BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

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Order Instituting Rulemaking Regarding Transportation Electrification Policy and Infrastructure	R.23-12-008

(NOT CONSOLIDATED)

Order Instituting Rulemaking to Continue Development of Rates and Infrastructure for Vehicle Electrification	R.18-12-006

SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E) MID-TERM REPORT ON VEHICLE-GRID INTEGRATION STRATEGIES, PROGRAMS AND PILOTS METRICS

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Dated: **September 16, 2024**

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Southern California Edison Company (SCE) hereby files the attached mid-term report on Vehicle-Grid Integration Strategies, Programs, and Pilots, as directed by Ordering Paragraph 1 of Decision (D.) 20-12-029. The Report is attached to this pleading.

Respectfully submitted,

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Southern California Edison

Mid-Term

Vehicle-Grid Integration Strategies Report

Submitted on September 16, 2024

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Southern California Edison Company's Mid-Term Report on Vehicle-Grid Integration Strategies, Programs and Pilots Metrics
September 16, 2024

Executive Summary

On December 21, 2020, the California Public Utilities Commission (CPUC or Commission) issued Decision (D.) 20-12-029, *Decision Concerning Implementation of Senate Bill 676 and Vehicle-Grid Integration Strategies* (the Decision), which among other things, orders the utilities to file mid-term and annual reports on metrics pertaining to pilots and programs related to Vehicle-Grid Integration (VGI).

Ordering Paragraph (OP) 1 directs utilities to "file mid-term reports annually starting on September 15, 2021, and annual reports starting in March 2021 and ending March 15, 2031."[1] On February 1, 2021, Executive Director Peterson issued an *Order Correcting Error*, to correct the date for the first annual report to March 15, 2022.

The first mid-term report covered the period of January 1 through June 30, 2021. SCE subsequently filed its first annual report on March 15, 2022.

This mid-term report covers the period from January 1 through June 30, 2024. In accordance with the Decision,[2] the report uses the VGI reporting template that was developed in consultation with Energy Division staff and upon which stakeholders commented during the Joint Utilities' VGI Pilots and Reporting Template Workshop on March 16, 2021.[3] The data collection template is provided as a separate Excel document.

In this report, SCE provides information on existing transportation electrification (TE) pilots and programs, some of which may have been implemented for a year or longer. SCE routinely tracks data, including costs and customer enrollment, for its TE pilot and program reports. SCE's program managers, internal experts, and TE staff were also engaged to provide narrative updates on the latest program and activity metrics.

The VGI template establishes some additional data requirements that SCE was not tracking as part of its existing reporting. Some of these data elements are not available for this report as they pertain to programs or projects which SCE has not launched as of

[1] D.20-12-029, Ordering Paragraph (OP) 1.
[2] D.20-12-029, p. 61.
[3] SCE, San Diego Gas & Electric Company (SDG&E), and Pacific Gas and Electric Company (PG&E) are collectively referred to as the Joint Utilities.

this report's timeframe covered, or SCE does not have access to those data elements. Additionally, SCE's TE programs are in various stages of implementation. As a result, some programs may have limited data. SCE discusses these areas in the Narrative Questions section, response to question 30 on "Barriers to data collection and potential solutions."

VGI Definitions

SB 676 originally defined VGI and gave authority to the Commission to revise the definition. In the Decision, VGI's definition is revised to the following:

> "Electric vehicle grid integration" means any method of altering the time, charging level, or location at which grid-connected light duty electric vehicles, medium-duty electric vehicles, heavy-duty electric vehicles, off-road electric vehicles, or off-road electric equipment charge or discharge, in a manner that optimizes plug-in electric vehicle or equipment interaction with the electrical grid and provides net benefits to ratepayers by doing any of the following:
>
> A. Increasing electrical grid asset utilization and operational flexibility.
> B. Avoiding otherwise necessary distribution infrastructure upgrades and supporting resiliency.
> C. Integrating renewable energy resources.
> D. Reducing the cost of electricity supply.
> E. Offering reliability services consistent with the resource adequacy requirements established by Section 380 or the Independent System Operator tariff.[4]

Based on this definition, VGI activities and programs can take many forms, broadly categorized as follows:

- Methods, including TOU tariffs and programs, autonomous or automatic settings on electric vehicles (EVs) or charging systems that position charging times and rates to increase grid asset utilization and reduce the need for upgrades.
- V1G: Vehicle charging is managed to respond to grid requirements to improve reliability and reduce costs. SCE further breaks this down into direct and indirect forms:
  - Indirect V1G uses EVs or Electric Vehicle Supply Equipment (EVSE) that can adjust according to price signals or periods and/or other mechanisms to optimize charging that benefits both the grid and the customer.

[4] D.20-12-029, pp. 12-13.

    - Direct V1G features the utility taking an active role in controlling timing and amount of vehicle charging, for example sending requests to throttle charging load during peak periods using a demand response mechanism.
- V2G: Vehicle-to-grid bidirectional charging and discharging, under which EVs may discharge onto the grid, or microgrid, in addition to characteristics offered by V1G.
- V2G: Parallel, Non-export: Vehicle-to-building integration, under which an EV may provide power directly to a home or building, is a form of V2G.

VGI Reporting Template Structure

The Decision determines that "[r]obust VGI metrics and reporting are essential" for statutory compliance as well as determining progress toward goals and providing information to various parties and to help evaluate the VGI programs.[5] Additionally, the Decision adopts the VGI staff paper proposal to establish three categories, with numerous corresponding metrics:

> (1) activity – track adoption of VGI policy actions
> (2) program – track the success of program implementation against program goals
> (3) outcome – track aggregate progress toward end goals across all programs and activities.[6]

For reporting purposes, the Decision directed the large electrical corporations to consult with the Commission's Energy Division staff to create a VGI reporting template that incorporated the required metrics.[7] The utilities collaborated with Energy Division staff and also served a draft copy of the VGI reporting template to the service list and other stakeholders on February 28, 2021 in order to allow time for review prior to the Joint Utilities' workshop on March 16, 2021, in which stakeholders had an opportunity to provide feedback.

The VGI reporting template consists of two components: (1) a narrative section, which includes general utility and SCE specific questions, to provide an overview of the utility's VGI efforts and qualitative information and (2) a spreadsheet for reporting quantifiable data, such as pilot/program participation, costs, and other data.

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[5] D.20-12-029, p. 52.
[6] Id., *see also id.*, OP 1 (listing VGI activities to be reported on).
[7] Id., p. 60.

Narrative - General Questions

The metrics reported below correspond to the row number in the VGI Reporting Template excel file.

3. Customer program or pilot and incentives related to VGI

SCE Emergency Load Reduction Program (ELRP) pilot:[8] As part of Rulemaking (R.) 20-11-003, on March 26, 2021, the CPUC issued Decision (D.) 21-03-056, which (among other measures) approved the ELRP pilot; an out-of-market (*i.e.*, not integrated into the CAISO's market), voluntary, non-penalty demand response (DR) resource. The ELRP currently consists of eight participant sub-groups.[9] On December 6, 2021, the CPUC issued D.21-12-015, which directs SCE, Pacific Gas and Electric Company (PG&E), and San Diego Gas & Electric (SDG&E) to take additional actions to prepare for potential extreme weather in the summers of 2022 and 2023, including the addition of a VGI Aggregator[10] option (Sub-Group A.5.) to the ELRP pilot. On December 20, 2023, the CPUC issued D.23-12-005 approving the extension of the ELRP Pilot through 2027, except for ELRP Sub-Group A.6. (Residential ELRP) which will end after the 2025 ELRP season (May-October 2025).

Integrated Distributed Energy Resources Partnership Pilot: SCE launched the Integrated Distributed Energy Resources Partnership Pilot in January 2022, which allows customers to enroll with energy solutions providers to implement distributed energy resource (DER) solutions to help meet grid needs in specific geographical areas. VGI opportunities are a potential option available to participants in this pilot.

4. Adoption of rates that encourage VGI and adoption of mechanism to provide credit for export

SCE interprets this metric to cover rates that encourage both VGI *and* adoption of mechanisms for export credits. Rates that encourage VGI are covered elsewhere.

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[8] ELRP Pilot approved in D.21-03-056; The VGI ELRP Sub-Group (Sub-Group A.5.) was established in D.21-12-015.

[9] ELRP Pilot sub-groups include: A.1. (Directly Enrolled Non-Residential Customers); A.2. (Base Interruptible Program (BIP) and Non-BIP Aggregators); A.3. (Non-Residential Customers with Rule 21 Exporting Distributed Energy Resources (DERs)); A.4. (Virtual Power Plant (VPP) Aggregators); A.5. (Vehicle Grid Integration (VGI) Aggregators); A.6. (Directly Enrolled Residential Customers); B.1. (Third-Party Demand Response Providers (DRPs) Participating in the CAISO Energy Market as a Proxy Demand Resource (PDR)); and B.2. (Capacity Bidding Program (CBP) Aggregators).

[10] A VGI Aggregator is a third-party that manages an aggregation consisting of any combination of electric vehicles and/or charging stations – including those that are capable of one-way charging (V1G) and/or bi-directional charging and discharging (V2G) deployed with residential (bundled or unbundled) or non-residential (bundled or unbundled) customers that meet specified criteria.

The VGI Aggregator ELRP Sub-Group, A.5., provides for the compensation of exported energy if the customer has a Rule 21 interconnected device/equipment with export capability and permit. The ELRP baseline is modified to account for exported energy during non-event days in order to count exported energy in the ELRP Incremental Load Reduction (ILR) calculation. Autogrid, Fermata, Flip Energy & Olivine are enrolled as VGI aggregators in ELRP Sub-Group A.5., however, they have not enrolled any customers during the reporting period. Ford Motor Company is finalizing a contract with Olivine. Ford intends to participate in ELRP Sub-Group A.5 through Olivine's aggregation. Ford has chosen Olivine because it offers a single point of contact, allowing Ford to enroll not only in SCE's ELRP Sub-Group A.5 but also in the ELRP subgroups of PG&E and SDG&E. SCE is also engaged in conversation with other potential VGI aggregators but have not had any additional aggregator or customer enrollments during this reporting period.

