose a list of devices to be tested by July 14, 2023. A draft of that list is contained in

¹ Case 18-E-0138, *Proceeding on Motion of the Commission Regarding Electric Vehicle Supply Equipment and Infrastructure* (EV Proceeding), Order Approving Managed Charging Programs with Modifications (issued July 14, 2022) (Order).

² The Joint Utilities are Central Hudson Gas & Electric Corporation (Central Hudson), Consolidated Edison Company of New York, Inc. (Con Edison), New York State Electric & Gas Corporation (NYSEG), Niagara Mohawk Power Corporation d/b/a National Grid (National Grid), Orange and Rockland Utilities, Inc. (O&R), and Rochester Gas and Electric Corporation (RG&E).

Appendix 1 and summarized in this document. The Joint Utilities and DPS Staff must also conduct meter accuracy testing of these devices by July 14, 2024. DPS Staff will submit a comprehensive filing with recommendations to the Public Service Commission based on the results of the accuracy testing by no later than October 1, 2024.

This request for information is to help inform several critical areas of the implementation plans for this metering accuracy testing initiative. The testing concepts discussed below are tentative and do not represent final decisions on the device testing approach, scope, or scale. The Joint Utilities appreciate your responses and look forward to your support as this initiative moves forward.

Other resources relating to this investigation:

- The Joint Utilities initial proposal for testing the accuracy of managed charging enabling devices, filed January 10, 2023:
<https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={9E2A1A7C-C902-4EB0-9069-3CB0599A0119}>
- Joint Utilities' presentation from the February 15, 2023, Technical Standards Working Group Meeting:
<https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={CE858677-4E0F-4327-95FE-67E863489379}>
- Joint Utilities' presentation from the March 29, 2023, Technical Standards Working Group Meeting:
<https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={F0BB3387-0000-C43D-A1A1-34FE9A8B61EF}>
- Other materials related to this matter can be found online at:
<https://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterSeq=69505&MNO=22-02356>

Intended audience of this request for information

The Joint Utilities are issuing this survey to request information from:

1. **Potential Testing Implementors**, such as testing laboratories, experts on electric metering and associated standards, and other administrators;
2. **Device Manufacturers**, such as EV manufacturers, EVSE manufacturers, and third-party EV managed charging service providers; and
3. **Other Stakeholders** with an interest in this proceeding, such as industry associations, standards bodies, other electric utilities, other regulatory bodies or authorities having jurisdiction, and any other interested party.

The questions below address several topics, including the testing setup, testing protocols, devices to be tested, testing sample sizes, implementation timelines, administrator experience, costs, and other important areas. Some questions are addressed to specific audiences only, such as *Potential Testing Implementors*. Given the design of this request for information, partially complete responses will be accepted, however complete responses are preferred.

Uses of the results of request for information

The Joint Utilities will use the results of this request for information to inform the implementation plans for this metering investigation. These implementation plans are likely to include a Request for Proposal (RFP) to be issued in the summer of 2023. The Joint Utilities and DPS Staff are required by the Commission to complete an initial round of device testing by July 14, 2024.

All responses to this request for information will be shared amongst the Joint Utilities, with hired advisors to the Joint Utilities, and with DPS Staff. All responses will be treated as confidential among this group. Descriptions of the general results or lessons learned from this survey may be discussed in public forums by the Joint Utilities and DPS Staff.

Response deadline

This request for information was issued on May 15. Respondents are requested to provide an intent to respond by May 19. Pre-RFI questions will be accepted by May 26 and the JU will attempt to provide responses to questions by June 1. Answers to pre-RFI questions will be circulated to all respondents. All RFI responses are requested by June 12. Any respondents requiring more time to respond should notify the Joint Utilities at info@jointutilitiesofny.org of their intent to respond and the date by which they expect to send their response, however any responses received after June 12 are not guaranteed to be reviewed.

Response format

Please send all responses and any supporting documentation to info@jointutilitiesofny.org, with the email subject “**EV Metering Accuracy RFI Response – [your organization name]**”. Respondents may submit information in any format.

Questions

Testing setup

The Joint Utilities need to obtain data on the accuracy of metering from electric vehicles, electric vehicle supply equipment, and from third-party managed charging service providers, many of whom leverage vehicle’s built-in telematics capability in some way to obtain kWh measurements for charging sessions. The testing could take place either in the field or in a laboratory setting.