5. Efforts to collaborate with CAISO to design wholesale market rules and access to support VGI

SCE collaborated with CAISO during the Los Angeles Air Force Base V2G pilot on wholesale V2G operations 2011-2013 and continues to study potential for VGI wholesale applications, for example in SCE's V2G Technical Advisory Board (TAB) which CAISO representatives participate in. SCE is not coordinating directly with CAISO on their wholesale market rule changes. However, FERC Order 2222 proposes a new pathway for VGI participation in wholesale markets, and SCE is exploring needed jurisdictional rule changes and its own internal methods to benefit aggregated resource participation in wholesale markets.

6. Leveraging or supplementing EPIC and/or other sources of funding for VGI technology demonstration projects

SCE administers five Electric Program Investment Charge (EPIC) projects under way which include electric transportation and VGI elements. In addition, there are several other EPIC projects which involve DER integration and controls which in general support VGI use cases and may include electric vehicles. The SCE administered EPIC electric transportation-focused projects are:

1. Distributed Plug-In Electric Vehicle Resources (DPIEV Resources)
2. Vehicle to Grid Integration with On-Board Inverter (V2G OBI)
3. Service Center of the Future (SCOF)
4. Stability Improvement with Distributed Energy Resources (SIDER)
5. Swift Electrification of Transit (SET)

DPIEV Resources: This project studies the integration of energy storage systems with high-power, high-impact EV charging systems. This project demonstrates the use of

batteries to support customer bill management while simultaneously evaluating several utility VGI grid support use cases, including renewables integration, grid infrastructure deferrals, and energy market services. This project has concluded testing activities and is in the final analysis stage.

V2G OBI: This project advances V2G AC, or on-board inverter-based architecture function and standards in partnership with automotive and EV charging original equipment manufacturers (OEMs). In addition, it provides the first demonstration of distributed energy resource management system (DERMS)-based IEEE 2030.5 controls from the SCE Grid Management System with both AC and DC (off-board inverter) systems. With three sets of partners involving light-duty OEMs automakers with dedicated EVSE and aggregator control elements, the project operates the systems in the lab while demonstrating Rule 21 interconnection requirements, control functionality with SCE's distribution operating system functions, and resulting effects on the electrical system. Six VGI use cases are demonstrated with the partners, which sets the stage for future field demonstrations and V2G interconnections and operations. SCE participates in SAE J3072, IEEE (Institute of Electrical and Electronics Engineers) 2030.13, 1547, and UL 1741 SC committees, among others, in conjunction with this project. Included as part of the project is the V2G Technical Advisory Board (TAB), which provides a forum for industry technical experts on V2G to review and advise on V2G and VGI aspects of the EPIC project and on the technology in general. The TAB has resulted in recommendations from project stakeholders on significant V2G technical gaps and volunteers to work on those gaps. The project is in progress and runs through 2024.

SCOF: The Service Center of the Future project is a broad-scale project that brings microgrid control strategies together with modernization of a utility fleet vehicle operations center. It involves building electrification and controls, energy storage, EV charging controls, EV charging submetering, and utility operations, all managed through a utility operated microgrid control system and DERMS platform. Multiple VGI use cases are demonstrated here, including power-off grid resiliency and local grid balancing and renewables integration. The project is in progress and runs through 2025 when a field pilot will begin with deployment of the technology to SCE's Dominguez Hills Service Center.

SCE, in a March 27, 2024, workshop, launched five new EPIC projects, including two projects with planned VGI elements.

SIDER: The SIDER project advances two EPIC Research Topics – Inertia Substitution and Customer Load Flexibility. It focuses on DER management, with both autonomous and directed controls. SIDER seeks involvement of several OEM automakers with hundreds of EVs per brand or aggregation. It leverages aggregation platforms and common interfaces with SCE's DERMS which will register and monitor resources and identify and leverage flexibility to arrange charging and discharging (V2G) events in a

way which maintains customer utility while minimizing grid impact and maximizing grid utilization. Bidirectional inverters or V2G chargers will incorporate advanced settings to support grid stability in an environment of increased inverter-based generation. This project is in initial planning and will ultimately deploy to a disadvantaged community in SCE's service area.

SET: The SET project studies new methods and equipment for serving high-impact electric transportation support facilities, such as electric transit bus depots. SET approaches the fleet depot electrification service provision from a standardization perspective, looking to incorporate standard elements and processes for general use. It seeks to address customer concerns with obtaining electrical service for fleet operations as quickly as possible while maximizing grid utilization, all while ensuring customer resiliency. SET explores integrated VGI controls, DERMS implementation, long duration energy storage, and advanced power electronics and DC power distribution. This project is in initial planning and will ultimately deploy to a transit depot of an SCE customer in a disadvantaged community.

SCE participates in the following CEC-administered EPIC projects:

eTRUC: "The Electric Power Research Institute (EPRI) and CALSTART manage the Electric Truck Research and Utilization Center (eTRUC), California's premier Research Hub for Electric Technologies in Truck Applications (RHETTA). With co-funding from the California Energy Commission's Electric Program Investment Charge, eTRUC is a stakeholder-driven consortium of industry, government, academia, and community partners committed to the development, advancement, and deployment of innovative heavy-duty (HD) high-power charging infrastructure along key freight corridors that promote the adoption of Class 7 and 8 battery-electric zero-emission (ZE) trucks. eTRUC follows a "Community First" approach to 1) engage stakeholders, 2) advance technology, and 3) create ZE freight corridors."[11] SCE hosts the eTRUC Advanced Transportation Research Center and is service provider and advisor to the project and its pilot high power charger deployments.

Innovative Curbside EV Charging (BESTFIT): This project, led by industry participant Flo, explores new methods for adding EV charging infrastructure to existing SCE utility equipment. This project will also increase access to more local EV charging for SCE customers who may not have access to at-home charging. This project is in progress with planned deployments in Huntington Park and Santa Monica.

7. Efforts to accelerate the use of VGI for resiliency

[11] Per https://etruc.org/, accessed on 9/4/24.

In addition to the EPIC projects, SCE has several activities focused on accelerating VGI for resiliency, including EV customer behavior and managed charging studies.

SCE continues work to accelerate vehicle-to-building (V2B) and V2G through various TE efforts, including through (1) its EPIC pilots discussed in response to question 6, (2) the School Bus V2G project and VGI pilots detailed below, and (3) in consultative communications between its employees and customers.

SCE was one of the original signatories to the "DOE V2X MOU" and participated in the signing event and in the V2X technical roundtable. SCE continues to collaborate on V2X and looks for potential projects and partnership opportunities.

On June 15, 2021, SCE Filed advice letter AL 4518-E which included a proposal to use Low Carbon Fuel Standard (LCFS) funds for a pilot project at Baldwin Park Unified School District (BPUSD) to increase deployment of bidirectional-capable school buses and equipment at the BPUSD and to enable existing and newly acquired school buses to be used for V2B services. Based on feedback from Energy Division, modifications were made to this proposal in SCE's supplemental advice letter AL 4518-E-A on February 24, 2022, where SCE additionally requested to utilize up to $3M per year of its LCFS funds to support other, yet-to-be-defined, school bus V2B projects in its service area. Both these initiatives were denied by Resolution E-5236 in November 2022, with the Resolution indicating that SCE failed to demonstrate why these V2B projects could not be implemented with other program funding (i.e., Charge Ready Transport, SCE's medium and heavy duty EV infrastructure program) or how these proposals aligned with broader TE resiliency efforts. It is worth noting that Charge Ready Transport does not easily accommodate V2B applications as the program requires separate metering and separate service drops, meaning that any vehicle connected to the charging equipment would be unable to provide power to any collocated facility.

Additionally, on July 15, 2021, SCE filed advice letter AL 4542-E outlining its VGI Pilots spending proposal in response to D.20-12-029. SCE proposed three VGI pilots in this advice letter, two of which are beneficial for resiliency. On June 2, 2023, SCE requested to withdraw its advice letter based upon input from the Energy Division.[12] SCE continues to explore VGI opportunities.

8. Progress to reform interconnection rules to advance VGI

Under Rulemaking (R.) 17-07-007, SCE's Rule 21 tariff and interconnection technical standards continue to evolve to support bidirectional VGI application. This section summarizes important enhancements of SCE's Rule 21 directed under this Rulemaking.

[12] The Commission's Energy Division issued a disposition adopting SCE's request to withdraw AL 4542E as of June 5, 2023.

On September 24, 2020, the Commission issued D.20-09-035, which provides direction on how bi-directional VGI applications are to be addressed. Among other things, D.20-09-035 adopted the following proposals:

- 23b. Rule 21 applies to the interconnection of both stationary and mobile storage systems.
- 23c. V2G direct current (DC) EVSE may be interconnected under the existing Rule 21 tariff so long as it meets certain requirements.
- 23d. V2G DC EVSE may connect as V1G and operate as load-only upon certification that it will not discharge to the grid, will not inadvertently switch to bidirectional mode, and factory default settings are set to unidirectional mode.
- 23e. V2G DC EVSE connected as V1G may switch to bidirectional mode upon completing the Rule 21 interconnection process and receiving permission to operate (PTO).
- 23f. The Utilities' interconnection portals should be modified to enable the simple tracking of V2G interconnections.
- 23g. The Utilities must clarify a temporary pathway to interconnect vehicle-to-grid alternating current (V2G AC) EVSE systems.

Pursuant to D.20-09-035, Ordering Paragraphs (OP) 42 and 44, the Utilities[13] held several workshops to present and discuss the proposed implementation steps for Proposals 23e and 23g. On March 26, 2021, the Utilities hosted a workshop during which they presented their proposed implementation steps for DC EVSE initially connected as load-only to later enable bidirectional operation (Proposal 23e). On March 29, 2021, the Utilities hosted a workshop during which they presented their proposed temporary pathway for V2G AC pilot project interconnection (Proposal 23g. OPs 42 and 44 also required the Utilities to submit a Tier 3 advice letter if Commission approval was needed for the implementation steps presented at the workshop.

On May 28, 2021, the Utilities jointly submitted a Tier 3 advice letter[14] requesting Commission approval for: 1) a temporary pathway for pilots seeking V2G AC interconnection that will ensure the necessary safety precautions, and 2) implementation steps for interconnection applicants with EVSE with stationary inverter for V2G DC EVSE system to request permission to switch to bidirectional mode after completing the Rule 21 interconnection process and receiving permission to operate from a Utility.[15] On November 4, 2021, the Joint Advice Letter was approved with modifications, in Resolution E-5165.

[13] Utilities are SCE, San Diego Gas & Electric (SDG&E) and Pacific Gas and Electric (PG&E).
[14] SCE AL 4510-E, PG&E AL 6209-E, SDG&E AL 3774-E.
[15] SDG&E AL 3774-E, SCE AL 4510-E, and PG&E AL 6209-E ("the Joint AL").

For certain type of systems (V2G-DC systems), D.20-09-035 clarified that these systems could interconnect to the grid as long as the V2G-DC EVSE meets all Rule 21 requirements, including UL 1741 SA and other updated Smart Inverter Standards.[16]

For other type of systems for which standards currently do not exist (V2G-AC systems), the IOUs were ordered to develop a process for interconnecting V2G-AC systems in pilot projects while ensuring that the necessary safety provisions are taken.[17]

Further, as required by D.20-09-035, SCE participates on committees that update the V2G-AC interconnection standards, such as the Vehicle-to-Grid Alternating Current Subgroup.[18]

On July 27, 2022, SCE filed with the Commission Advice Letter 4836-E to revise Rule 21 to provide information regarding certification requirements for interconnection applicants with Electric Vehicle Supply Equipment (EVSE) with a stationary inverter for direct current charging of vehicles (V2G DC EVSE). On August 30, 2022, Advice Letter 4836-E was accepted with an effective date of July 27, 2022.

On September 22, 2023, SCE/PG&E/SDG&E provided the following update to parties of R.17-07-007 and R.18-12-006 on the status of V2G AC interconnections.

- ***UL 1741 SC – Standard for Interconnection System Equipment (ISE)/EVSE***
    - Development of the standard continues, with an expected publication date of end of Q1 2024.
- ***SunSpec J3072-2030.5 SunSpec profile standard and certification***
    - Development of the standard and certification continues, with an expected publication date of Q4 2023.
    - Dependent on UL 1741 SC and SAE J3072 development
- ***SAE J3072- V2G-AC EV standard (equivalent to 1547-2018 and UL 1741 SB)***
    - J3072 has been re-opened for revisions.
    - Besides revisions, needs to include test spec for vehicle – also requires 1547.1/UL 1741 SB.
    - Expected completion End of Q4 2023
    - Certification program is TBD.

On November 9, 2023, SCE filed AL 5138-E to establish a two-year customer-side, third-party owned Automated Load Control Management Systems (LCMS) Pilot, revise SCE's Rule 16 to accommodate these systems, and establish the Automated Load Contract Management System Pilot Agreement (Form 16-332) to support customer ownership, installation, and operation of the automated LCMS. AL 5138-A was approved by the CPUC on January 16, 2024. The LCMS Pilot was designed to provide

[16] D.20-09-035, OP. 39, p. 218.
[17] *Id*., OP. 44. p. 220.
[18] *Id*., OP, 53 and 54, p. 225.

safe and reliable service to new load customers requesting interconnection within grid capacity constrained areas during certain times of the day when there is sufficient capacity on the system to serve customers' load.

Also in 2023, pursuant to D.20-09-035 and Resolutions E-5211 and E-5230, the Utilities filed advice letters[19] providing the specifics on whether and how reductions to a customer's Limited Generation Profile (LGP) are determined, and providing recommendations regarding the standard review, certification requirements, and interconnection processes necessary for implementation of the LGP option. The Utilities advice letters were approved by the Commission on March 21, 2024, by Resolution E-5296. The LGP optionality will be implemented as part of an upcoming publication of the UL 3141 certification standard being approved for Power Control Systems (PCS) with integrated schedule.

On January 5, 2024, pursuant to D. 20-09-035 OP 44, the IOUs filed a joint Advice Letter[20] to provide lessons learned from the Vehicle to Grid Alternating Current (V2G AC) Pilot and recommendations for a pathway forward. The Joint IOU Advice Letter recommended extending the existing AC V2G pilot, with the same requirements included in Resolution E-5165, for an additional two years (i.e., January 1, 2024, to December 31, 2025). The IOUs ALs were approved by the Commission on August 22, 2024, by Resolution E-5315. In the Resolution, the Commission instructed the Utilities to keep the V2G AC pilot open indefinitely until standards were approved and changes to Rule 21 were implemented with a permanent process to allow the interconnection of V2G AC systems. The Commission also directed the Utilities to work with industry representatives to evaluate alternatives for testing and interconnection of V2G AC systems until standards are approved.

SAE J3072 was identified by the Commission as a standard to be considered for V2G AC systems. Currently, UL is working on a standard (UL 1741 Supplement SC) that aligns with an EV certified to SAE J3072. This UL standard is expected to be published in 2024. SAE J3072 establishes requirements for a grid support inverter system function which is integrated into a Plug-in Electric Vehicle (PEV) which connects in parallel with an electric power system (EPS). This standard also defines the communication between the PEV and the EVSE required for the PEV onboard inverter function to be configured and authorized by the EVSE for discharging at a site. The approval of UL 1741 SC will allow V2G AC systems to operate in parallel with the utilities' grid using the Rule 21 process.

SCE is also developing the use of customer-owned telemetry to support distribution-connected generating facilities' telemetry requirements using the IEEE 2030.5 standard and SCE's Rule 21 specified Common Smart Inverter Profile (CSIP) requirements to communicate with the generating facility's Currently Off-the-Shelf Technology (COT)

[19] SCE ALs 4941-E and 5025-E, PG&E ALs 6816-E and 6929-E, SDG&E ALs 4138-E and 4215-E, as well as some supplemental ALs.

[20] SCE AL 5185-E, PG&E AL 7125-E, and SDG&E AL 4350-E.

available from approved vendors. SCE expects to file for approval of the 2030.5 telemetry solution in the upcoming months.

9. Support and adoption of non-interconnection technical standards to advance VGI

SCE actively supports industry in development and adoption of VGI and EV charging standards through SAE, IEEE, CSA, UL, SunSpec, and others. SCE experts helped develop the SAE J2894 power quality of PEV chargers recommended practice and continues to actively participate in ongoing revision efforts . SCE staff participate as original members of the CSA (CSA Group, Canadian Standards) task force on EVEMS (EV Energy Management Systems, also known as ALM), which is the first attempt in North America on developing comprehensive standards for network-controlled EV charging energy management systems. This supports a critical need for a certifiable safety standard and implementation process for Type II EVEMS. The CSA effort supports harmonization with US standards bodies to create the first US/Canada standard on network-connected EV charging management systems.

In addition, SCE membership is maintained on the IEEE 2030.13 committee on network-managed EV charging facilities. SCE staff participates and maintains expertise in VGI communications and controls protocols, such as IEEE 2030.5, demonstrated in SCE's EPIC projects and utilized by SCE's Distributed Energy Resource Management System. These standards and systems will ultimately be used to effectively utilize VGI for grid and customer effect.

Additionally, SCE continues to work with industry on advancing adoption of new technical standards and capabilities. For example, SCE is part of a CEC-funded project under the BESTFIT program (focuses on projects that demonstrate transformative technology solutions and work to accelerate the successful commercial deployment of electric vehicle (EV) charging for both light-duty and medium- and heavy-duty (MD/HD) applications) to demonstrate innovative utility-connected charging methods. This project entails partnering with cities to deploy low-cost EVSE in needed areas and increase utilization of utility grid equipment, using V1G smart charging methods to manage grid impact and support customers. SCE is also a partner in the CEC-funded RHETTA program, and resulting eTRUC project, working to demonstrate advanced high-power charging systems for heavy-duty trucks, siting of public truck charging stations, and the integration of DERs with those systems. SCE is hosting the Advanced Transportation Research Facility laboratory in its Pomona EV Technical Center. SCE continues to work with partners and associations such as the Electric Power Research Institute (EPRI) and maintains membership in the National Infrastructure Working Council to support these objectives.

On June 15, 2021, pursuant to OP 19 of the D. 20-12-029, SCE submitted Advice 4521-E, detailing its workplan and work schedule to conduct a cybersecurity gap analysis to

identify potential gaps in existing cybersecurity protocols and EV charging equipment products used for TE programs, and to provide recommendations on how to address those gaps. Advice 4521-E was approved by the Commission without direction or funding to advance the topic. SCE discussed its need for further direction from the Commission with the Energy Division. On November 17, 2022, the Commission issued the Decision on Transportation Electrification Policy and Investment (D.22-11-040) and in OP 1 was directed to file an advice letter to establish a memorandum account to track and record costs related to implementation of the cybersecurity workplan and to implement the workplan according to the budget specified in Advice 4521-E. Pursuant to this directive, SCE conducted an RFP for consultants to execute the work, and in early 2024, awarded the contract to EPRI. That work is currently in progress. SCE continues to collaborate with cybersecurity experts and organizations such as EPRI, the National Labs and the DOE Vehicle Technology Office on advancing EV charging cybersecurity. In the V2G TAB, SCE has guided industry consensus work on cybersecurity, AC V2G, and standards harmonization.

Finally, SCE maintains membership in US DRIVE and the Grid Integration Technical Team and is on the DOE's "EVs at Scale" Steering Committee. SCE is also a member of EPRI's "EVs2Scale"[21] fleet electric transportation acceleration initiative and is also currently working on a project with EPRI on EV fleet distribution impacts.

10. Summary on efforts to fund and launch VGI customer education

The Decision does not establish funding to support customer education and outreach but directs SCE in OP 6 to provide customer education. SCE provides VGI customer education through its Charge Ready Light-Duty, Charge Ready Transport and TE Advisory Services (TEAS) programs. Education is generally limited to indirect V1G applications, which optimize customer charging within existing EV tariffs. SCE's Charge Ready programs offer educational webinars for multi-family, commercial, and medium- and heavy-duty fleet customers, which cover an array of topics such as, site planning, right-sizing their EVSE infrastructure, managed charging, EV Time-of-Use (TOU) rates, among others. In addition, SCE provides Rate Analysis Reports to interested customers who want to better understand TOU rate impacts and pricing implications based on historical charging patterns.