The Joint Utilities are aware of several possible metering accuracy testing setups. Two approaches under consideration by the Joint Utilities are:

- A. A “meter first” approach, where an accurate meter or testing device is inserted in between the power supply and the EVSE, with an EV connected to the EVSE for a charging session. The EV may also be connected via telematics to a third-party managed charging service provider.
 - a. This concept could potentially be implemented by directly wiring the trusted meter in line with the EVSE that is charging the EV being tested.

- b. This concept could potentially be implemented by leveraging a removable clamp/probe to measure the power flowing through the conductors serving the EVSE.³
- B. A “meter-in-the-middle” (MITM) approach, where an accurate meter or testing device is inserted in between the EVSE and the EV during a charging session. The EV may also be connected via telematics to a third-party managed charging service provider.
- a. This concept could potentially be implemented with a made-for-purpose device that has the required input receptacles and output cables.
 - b. This concept could also potentially be implemented by leveraging a removable clamp/probe that can measure the power flowing through the conductors.

Both approaches are expected to provide charging session-level data for an apples-to-apples comparison, potentially including 1. An accurate kWh measurement from a trusted metering device, 2. A reading from the EVSE, 3. A reading from the vehicle’s onboard systems, and 4. A reading from a third-party managed charging service provider. The ability to obtain interval data (e.g., 15-minute intervals) in either approach is unclear at this time and is not expected. The Joint Utilities are interested in a Testing Setup that can efficiently test vehicles using either the CCS/J1772 or Tesla charging connectors.

Questions

1. *For all respondents:* Please provide any thoughts on the feasibility, strengths, or weaknesses of the two setups under consideration.
2. *For all respondents:* Please suggest any other testing setups that may accomplish the goals of this meter accuracy testing initiative.
3. *For all respondents:* Please suggest any specific meter testing equipment and products that may be suitable for this initiative.

Testing protocol

Several stakeholders have suggested that the Joint Utilities consider leveraging the testing protocols used in NIST Handbook 44, Section 3.40, 2023 edition,⁴ specifically articles *N. Notes* and *T. Tolerances*. Those sections include specifications for “low load” metering accuracy tests at 10% or less of the device’s maximum deliverables amperes (MDA) and “full load” metering accuracy tests at 85% or more of the device’s MDA. For example, under Handbook 44 a 100-amp EVSE would be tested at 10 amps or less for the low load test and at 85 amps or above for the full load test (with some additional flexibility provided for testing DC EVSE under article N.5.2). Article N.6 of Handbook 44 requires the tests of EVSE to be completed at least three times. Article T.2 states that the acceptance tolerance for accuracy for load tests are 1 percent and maintenance tolerances are 2 percent. For DC charging systems, Handbook 44 Section N.5.2

³ This setup has been used with some automakers for EV fuel economy testing, conducted in accordance with SAE J1634. See an example from Tesla, at https://dis.epa.gov/otaqpub/display_file.jsp?docid=54289&flag=1. See an example from General Motors, at www3.epa.gov/otaq/datafiles/FOI_PGMXT00.0008_APPIPT1_R1.PDF.

⁴ Available at <https://www.nist.gov/system/files/documents/2023/01/29/3-40-23-HB44.pdf>.

anticipates that the vehicle telematics may be sufficient to test load and fast chargers are exempt from the testing requirements until January 1st 2028.

Revenue grade meters for electric utilities in New York State must meet or exceed applicable ANSI C12.1: Code for Electricity Metering.⁵ ANSI also released a draft “Roadmap of Standards and Codes for Electric Vehicles at Scale” for stakeholder comment on March 31, 2023, and aims to publish the finalized standards in the summer of 2023.⁶

NIST Handbook 44, Section 3.40 and ANSI C12.1 do not address testing protocols for EVs or for third-party managed charging service providers (each of whom may use unique software-based methods of obtaining kWh data from the vehicle). The Joint Utilities are not aware of other established protocols for testing vehicles or managed charging services. Thus, the Joint Utilities expect the need to create a new testing protocol as part of this research and policy development initiative which is focused on obtaining data to compare across the vehicle, EVSE, managed charging service provider, and trusted meter testing device.

The Joint Utilities present a draft testing protocol below for feedback that assumes the use of one of the two Testing Setups described in the prior section.