In 2020, SCE launched a simple, user-friendly, Fleet Fuel Calculator (FFC) tool, which provides fleet operators with information on electric vs. diesel fueling costs, EVSE charging level recommendations, managed vs. unmanaged electric fuel savings comparison, and GHG emission reductions. Through the TE Advisory Services' EV Readiness Studies offering, qualified customers are eligible to receive one-on-one

[21] EVs2Scale2030 | EPRI

consultation with a TE specialist who will go over various topics including but not limited to, managed vs. unmanaged charging, EV TOU rates, incentives, and recommended EVSE level charging. To ensure ongoing advancement of VGI customer education after the sunset of the Charge Ready programs, SCE included a request for V2X Customer Education in its 2025 General Rate Case filing.[22]

11. Summary on efforts to develop and support complementary policies needed to support Automated Load Management (ALM) technology

SCE described two separate architectures for ALM (also referred to as EV Energy Management Systems (EMS)) in 2019 at the National Infrastructure Working Council:

- Type I: Electrical infrastructure has full capacity for all stations; EMS is used to manage energy costs or respond to time- and location-based grid conditions.
- Type II: Electrical infrastructure has less capacity than would be needed for all stations without EMS; EMS needed as critical safety element. Uses can also include economic or grid service.

All EV Supply Equipment (EVSE or charging stations) installed in SCE's Charge Ready programs (except for Charge Ready Transport and Level 1 applications in all programs) are Type I ALM capable, with network connection and an EVSP operator in place. Type I capable systems can be configured by the customer to reduce electricity consumption costs, for example, by changing price or capability according to time and utility tariff. These systems, when also configured to connect to SCE's DR system, as demonstrated in the Charge Ready DR Pilot, can be signaled to perform a grid support function when such action is needed based on grid conditions. In this manner, generation, transmission, and distribution impacts are reduced, utilization is increased, and otherwise potentially necessary upgrades could be deferred.

Type II ALM is designed, installed, and configured in the case where a customer or the utility is adding load to an electrical system which is greater than the existing physical capacity of that system (wires, connectors, etc.). In other words, an electrical overload could be present without some induced control. The deficit of capacity can occur on the customer's side of the meter, the utility's side of the meter, or both. The normal course in this situation is to design and construct the needed (Code based) electrical infrastructure to adequately serve the load. In the anticipation of certified and capable energy management systems, it is helpful to start planning to assess the two alternatives (build out or controller) and determine which is more economical and useful under various scenarios.

[22] SCE's 2025 General Rate Case (A.23-05-010), Exhibit SCE-03, Vol 3, pg. 69.

In 2017, California's Title 24 adopted the version of the National Electrical Code which gave provisions for listed and suitable EV EMS to configure and manage load up to the nameplate rating of the EV EMS. As of this date, there is not a Nationally Recognized Testing Laboratory (NRTL) listed network controlled EV EMS available. SCE looks forward to the availability of listed Type II ALM systems that might be leveraged for further opportunities. SCE is a member of the CSA task force (C22.2, Number 343) on EV EMS, working to develop the first applicable safety code standard. This standard is being developed as a binational standard, to be applicable in the U.S. and Canada. SCE also maintains membership on UL 3141 relating to power control systems – a result of SCE's pilot activities on Load Control Management Systems (LCMS), described further below.

SCE remains open to pursuing and investigating Type II ALM opportunities within the previously launched Charge Ready programs. In anticipation of coming standards, SCE developed procedures in 2017 to evaluate and approve such systems in support of SCE's responsibilities to evaluate and qualify EVSE systems for use within the Charge Ready programs. SCE worked with two vendors in lab safety evaluations to test and approve their products for use. . Based on stated business reasons by customer participants two of the initial project sites identified for Type II ALM ultimately did not proceed.

Because the two projects did not proceed, SCE did not gain experience with the next part of Type II ALM deployment, which is the implementation and commissioning procedure. As SCE is not the permitting authority, SCE would have had to demonstrate its due diligence in each project to the authority having jurisdiction (AHJ), but it would be up to the AHJ to approve the installation and energization of the devices. The AHJ may require an NRTL field evaluation. Another important aspect of Type II ALM deployment is field commissioning. Each site must be properly configured with all of the EVSE types, their numbers, the infrastructure characteristics, protection settings, interface with utility systems, and fail-safe operating parameters, along with cybersecurity protections to prevent changes or takeovers which could immediately result in unsafe conditions. Each project at each site has uncertainty on the customer side with the AHJ and on the utility side with utility service design standards. This last component also requires further advancement due to the nature of unlisted electronic and network-controlled devices used in a critical fashion.

Subsequently, SCE in its Charge Ready Bridge program installed Type II capable systems in response to customer requests based on economics, but the Type II capabilities were not implemented because the electrical infrastructure was capable of handling full load. The systems are still useful for providing customer and grid benefits as Type I systems.

SCE continues to work to advance the deployment and use of Type I ALM and to address the issues and gaps with Type II implementation. SCE continues to serve on the CSA (CSA Group, Canadian Standards) and Institute of Electrical and Electronics Engineers' (IEEE) boards working on EV controls and EMS. In addition, SCE participates in UL 3141 development for Power Control Systems in conjunction with its LCMS pilot of Type II systems.

12. ALM deployment in the utility territory in the context of both existing and future transportation electrification programs, rules, and tariffs to the extent practical; including estimates on the number of ALM

Current ALM deployment covers Type I systems, referenced above, which apply to all Charge Ready programs with the exception of Charge Ready Transport and Level 1 chargers.

SCE has 148 sites and 2,757 ports participating in Type I ALM within our territory. The current list of sites is made up of customer participants from our Charge Ready Pilot, Bridge and Schools programs. Charge Ready Pilot participants have defaulted onto ELRP Sub-Group A.1.

SCE has implemented the Load Control Management Systems (LCMS) pilot program, which allows customers in grid constrained areas to energize partial load in advanced of grid upgrades if the customer uses an SCE approved control system to limit the load as provided by SCE and if the customer enters into an LCMS pilot agreement.[23] SCE currently has four (4) sites energized with this system operating and plan on an additional three (3) sites to be energized in 2024. These would be considered Type II ALM systems.

For future TE programs and installations, SCE will evaluate the needs, costs and benefits of Type I and Type II ALM as directed by D.20-12-029 and report out accordingly.

13. ALM systems installed for passenger vehicles and any medium and heavy-duty vehicle segment(s) under currently approved transportation electrification programs as well as estimates on the potentially expected avoided distribution and customer-side cost savings attributable to such ALM installations

No Charge Ready Transport, Charge Ready Schools, or Charge Ready Parks sites have deployed Type II ALM systems to date (i.e., where a customer or the utility is adding load to an electrical system which is greater than the existing capacity of that

[23] SCE proposed this pilot program via Advice 5138-E/E-A, which was approved by Energy Division on January 16, 2023 with an effective date of January 3, 2024.

system). Two sites participating in SCE's Charge Ready Pilot and Bridge programs installed Type II capable ALM systems with their Level 2 EVSEs. However, because the customers indicated that they were not sure if or when they would implement the capabilities, and SCE did not have service capacity constraints, SCE proceeded to design the sites based on 100% load capabilities. Therefore, as installed, the systems are Type I ALM. Type I ALM can still have system benefits, depending on how they are utilized and coordinated with the utility system, but there is currently no information to calculate those benefits.

The ELRP Pilot participant performance is calculated at the end of the ELRP season (May-October). If there are any current participants that have deployed or installed ALM systems, if data is available, SCE will attempt to calculate the ELRP customer-side cost savings attributed to ALM installations at the end of the year.

14. Customer VGI participation in utility demand response programs, including customer retention and efforts to reduce churn and data requested from 3rd party providers as needed.

All Charge Ready Pilot and Bridge customers were required to participate in the Charge Ready DR Pilot, which is a direct V1G DR pilot. Customer retention and efforts to reduce churn have not been needed since participation is required. Charge Ready Light Duty has a similar requirement for customers to enroll in the Charge Ready DR pilot or an eligible DR program. Since the Charge Ready DR Pilot was a utility run pilot, data has not been requested from third party providers. Charge Ready DR Pilot participants have now been defaulted into ELRP Sub-Group A.1.

15. Implementation of VGI pilots, lessons learned and potential future efforts

In response to discussions with Energy Division staff, SCE withdrew its request for VGI Pilots on June 2, 2023, via Advice 4542-E/E-A. Although not the VGI pilots proposed in AL 4542-E/E-A, SCE pursued expansion and enrollment of VGI resources into its proposed Mass Market Demand Response (MMDR) Pilot[24], which was denied in D.23-12-005. SCE's remaining in-market opportunity for enrollment of VGI resources is the Dynamic Rate Pilot.[25]

Within the Dynamic Rate Pilot, authorized in D.21-12-015 and expanded in D.24-01-032, SCE will be communicating a day-ahead flexible pricing rate to eligible customers with smart enabling price-responsive end-uses that include electric vehicles, behind-the-meter batteries, and controllable loads through automation service providers during the Dynamic Rate Pilot's authorized duration (2022 - 2024) and during the expanded pilot (2024-2027). The flexible pricing rate is currently available to Pilot participants that may

[24] SCE 2023-2027 Demand Response Application (A.) 22-05-004.
[25] https://www.dret-ca.com/dynamic-rate-pilot/

have EVs, and SCE has been in active communication with EVSE providers, third party EV managed charging vendors, and the EV OEM sector for their interest and participation in the Pilot. Currently, SCE is working with one EV managed charging provider to assess customer engagement and usability, and in addition, several other EV managed charging vendors, EVSE providers, and OEMs have expressed interest in participating. SCE is following up to further examine the overall technical requirements for these providers to interface with the Pilot flexible pricing rate platform later this year.

16. Integration of VGI across the utility relevant business activities

As described in the VGI Definitions section above, VGI activities and programs can take many forms – including direct and indirect V1G and V2G applications. SCE has worked to accommodate VGI in its TE programs. For example, customers participating in SCE's Charge Ready Light Duty and Charge Ready Transport programs are required to enroll in TOU rates, which support V1G. Customers participating in Charge Ready Light Duty are also directly enrolled in the ELRP Pilot. SCE has over 193 CRLD customers enrolled or scheduled to be enrolled in the ELRP Pilot which represents a total DR nomination of 1,502 kW.