Pre-testing preparation

- Ensure the vehicle being tested starts with a battery state-of-charge (SOC) between 10% and 20%.
- Ensure the process to obtain onboard metering for this vehicle is established (e.g., through a partnership with the OEM, through the vehicle infotainment system, etc.).
- Ensure the vehicle is connected to any third-party managed charging service providers being tested. The Joint Utilities assume that only one third-party managed charging service provider can be connected to the vehicle at a time.
- Document the testing conditions (e.g., VIN, ambient temperature, date/time, etc.).

Device Testing

- If necessary, drive the vehicle to the location where the “Fast Charging” test is taking place.
- Run the **Fast-Charging** load test.
 - Document the vehicle’s starting state of charge and other relevant attributes.
 - Charge the vehicle at a **DC Fast Charger** (DCFC) for a randomly determined amount of time between 15 and 45 minutes, not exceeding an 80% state of charge on the vehicle’s battery.
 - Read the charging session kWh values from:
 - the trusted meter or meter testing device;
 - the EVSE;

⁵ The content of ANSI C12.1 and ANSI C12.20 has been merged into ANSI C12.1-2022, establishing a singular document that covers the entire code for electricity metering.

⁶ See the roadmap at <https://www.ansi.org/standards-coordination/collaboratives-activities/electric-vehicles>.

- the vehicle's on-board systems (if being sent by the OEM, this may occur with some delay); and
 - the third-party managed charging service provider (this may occur with some delay).
 - Document the vehicle's ending state of charge and other relevant attributes.
- Run the **Level 2** load test.
 - If necessary, drive to the place where the Level 2 test will occur.
 - Ensure at least 30 minutes elapse between the Fast Charging and Level 2 load test to prevent data issues for any third-party managed charging service providers.
 - Document the vehicle's starting state of charge and other relevant attributes.
 - Charge the vehicle on a **Level 2** EVSE for a randomly determined amount of time between 30 and 120 minutes, allowing the full time to elapse even if the vehicle reaches a 100% state of charge during the charge session.
 - Read the charging session kWh values from:
 - the trusted meter or meter testing device;
 - the EVSE;
 - the vehicle's on-board systems (if being sent by the OEM, this may occur with some delay); and
 - the third-party managed charging service provider (this may occur with some delay).
 - Document the vehicle's ending state of charge and other relevant attributes.
- Run the **Level 1** load test.
 - If necessary, drive to the place where the Level 1 test will occur.
 - If necessary, ensure the vehicle's battery state of charge is below 95%.
 - Ensure at least 30 minutes elapse between the Level 2 and Level 1 load test to prevent data issues for any third-party managed charging service providers.
 - Document the vehicle's starting state of charge and other relevant attributes.
 - Charge the vehicle on a **Level 1** EVSE for a randomly determined amount of time between 30 and 120 minutes, allowing the full time to elapse even if the vehicle reaches a 100% state of charge during the charge session.
 - Read the charging session kWh values from:
 - the trusted meter or meter testing device;
 - the EVSE;
 - the vehicle's on-board systems (if being sent by the OEM, this may occur with some delay); and
 - the third-party managed charging service provider (this may occur with some delay).
 - Document the vehicle's ending state of charge and other relevant attributes.

Post-testing administration

- Document any test procedures and conditions not already captured.
- Verify that any OEM or third-party managed charging service provider readings have been obtained.
- If necessary, switch the vehicle over to another third-party managed charging service provider being tested later in the day or the following day.

- If necessary, reduce the vehicle’s battery state of charge to the target required to start future testing (e.g., a 10 to 20% state of charge for the next Fast Charging test).

Repeated Testing

- The testing protocol would ideally be completed three times per vehicle, each time being connected to a different third-party managed charging service provider (connected for all tests) and a different Level 2 EVSE (used in the Level 2 test).
 - The Joint Utilities are uncertain of their ability to obtain test vehicles for the length of time required to perform these tests three times per vehicle.
 - The ability to test different DCFC or Level 1 EVSEs is unclear at this time.

Additional notes

- The Joint Utilities expect that plug-in hybrid electric vehicles (PHEVs) would not perform the Fast Charging test but may perform an additional round of the Level 2 or Level 1 test.
- The Joint Utilities expect some device incompatibility to arise, potentially including that not all third-party managed charging service providers support all vehicles being tested.