SCE collaborates with VGI market actors and TE program site hosts to understand and address concerns when they arise. SCE also provides verbal and written clarification to stakeholders regarding the ability to install customer-load monitoring equipment in its Charge Ready Transport program via the customer-build path.

Additionally, SCE is including VGI in utility discussions on relevant business activities, including the development of potential new rates and how to address operational challenges. This will become more relevant as SCE enrolls OEMs and other vendors as VGI Aggregators to participate in the ELRP Pilot.

17. Pilots underway with a discussion on the results and next steps including cost, lessons learned

SCE has multiple pilots underway, which include a VGI aspect:

- SCE's EPIC project, V2G Integration demonstrates new interconnection procedures and standards, V2G-related technologies (as well as smart charging or V1G) and utility and third-party controls to demonstrate how V2G direct current (V2G-DC) and V2G alternating current (V2G-AC) capable EVs and EV chargers can connect and charge/discharge to the grid under an effective SCE grid management control. The demonstrations consist of both customer support and grid support use cases. As of this writing, the lab environment is established and V2G-AC EVSE, smart load panel, and EV are in place in SCE's lab and under test. The V2G-DC system will follow. This EPIC SCE-administered project,

including cost, schedule, and deliverables, is managed and reported annually in the EPIC administrative process.

- SCE EPIC project, Service Center of the Future demonstrates a fleet service center supporting large EV charging demands, while also integrating elements such as ESS, PV, and controllable loads such as electrified space and water heating - all controlled by a utility-owned microgrid control system (MCS) to maintain safe and reliable operation and minimize costs. This project focuses on the electrification of SCE's fleet of 6,000 vehicles and its 30 distributed service center depots. As SCE moves to electrify its fleet in accelerated fashion, SCE must prepare its facilities with the appropriate tools and methods to ensure the fleet is reliably fueled and economically positioned. At the same time, the nature of the distributed service centers and their locations throughout the service territory lend themselves to serve as grid support assets. The Project will also help inform Charge Ready Transport project sites beyond initial phase distribution and charging infrastructure deployment. The MCS will also aggregate customer controllable resources and integrate with SCE's Grid Management Systems (GMS) to demonstrate distribution system operator (DSO) use cases, as well as power-out resiliency use cases. SCE has completed a microgrid control system test bed and network design elements. Next steps are to carry out MCS testing, SCE lab testing, and field deployment. This EPIC SCE-administered project, including cost, schedule, and deliverables, is managed and reported out annually in the EPIC administrative process and runs through 2025 when field deployment will proceed.

- SCE EPIC project, Distributed Plug-In Resources demonstrates technology and techniques to leverage energy storage systems (ESS) in order to alleviate fast-charging impacts to the grid and address the potential to reduce customer demand charges while also serving as resources for grid support and resiliency purposes. SCE has acquired the high-power charging system and test components and assembled them in the SCE microgrid test bed lab to integrate with a battery system and test use cases. This EPIC SCE-administered project, including cost, schedule, and deliverables, is managed and reported out annually in the EPIC administrative process and will conclude in 2024.

Additionally, SCE partnered with Flo, Arup, LACI, and EPRI to win a CEC-funded project under the BESTFIT program to demonstrate innovative utility-connected charging methods. EVSP/EVSE maker, Flo, is the contracted entity with CEC, with EPRI and ARUP providing project management. SCE is a team member, focused on designing new methods for attaching EVSE to utility equipment in a low cost and time

efficient manner. Two cities are participating, Santa Monica and Huntington Park, and seven different types of installations are planned. Studies will be conducted on costs, energy utilization, grid impact, driver utilization, city satisfaction and utility, and other important factors. Final reporting will provide a guide to other utilities. New standards may emerge for utility infrastructure. Demand management of the EVSEs through price control is expected.

SCE is also a partner in the CEC-funded RHETTA program and resulting eTRUC project, working to demonstrate advanced high-power charging systems, siting of public truck charging stations, and the integration of DERs with those systems to manage grid impact and increase utilization. EPRI is the awardee and is co-leading with CALSTART. SCE is a project partner and will work on lab technical evaluations and technical studies on DER integration with charging systems and is hosting the Advanced Technology Research Facility in its Pomona EV Technical Center. The two initial truck charging pilot sites are partners in the project and have completed initial site designs. The program includes comprehensive studies of truck goods movement needs, electric energy fueling needs, and grid impact assessment with high-powered megawatt charging systems.

18. Metrics on interconnection reform (in conjunction with item 7)

SCE does not have metrics on interconnection reform for V2G for the January 1 – June 30, 2023, time period. As stated in Advice 5185-E, SCE received no V2G AC Pilot applications. SCE is currently processing two V2B interconnection requests. As reported above, SCE's V2G EPIC project has worked to advance V2G AC standards and demonstrate them in the lab and expects prior to the end of 2024 to present results and recommendations which will be provided to the Rule 21 working group.

19. Effectiveness of credit-for-export availability, lessons learned and potential next steps to increase availability

The 2024 season and event period for ELRP Pilot will conclude at the end of the year. SCE did not have any V2G participants directly enrolled in ELRP during the current reporting period.

20. Participants in credit for export and discussion to increase participation

See response to Question #19 above.

21. Annual energy exported (kWh) and report out on potential efforts to increase participation

This metric is not applicable, because there are no V2G enrolled ELRP participants exporting energy to our grid at this time.

22. Overall barriers removed in V2B

In SCE's V2G EPIC project, SCE is working with three major automakers or original equipment manufacturers (OEMs) to demonstrate V2G interconnection and controls. One included area of focus is on V2G resiliency use cases, including V2G- backup power (or V2H). One objective is to remove barriers that could arise from automakers not complying with safe and legal interconnection requirements. Lacking compliance with interconnection safety requirements, these systems would be denied interconnection, and they could cause safety issues if interconnection requirements were not followed. With this project, SCE can work with OEMs to implement technical measures that will be successful and work to prevent unsafe or unauthorized use of such devices to discharge to a grid-connected premise in violation of California Health and Safety codes. SCE works with industry and organizations to broaden the effectiveness of these measures. Additionally, in conjunction with this project the team works with stakeholders in the grid interconnections field to better incorporate V2G, including V2B, in the web-based grid interconnection application tools. In this regard, SCE has worked with EPRI and EPRI members and automakers to publish the first guide for V2H backup power configuration and test.

23. Number of EVs enrolled in DR programs

The Charge Ready DR Pilot did not enroll specific EVs, but rather it enrolled the EVSE through the EVSP. As noted above, all Charge Ready Pilot and Bridge customers were required to participate in the Charge Ready DR Pilot. The Charge Ready DR Pilot sends control signals from the utility to the EVSP, who can then communicate with the EVSEs to stop or start charging or to throttle charging current. The number of sites and charging ports participating are listed on the Program and Pilot Metrics spreadsheet (Appendix A). Charge Ready DR Pilot participants have been defaulted into ELRP Sub-Group A.1.

Autogrid, Flip Energy, Fermata and Olivine are currently enrolled as VGI aggregators in ELRP Sub-Group A.5.; however, they have not enrolled any customers during the reporting period. Ford Motor Company is in the process of enabling a subset of its customers to participate in Sub-Group A.5. Ford plans to leverage Olivine as an aggregator to participate in Sub-Group A.5. SCE is engaged in conversation with other

potential VGI aggregators but have not had any additional aggregator enrollments during this reporting period.

24. Rate of change of EV DR enrollment and potential steps to increase enrollment

Since participation in a DR program is a condition for all Charge Ready Pilot and Bridge customers, efforts to increase enrollment were not needed. The rate of change in participation in DR events can be attributed to additional Charge Ready Pilot and Bridge sites being completed, increased utilization of charging ports over time, and variability in when drivers choose to charge their EVs. In 2023, Charge Ready DR Pilot participants have been transitioned to ELRP Sub-Group A.1. There will be continued enrollment of Charge Ready customers onto ELRP for those that have a Demand Response requirement within their contract, as well as engagement with other potential VGI aggregators to join the ELRP Pilot.

SCE's proposed Mass Market Demand Response (MMDR) Pilot, which was partially intended to explore the integration of Electric Vehicles, was denied in D.23-12-005. However, SCE will continue to expand its Vehicle Grid Integration (VGI) efforts through The Emergency Load Reduction Program (ELRP). Currently EVs are not allowed to participate in existing mass market DR programs such as the Summer Discount Plan (SDP) Program and Smart Energy Program (SEP).

25. EV DR enrollment capacity (MW)

Charge Ready Pilot and Charge Ready Light Duty participants have been defaulted onto ELRP Sub-Group A.1. After a Charge Ready customer has been enrolled into ELRP, the ELRP program does not distinguish participation from Charge Ready customers relative to other customer types.

26. EV DR enrollment load shift (MWh)

Assuming load shift is simply the amount of MWh reduced during a DR event that will be shifted to a different time, 100% utilization of charging ports with DR MW potential of 10 MW over a 5-hour event (Charge Ready DR Pilot load reduction events are from 4:00 pm to 9:00 pm) could result in a maximum DR potential load shift of 50 MWh. However, the Charge Ready DR Pilot through 2022 averaged just under 1.2 MWh of load shift per event based on much lower than 100% utilization of charging ports and the variability of EV charging during baseline and event time periods. Charge Ready DR Pilot participants have been defaulted into ELRP Sub-Group A.1. starting in 2023. ELRP Sub-Group A.1. consists of directly enrolled non-residential customers; ELRP does not distinguish between customer participant type within the different subgroups.

27. Estimated aggregated GHG reduction attributable to VGI

SCE does not have a complete accounting of all aggregated greenhouse gas (GHG) reduction attributable to VGI (e.g., TOU rates are considered V1G and shift a significant amount of load thus potentially contributing significant GHG reduction to a non-TOU scenario). Consequently, SCE interprets this question to only cover the VGI pilots and programs addressed through D.20-12-029 which have been withdrawn. See item 15.

28. Site Participation in rate-to-driver and discussion on how to increase participation

SCE interprets this section as being specific to EVSEs (EV chargers) that are installed and owned by the utility, as part of a utility TE program, and for which the utility bills the EV driver directly. SCE does not currently have any EVSEs that fall into this category.

29. Sites participating in DR, lesson learned and next steps to increase participation

All active Charge Ready Pilot, Bridge and School sites participate in the Charge Ready DR Pilot, which began in 2018. A total of 136 EV charging sites installed as part of the Charge Ready Pilot and Bridge phases were active in 2022. Lessons learned include the difficulty in shifting EV charging to specific times and problems with using baselines to determine DR performance. There was difficulty in getting vendors connected to SCE's Demand Response Automation Server (DRAS) due to missing security certificates, vendors had to purchase additional security certificates to bypass the issue and successfully connect to the DRAS. Since participation in DR was required for connected Pilot, Bridge and School customers and will also be required for Charge Ready Light Duty, steps to increase participation are unnecessary as participation will increase organically as more sites go live and utilization of charging stations improves. To date, there has been minimal negative feedback from customers relating to DR events. In 2023,152 Charge Ready DR Pilot participants have been defaulted onto ELRP Sub-Group A.1. . A total of 193 Charge Ready Light Duty participants were defaulted into ELRP sub-group A.1, there will be continued enrollment of Charge Ready customers onto ELRP for those that have a DR participation requirement within their contract.

30. Barriers to data collection and potential solutions

Below are barriers to data collection and potential solutions:

- **Existing TE programs are not able to separate O&M Costs by market segment**

  SCE tracks costs by program and pilot through Capital and O&M expense categories. While SCE is able to separate Capital expenses by market segment, we are not able to separate O&M costs by market segment, and therefore budget and spend figures are presented as consolidated.

- **Certain metrics require baselines that have yet to be established**

  Columns O-S of the Program and Pilot Metrics tab in the Appendix A, covering savings and avoided upgrades as a result of VGI measures, require an estimated baseline or a level of granular visibility and tracking that SCE has not yet deployed. At this time SCE is not operating any program or projects that are relevant to columns O-S. SCE will assess how to collect, track, and best present this data for future reporting if such programs or projects begin operation.

- **Metrics SCE cannot directly gather**

  Several metrics include customer-side data and behind the meter load dynamics that are not available to SCE. Without surveys or other customer reports, these metrics cannot be reported concretely.

- **Electric Vehicle Service Provider (EVSP) data collection and quality challenges**

  As per our program requirements, SCE and its partners collect interval and session level data from Electric Vehicle Service Providers. SCE continues to see data collection and quality challenges. On a monthly basis, we are actively engaging with EVSPs to help identify these challenges and work toward streamlining data collection.

31. Load shift for EV rate customers

SCE offers a TOU-D-PRIME rate for residential customers who either own or lease an electric vehicle or plug-in hybrid or have a residential battery or electric heat pump system for water or space heating.[26] SCE's findings show that the TOU-D-PRIME rate option is effective in shifting peak period demand during summer weekdays from 4:00 to 9:00 PM to off-peak periods, when the rate is lowest.

[26] See https://www.sce.com/residential/rates/Time-Of-Use-Residential-Rate-Plans for details.

SCE evaluated load impacts from Residential EV customers enrolled in its TOU-D-PRIME rate option in 2019-2023. SCE reported on 2019-2022 in previous VGI reports.

For Summer 2023, non-NEM EV customers who attested to owning an EV before October 2021 and joined TOU-D-PRIME prior to March 2023 exhibited peak-period demand reduction of 0.24 kW/customer or 13.9%, along with an **increase** in daily electricity usage of 1.65 kWh or 5.2%.[27] Non-NEM EV customers who attested to owning an EV before Oct 2021 and joined either TOU-4-9PM or TOU-5-8PM prior to March 2023 exhibited peak-period demand reduction of 0.04 kW/customer or 3.5% and 0.05 kW/customer or 3.8%, respectively. Conversely, TOU-4-9PM exhibited a **decrease** in daily electricity usage by 0.18 kWh/customer or 0.8%, and TOU-5-8PM did not show a significant change in overall daily electricity usage. Note that the TOU-D-PRIME rate option has the largest peak-to-off-peak differential and the lowest off-peak period price compared to that of TOU-5-8PM and TOU-4-9PM. EV customers on the TOU-D-PRIME rate option opt into the rate option and are likely aware of the steep peak to off-peak differential, and shift most of their usage to the off-peak period with low energy rates ($/kWh). EV customers on either TOU-4-9PM or TOU-5-8PM are likely defaulted onto the rate and can either be unaware that they were defaulted or not know the exact peak hours. The smaller peak to off-peak differential of the default rates also provides less incentive for load shifting than that of TOU-D-PRIME.

For summer 2023, NEM EV owners enrolled in Prime had the largest load impacts and reduced their on-peak demand by 0.86 kW or 45.9% on the average summer weekday. NEM EV owners on TOU-4-9PM reduced their on-peak demand by 0.14 kW/customer or 7.9%The difference in load impacts between TOU-D-PRIME and TOU-4-9PM was statistically significant. TOU-5-8PM had insufficient sample sizes to conduct the analysis.

In addition, two cohorts of the study were examined over three and two years to measure persistence in load reduction. SCE's findings show that the TOU-D-PRIME rate option continues to be effective in shifting peak period demand during summer weekdays from 4:00 to 9:00 PM to off-peak periods, when the rate is lowest. Generally, non-NEM EV owners maintained a similar level of peak demand reductions between PYs 2021-2023, with the only exception being TOU-5-8-PM, which seemed to show a small decline (although not statistically significant). Results were mixed for NEM EV owners, but those on Prime increased their peak demand reductions in PYs 2022 and 2023, although the change was not statistically significant. TOU-4-9PM, conversely, showed a statistically significant decline in peak load reductions after PY 2021.

[27] For the PY 2022 TOU-D-PRIME load impact evaluation, results were disaggregated by NEM and non-NEM EV owners on TOU-D-PRIME.

32. Rate-to-driver enrollment by sites

SCE interprets this section as being specific to EVSEs (EV chargers) that are installed and owned by the utility, as part of a utility TE program, and for which the utility bills the EV driver directly. SCE does not currently have any EVSEs that fall into this category.

33. Dynamic rate load shift (MWh)

“Dynamic rate” is interpreted to mean retail rates that adjust to day-ahead or day-of prices based on the supply and demand of capacity for each hour. SCE is currently conducting a dynamic rate pilot (known to customers as SCE’s Flexible Rate Pilot) that is open to customers with electric vehicles. Although a mid-term evaluation report became available in December 2023, there were no EV customers enrolled at that time. A final evaluation report is expected to be filed prior to March 2025, although it is unknown if any EV customers will be included. SCE notes that on July 22, 2022, the Commission initiated a new proceeding, the Rulemaking to Advance Demand Flexibility through Electric Rates (R.22-07-005), which will address dynamic rates in greater depth. On January 25, 2024, as part of Track B of this proceeding, SCE received Decision (D.)24-01-032 to add a second phase of the Flexible Rate Pilot for three additional years through December 31, 2027. SCE expects to file a mid-term evaluation report for the expanded pilot on August 1, 2026, and a final evaluation report for the expanded pilot on March 1, 2028. These reports may contain data on load shift of electric vehicle customers.

34. Aggregate unmanaged load profiles within programs (kWh)

SCE does not currently have any customers within our TE programs with unmanaged load, as all programs employ TOU rates, which SCE defines as managed load for the purposes of this report.

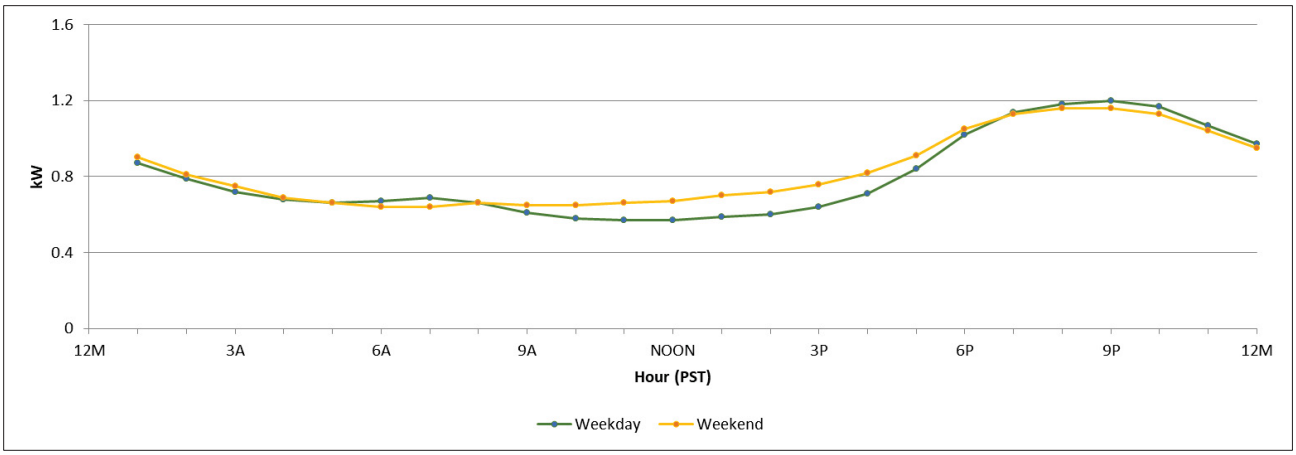
35. Aggregate unmanaged peak load within programs (kW)

SCE does not currently have any customers within our TE programs with unmanaged load, as all programs employ TOU rates, which SCE defines as managed load for the purposes of this report.

36. Aggregate unmanaged load profiles outside of programs (kWh, Misc.)

All non-residential rate schedules are TOU. For residential customers, Schedule D is an optional, tiered rate structure which applies to all household load, including load from EVs. SCE has identified a limited number of customers on Schedule D believed to have EVs. The average load profile for these customers is presented in Chart 1. The values for Chart 1 are presented in Appendix B.

Chart 1 – Aggregate Average Load Profile for Schedule D



37. Aggregate unmanaged peak load outside of programs (kW, Misc.)

The peak load for these Schedule D customers is 1.20 kW on weekdays and 1.16 kW on weekends. This includes all household load.