Questions

4. *For all respondents:* Please provide feedback on the strengths and weaknesses of this testing protocol.
 - a. *For third-party managed charging service providers:* Please respond to whether the Joint Utilities’ assumption of connecting a vehicle to only one service provider at a time is accurate or prudent.
5. *For all respondents:* Please suggest any alternative testing protocols or specific enhancements to the draft testing protocol.
6. *For Potential Testing Implementors:* Please discuss your ability to conduct the draft testing protocol as written.
 - a. Please discuss your experience testing EVs, EVSE, metering accuracy, and any other relevant experience.
 - b. What facilities do you have that could support this testing? Please provide a description and the street addresses of any such facilities.
 - c. Do you have access to CCS-based DCFC and Tesla Superchargers to support vehicle testing, either at your facility or a reasonable distance away? Please be specific.
 - d. Do you have today, or could you have, the ability to support vehicle testing using the various Level 2 EVSE devices the Joint Utilities desire to test? (See the Draft Device List in Appendix 1 for more details)
 - e. Do you have the ability to charge EVs on Level 1 EVSE?
 - f. How many staff hours would you estimate are required to complete one round of the proposed vehicle testing protocol (e.g., 6 hours per protocol)?
 - g. What type of testing equipment would be used and how often is the equipment calibrated?

Device list and sample size for testing

Appendix 1 shows the draft list of eligible, prioritized devices to be tested. Each device listed is supported by one or more Utility managed charging programs. Priority 1 devices are those the Joint Utilities intend to test, pending availability. Priority 2 devices are those the Joint Utilities intend to test some of, pending budget resources and availability. Priority 3 devices are those the Joint Utilities do not expect to test but might pending resources and availability.

Appendix 1 identifies eight vehicle makes/models in the Priority 1 category⁷, 27 other vehicle models as Priority 2, and 25 other models as Priority 3. Two residential Level 2 EVSEs are Priority 1 and three Level 2 EVSE are Priority 2.

From this list, the Joint Utilities propose to test 15 EV models (around 13 BEV models and 2 PHEV models) and three residential Level 2 EVSE models. The Joint Utilities propose a target to test one of each vehicle make, thereby testing 15 vehicles and three Level 2 EVSE total. Table 2 summarizes this information for Priority 1 devices. Table 3 summarizes examples of additional makes that could be tested, but specific devices models have not been determined at this time.

Table 2. Priority 1 devices to be tested

Device Type	Device Make/Model	Target number to be tested
BEV	Chevrolet Bolt (incl. EUV) 2017+	1
BEV	Ford F-150 Lightning 2022+	1
BEV	Ford Mach-E Mustang 2021+	1
BEV	Hyundai IONIQ5 2022+	1
BEV	Kia EV6 2022+	1
BEV	Tesla Model 3 (all years)	1
BEV	Tesla Model Y (all years)	1
PHEV	Toyota Prius Prime 2021+ <u>or</u> Toyota RAV4 Prime 2021+	1
Level 2 EVSE	ChargePoint Home Flex	1
Level 2 EVSE	Enel X JuiceBox 32/40/48	1

⁷ Note that only one of the Toyota models would be included as be Priority 1.

Table 3. Priority 2 device makes to be considered for testing

Device Type	Device Make	Target number to be tested
BEV	Audi	1
BEV	BMW	1
BEV	Nissan	1
BEV	Rivian	1
BEV	Stellantis (Chrysler, Jeep)	1
BEV	Volkswagen	1
BEV	Volvo	1
Level 2 EVSE	Siemens VersiCharge	1
Level 2 EVSE	FLO Home G5/X5	1
Level 2 EVSE	Emporia	1
Note: This is a non-exhaustive list of devices under consideration.		

Given the desire to run the testing protocol three times per vehicle, with up to three tests per protocol (Fast Charging, Level 2, and Level 1), and with up to four observations per test (the trusted meter or meter testing device; the EVSE; the vehicle’s on-board reading; the third-party managed charging service provider), this sample size of 15 vehicles could obtain up to 540 kWh observations for comparison and analysis. The Joint Utilities estimate:

- 36 kWh measurements per EV model;
- 15 kWh observations per Level 2 EVSE model; and
- 45 kWh observations per third-party managed charging service provider.

The Joint Utilities are uncertain of how many observations will be obtained per DCFC model or per Level 1 EVSE model at this time. These sample size calculations are provided in Appendix 2.

Questions

7. *For all respondents:* Please provide feedback on the proposed device list (Appendix 1 and Table 2) and priority framework.
8. *For all respondents:* Please provide feedback on the proposed sample sizes and associated sampling and observation framework (see also Appendix 2).
9. *For all respondents:* Please provide feedback on the use of existing testing reports produced by a Nationally Recognized Testing Laboratory as an additional quality-control measure to be integrated into the proposed testing framework.
10. *For Device Manufacturers:* Please provide feedback on your willingness to partner to support this effort, including:
 - a. Your willingness to provide loaner devices for the specified models or otherwise support this testing initiative in obtaining devices for testing purposes.

- b. Your willingness to help provide data obtained from your devices (i.e., from connected EVSE, onboard measurements, third-party service providers, or other means).

11. *For Potential Testing Implementors:* Please provide feedback on the feasibility of conducting testing with the proposed sample size, including:
- a. How many vehicles your facility could simultaneously test.
 - b. What testing protocol(s) is your facility equipped to administer?
 - c. Whether you are a Nationally Recognized Testing Laboratory (NRTL)
 - i. If so please specify if you are considered a government lab, manufacturer facility or third-party laboratory.

Implementation Schedule

The Technical Standards Working Group is required to conclude an initial phase of testing by July 14, 2024. In order to meet that deadline, the Joint Utilities expect the following high-level schedule:

- Issue a Request for Proposals (RFP) in the summer of 2023, with a target of a contract award during the fall of 2023.
- Use the fourth quarter of 2023 to prepare any facilities, refine testing logistics, and secure devices to be tested for specific dates in the following weeks or months.
- Execute the testing, assumed to be during the first quarter of 2024 and, if needed, the second quarter.
- Draft and issue a report analyzing the findings of the device testing by early June 2024.

Questions

12. *For all respondents:* Please provide feedback on the draft testing schedule.
- a. *For Potential Testing Implementors:* Please provide feedback on the availability of your testing facilities to conduct testing during this time period.
 - b. *For Device Manufacturers:* Please provide feedback on your potential to support this testing initiative with the schedule proposed, such as by providing loaner devices or supporting data collection efforts.

Implementation Costs

The Joint Utilities are looking for feedback on the potential costs associated with this testing initiative, as well as suggestions for outside funding sources to support this effort.

Questions

13. *For all respondents:* Please provide any suggestions that may lead to a more efficient or cost-effective testing initiative (without compromising its ability to draw conclusions).
14. *For all respondents:* Please provide any suggestions for outside funding sources (i.e., funding sources other than the Joint Utilities' ratepayers) and whether your organization would be able to provide resources or in-kind donations. Please note that these are non-binding commitments at this time.

15. *For Potential Testing Implementors:* Please provide estimates on the following costs.

Please note that these are non-binding cost estimates to inform planning and budgeting.

- a. Facilities costs. (Please assume that any vehicles being tested are provided, but please discuss whether you would need to install any EVSE to support this testing at your facility.)
- b. Labor costs to conduct the testing, as proposed. (Please assume that any coordination of the vehicles and devices is largely already provided for.)
- c. Reporting and analysis costs.
- d. Any other costs.

EV and EVSE Metering Accuracy Testing Request for Information

Appendix A

Table A-1. Priority 1 devices recommended for testing, pending availability

Device Type	Device Make	Device Model	Registered in NY as of April 2023	JU Programs that Support this Device
BEV	Chevrolet	Bolt (incl. EUV) 2017+	5,205	ConEd/O&R/National Grid/ NYSEG/RG&E/CenHud
BEV	Ford	F-150 Lightning 2022+	886	ConEd/O&R/National Grid/ NYSEG/RG&E/CenHud
BEV	Ford	Mach-E Mustang 2021+	2,893	ConEd/O&R/National Grid/ NYSEG/RG&E/CenHud
BEV	Hyundai	IONIQ5 2022+	1,375	ConEd/O&R/NYSEG/RG&E/ CenHud
BEV	Kia	EV6 2022+	786	ConEd/O&R/ NYSEG/RG&E
BEV	Tesla	Model 3 (all years)	22,621	ConEd/O&R/National Grid/ NYSEG/RG&E/CenHud
BEV	Tesla	Model Y (all years)	21,819	ConEd/O&R/National Grid/ NYSEG/RG&E/CenHud
PHEV	Toyota*	Prius Prime 2021+	14,206	ConEd/O&R/National Grid/ NYSEG/RG&E/CenHud
PHEV	Toyota*	RAV4 Prime 2021+	7,724	ConEd/O&R/National Grid/ NYSEG/RG&E/CenHud
EVSE Level 2	ChargePoint	Home Flex		ConEd/O&R/National Grid/ NYSEG/RG&E/CenHud
EVSE Level 2	Enel X	JuiceBox 32/40/48		ConEd/O&R/National Grid/ NYSEG/RG&E/CenHud
*Note that only one of the Toyota models would be included as be Priority 1.				