38. Net Avoided Costs from Avoided Upgrades

Not applicable, as SCE has not identified any avoided upgrades at this time.

39. Aggregate load profiles for EV TOU rates within programs (kWh)

Chart 2 provides average weekday and weekend hourly load profiles for TOU-D-Prime between January 1, 2024, and June 30, 2024 within SCE's Charge Ready Home Installation Rebate pilot program. The average hourly weekday demand begins to rise around 8:00 PM where it is 0.14 kW and peaks around 11:00 PM with an average hourly demand of 1.44 kW. The charging activity remains low from 6 AM to 8 PM. The weekend profile is similar to the weekdays profile, as it also remains low from 6 AM to 8 PM, and it begins to rise at 8:00 PM with an average hourly demand of 0.12 kW and peaks around 12:00 AM with an average hourly demand of 1.14 kW.

Chart 2: Average hourly load profiles for TOU-D-Prime within programs

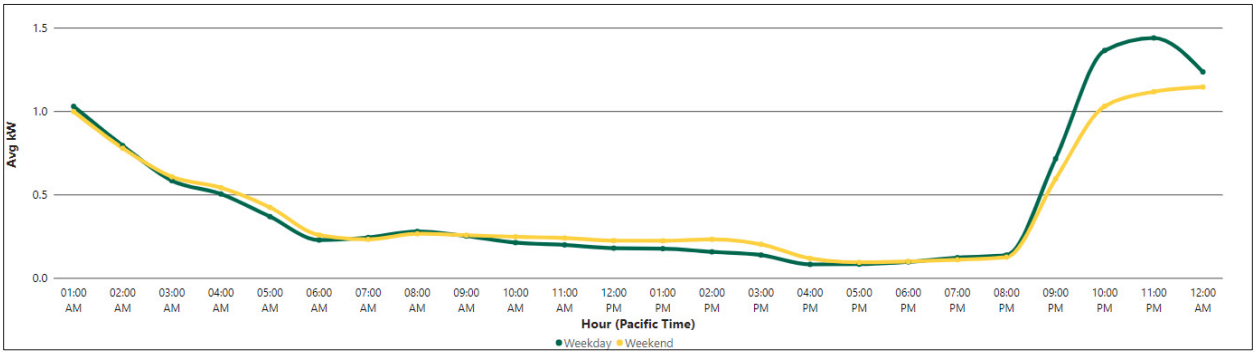


Chart 3 provides average weekday and weekend hourly load profiles for program customers on separately metered TOU-EV-7 between January 1, 2024, and June 30, 2024. The average hourly weekday demand begins to rise around 4:00 AM where it is 0.38 kW and peaks around 9:00 AM with an average hourly demand of 0.98 kW. For the rest of the day, charging within our program customers tapers off after the 9:00 AM peak. The weekend profile begins to rise at 6:00 AM with an average hourly demand at 0.31 kW and peaks around 10:00 PM with an average hourly demand at 0.60 kW.

Chart 3: Average hourly load profiles for TOU-EV-7 within programs

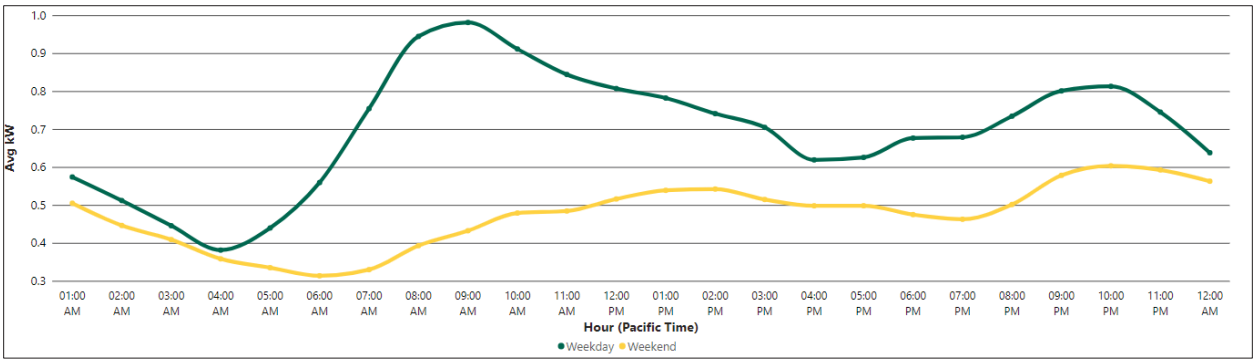


Chart 4 provides average weekday/weekend hourly load profiles for program customers on separately metered TOU-EV-8 between January 1, 2024, and June 30, 2024. The average hourly weekday demand begins to rise beginning at 3:00 AM where it is 2.34 kW and peaks at 9:00 AM with an average hourly demand of 18.15 kW. Charging demand noticeably dips starting at 9:00 AM and begins to slowly taper off. The weekend profile displays a slow increase from 4:00 AM at 1.86 kW and peaks at 9:00 PM where it is 4.67 kW.

Chart 4: Average hourly load profiles for TOU-EV-8 within programs

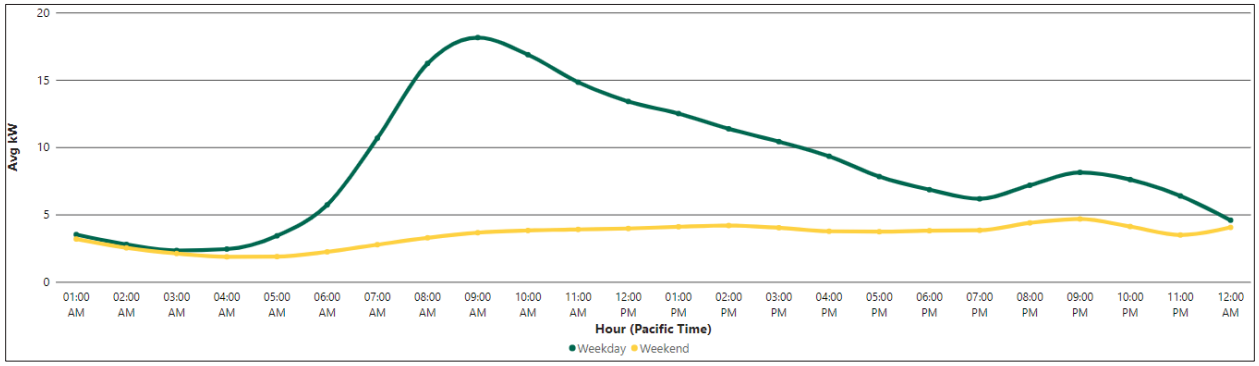
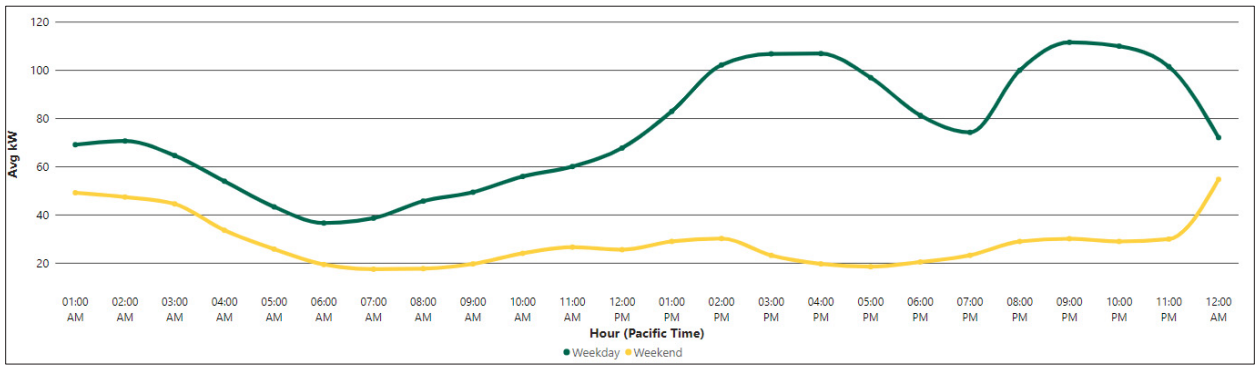


Chart 5 provides average weekday/weekend hourly load profiles for program customers on separately metered TOU-EV-9 between January 1, 2024, and June 30, 2024. The average hourly weekday demand begins to rise beginning at 6:00 AM where it is 36.53 kW and peaks at 9:00 PM with an average hourly demand of 111.48 kW. The weekend profile displays a slow increase from 7:00 AM at 17.39 kW and peaks at 12:00 AM where it is 54.64 kW.

Chart 5: Average hourly load profiles for TOU-EV-9 within programs



The supporting data for Charts 2, 3, 4, and 5 can be found in Appendix B.

40. Aggregate peak load of EV TOU rates within programs (kW)

Average weekday usage within the TOU-D-PRIME rate category peaks at 1.44 kW and average weekend usage peaks at 1.14 kW.

Average weekday usage within the TOU-EV-7 rate category peaks at 0.98 kW and average weekend usage peaks at 0.60 kW.

Average weekday usage within the TOU-EV-8 rate category peaks at 18.15 kW and average weekend usage peaks at 4.67 kW.

Average weekday usage within the TOU-EV-9 rate category peaks at 111.48 kW and average weekend usage peaks at 54.64 kW.

41. Rate-to-host

SCE interprets this section as asking for information on rates charged to hosts as distinguished from rates charged directly to drivers on utility-owned chargers.

In Charge Ready programs, customers are required to adopt a TOU rate. Charge Ready participants can select one of three TOU-EV rates specific for EV charging sites based on metered monthly maximum demand. TOU-EV-7, TOU-EV-8, and TOU-EV-9 rates are applicable to commercial EV customers whose metered monthly max demand is 20 kW or less, greater than 20 kW to 500 kW, and above 500 kW, respectively.

Charging infrastructure must be separately metered to qualify for these rates. In D.22-08-001 (Phase 2 of SCE's 2021 General Rate Case), the Commission adopted SCE's proposal to extend the energy-only rate structure for TOU-EV-8 and TOU-EV-9 beyond the timeline established in D.18-05-040 until the implementation of the next GRC Phase 2, or when rates consistent with guidance in the Transportation Electrification Framework can be implemented either in a Rate Design Window, or in a separate rate design proceeding as determined by the Commission, whichever occurs first.