Table A-2. Priority 2 devices recommended for testing, pending resource constraints and device availability

Device Type	Device Make	Device Model	Registered in NY as of April 2023	JU Programs that Support this Device
BEV	Audi	Q4 e-Tron 2022+	168	ConEd/O&R/NYSEG/RG&E/CenHud
BEV	Audi	e-Tron 2019+	978	ConEd/O&R/NYSEG/RG&E/CenHud
PHEV	BMW	3-series PHEV 2017+	588	ConEd/O&R/National Grid/NYSEG/RG&E/CenHud
PHEV	BMW	5-series PHEV 2017+	898	ConEd/O&R/National Grid/NYSEG/RG&E/CenHud
PHEV	BMW	7-series PHEV 2017+	84	ConEd/O&R/NYSEG/RG&E/CenHud
BEV/PHEV	BMW	i3 (+REX) 2014+	576	ConEd/O&R/National Grid/NYSEG/RG&E/CenHud
BEV	BMW	iX 2021+	312	ConEd/O&R/CenHud
PHEV	BMW	X5 PHEV 2017+	1,794	ConEd/O&R/National Grid/NYSEG/RG&E/CenHud
PHEV	Chrysler	Pacifica Hybrid 2017+	1,876	ConEd/O&R/CenHud
BEV	Hyundai	Kona 2019+	2,170	ConEd/O&R/CenHud
PHEV	Hyundai	SantaFe PHEV 2022+	770	ConEd/O&R/NYSEG/RG&E/CenHud
PHEV	Jeep	Cherokee 4xe 2022+	1,214	CenHud
PHEV	Jeep	Wrangler 4xe 2021+	5,599	CenHud
BEV	Kia	e-Niro 2019+	1,328	ConEd/O&R/NYSEG/RG&E
BEV	Nissan	Leaf 2017+	2,537	ConEd/O&R/NYSEG/RG&E/CenHud
BEV	Rivian	R1S 2022+	180	ConEd/O&R/CenHud
BEV	Rivian	R1T 2022+	488	ConEd/O&R/CenHud
BEV	Tesla	Model S (all years)	5,364	ConEd/O&R/National Grid/NYSEG/RG&E/CenHud
BEV	Tesla	Model X (all years)	4,730	ConEd/O&R/National Grid/NYSEG/RG&E/CenHud
BEV	Toyota	BZ4X 2023+	83	ConEd/O&R/National Grid/NYSEG/RG&E/CenHud
BEV	Volvo	C40 Recharge 2022+	153	ConEd/O&R/CenHud

PHEV	Volvo	S60/S90 PHEV 2018-21	302	ConEd/O&R/CenHud
BEV	Volvo	XC40 Recharge 2021+	401	ConEd/O&R/CenHud
PHEV	Volvo	XC60 PHEV 2018 – 2021	918	ConEd/O&R/CenHud
PHEV	Volvo	XC90 PHEV 2016+	1,233	ConEd/O&R/CenHud
BEV	Volkswagen	ID.4	1,254	CenHud
BEV	Volkswagen	e-Golf	186	CenHud
EVSE Level 2	Siemens	VersiCharge		<i>expected to be supported</i>
EVSE Level 1	Smartenit	SmartElek Level 1 EVSE		ConEd/O&R/National Grid/ NYSEG/RG&E
EVSE Level 2	FLO	Home G5/X5		CenHud
EVSE Level 2	Emporia	Emporia		CenHud

Table A-3. Priority 3 devices not recommended for testing at this time

Device Type	Device Make	Device Model	Registered in NY as of April 2023	JU Programs that Support this Device
PHEV	Audi	A5 PHEV 2022+	160	ConEd/O&R/NYSEG/RG&E/CenHud
PHEV	Audi	A7 PHEV 2021+	39	ConEd/O&R/NYSEG/RG&E/CenHud
PHEV	Audi	A8 PHEV 2020-21	16	ConEd/O&R/NYSEG/RG&E/CenHud
PHEV	Audi	Q5 PHEV 2020+	412	ConEd/O&R/CenHud
PHEV	BMW	i8 2017-2020	230	ConEd/O&R/NYSEG/RG&E/CenHud
PHEV	BMW	X3 PHEV 2020-21	411	ConEd/O&R/NYSEG/RG&E/CenHud
PHEV	Cadillac	CT6 PHEV 2017-18	21	ConEd/O&R/CenHud
PHEV	Cadillac	ELR 2017-16	64	ConEd/O&R/CenHud
PHEV	Chevrolet	Volt 2015-19	3,287	ConEd/O&R/National Grid/NYSEG/RG&E/CenHud
PHEV	Ford	Escape PHEV 2021+	744	ConEd/O&R/CenHud
PHEV	Ford	Fusion PHEV 2020	2,991	ConEd/O&R/CenHud
BEV	Hyundai	IONIQ BEV 2017-21	879	ConEd/O&R/CenHud
PHEV	Hyundai	IONIQ PHEV 2018+	1,946	ConEd/O&R/NYSEG/RG&E/CenHud
PHEV	Hyundai	Sonata PHEV 2017-19	428	ConEd/O&R/NYSEG/RG&E/CenHud
PHEV	Hyundai	Tucson PHEV 2022+	444	ConEd/O&R/NYSEG/RG&E/CenHud
BEV	Jaguar	i-pace 2019+	131	CenHud
PHEV	Kia	Optima PHEV 2017-2020	105	ConEd/O&R/NYSEG/RG&E
PHEV	Kia	Niro PHEV 2018-19	560	ConEd/O&R/NYSEG/RG&E
PHEV	Kia	Sorento PHEV 2022+	309	ConEd/O&R/NYSEG/RG&E
BEV	Kia	Soul BEV 2017-2020	147	ConEd/O&R/NYSEG/RG&E
PHEV	Land Rover	Range Rover P400e 2019-21	80	CenHud

PHEV	Lincoln	Aviator 2020+	242	ConEd/O&R/CenHud
PHEV	Lincoln	Corsair 2021+	136	ConEd/O&R/CenHud
PHEV	Mini	SE Countryman 2018+	287	ConEd/O&R/CenHud
BEV	Mini	SE Hardtop 2020+	159	ConEd/O&R/CenHud

Note: This list is non-exhaustive, i.e., there are additional devices available in the market not listed here that are also not expected to be tested.

EV and EVSE Metering Accuracy Testing Request for Information

Appendix B

Table B-1. Testing Sample Sizes

15	Target number of EV make/models to be tested (across Priority 1 and 2 EVs)
13	Est. number BEV make/models to be tested
2	Est. number PHEV make/models to be tested
1	Desired minimum number to be tested per make/model
15	Target number of EVs to be tested
3	Est. number of testing protocols performed per vehicle
3	Est. number of tests performed per testing protocol (1x Fast Charging, 1x Level 2, 1x Level 1)
1	Est. days to complete one testing protocol
3	Est. days of testing per vehicle
45	Est. number of vehicle-days of testing
4	Est. kWh measurements per Test (Meter Testing Device, EVSE, EV on-board, Third-party managed charging service provider)**
540	Est. kWh measurements obtained for analysis and comparison
36	Est. kWh measurements per EV make/model
3	Number of Level 2 EVSE make/models to test
1	Desired minimum number to be tested per make/model
3	Est. number of Level 2 EVSE to be tested
45	Est. kWh measurements for Level 2 EVSE devices (i.e., Level 2 load tests only)
15	Est. Tests per Level 2 EVSE make/model
TBD	Number of DCFC make/models to test
TBD	Number of Level 1 make/models to test
3	Est. number of managed charging service providers tested
45	Est. number of kWh measurements per service provider (e.g., one service provider per vehicle testing day)**
15	Est. number of kWh measurements per service provider per Test (Fast Charging, Level 2, Level 1)**

* PHEVs are not expected to perform the "Fast Charging" test, however PHEVs may still receive three tests between the Level 1 and Level 2 load tests.

** Vehicles may not be supported by every third party managed charging service provider, hence not all vehicle-tests are expected to receive four kWh measurements.