42. Rate-to-driver

SCE interprets this section as being specific to EVSEs (EV chargers) that are installed and owned by the utility, as part of a utility TE program, and for which the utility bills the EV driver directly. SCE does not currently have any EVSEs that fall into this category. However, through the Charge Ready programs and the TE Advisory Services Program, SCE communicates and educates customers (host) on rate-to-driver structures, grid impacts, rate levels and conversions to dollars per gallon equivalence so that they can make an informed decision on the impact their decisions make on drivers as well as the grid.

43. Aggregate load profiles for EV TOU rates outside of programs (kWh)

The average load profiles for all TOU-EV customers not participating in an EV program are presented below. Non-residential TOU-EV rates include TOU-EV-7, TOU-EV-8, and TOU-EV-9 as described above. EV owners are eligible for residential TOU-D-PRIME, which is also a TOU rate. Customers on TOU-D-PRIME can opt to place their whole household load on the rate, or just their electric vehicle load, if it is separately metered. All average load profiles are for metered data between January 1, 2024, and June 30, 2024. The values for all average load profiles are provided in Appendix B.

The average weekday and weekend load profiles are shown in Chart 6 for customers who are separately metered on the TOU-D-PRIME rate. For both weekdays and weekends the average load remains relatively flat and low between 7:00 AM and 8:00 PM. EVs commence charging promptly at the beginning of the off-peak period at 9:00-10:00 PM. On weekdays, the average load peaks at 11:00 PM at 1.3 kW before tapering off until 5:00 AM. On weekends the average load peaks slightly lower at 1.1 kW and also at 11:00 PM.

Chart 6 – Aggregate Average Load Profile for Separately-Metered TOU-D-PRIME outside of Programs

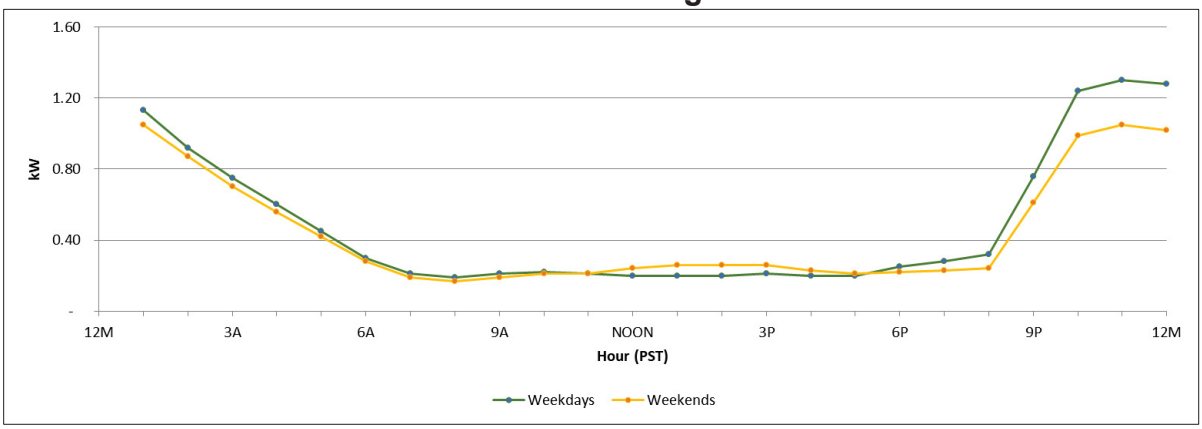


Chart 7 provides average weekday and weekend hourly load profiles for customers outside of programs on separately metered TOU-EV-7. The average weekday hourly demand begins to rise around 5:00 AM where it is 0.5 kW and peaks around 10:00 AM with an average hourly demand of 1.9 kW. Charging for customers not participating in EV programs begins tapering off for the rest of the day at 6:00 PM. The weekend profile almost overlaps with the weekday profile between midnight and 5:00 AM. Weekend load gradually increases from 6:00 AM where it is 0.5 kW and remains stable at 1.2 kW from 11:00 AM to 7:00 PM.

Chart 7 – Aggregate Average Load Profile for TOU-EV-7 outside of Programs

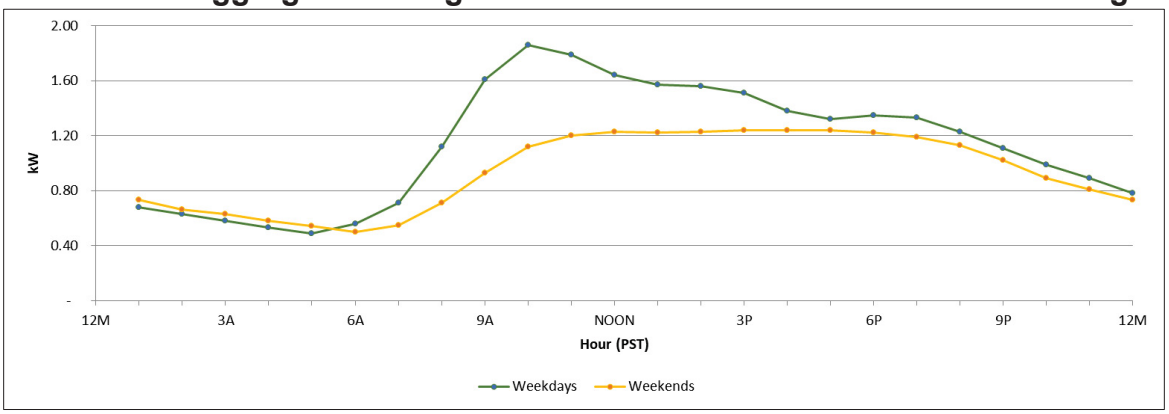


Chart 8 provides average weekday and weekend hourly load profiles for customers outside of programs on separately metered TOU-EV-8. The average weekday hourly demand begins to rise around 5:00 AM where it is about 12 kW and peaks around 6:00 PM with an average hourly demand of 38 kW, it tapers off for the rest of the day. The charging load profile for customers on TOU-EV-8 not participating in EV programs has higher weekend usage during midday. Weekend peak demand is also around 2:00 PM with an average hourly demand of 40 kW, however, it begins tapering off after 3:00 PM.

Chart 8 – Aggregate Average Load Profile for TOU-EV-8 outside of Programs

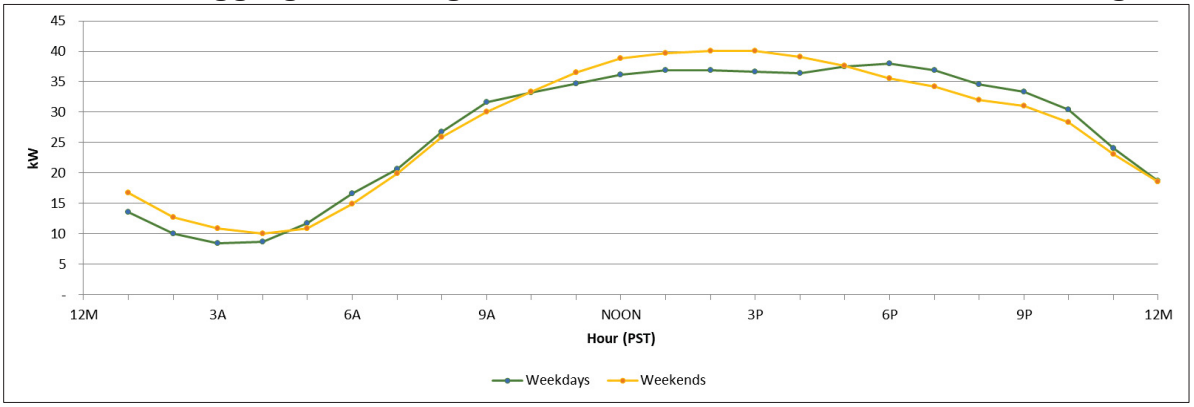
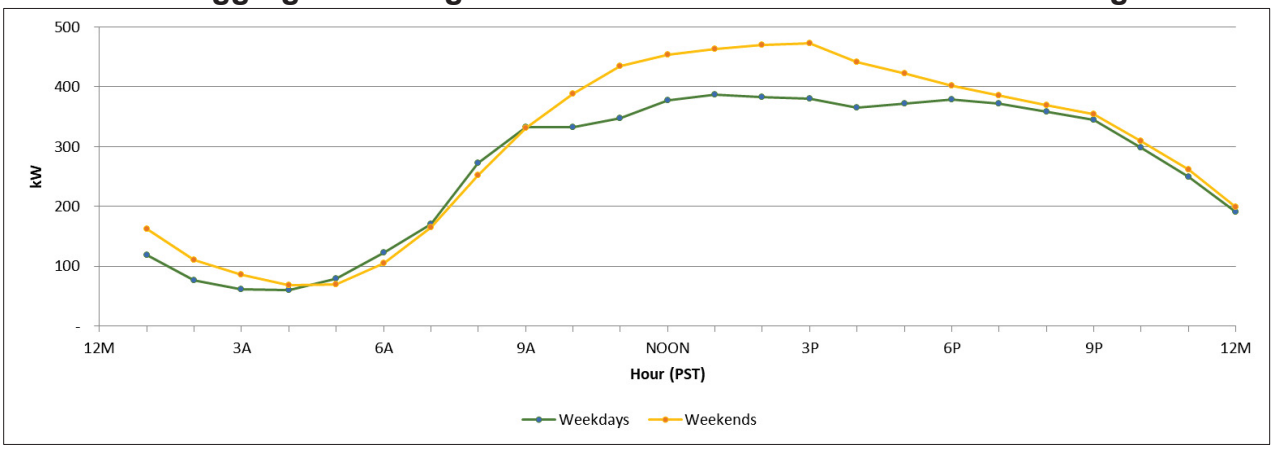


Chart 9 provides average weekday and weekend hourly load profiles for customers outside of programs on separately metered TOU-EV-9. The average weekday hourly demand begins to rise around 5:00 AM where it is 79 kW and peaks around 1:00 PM with an average hourly demand of 387 kW, the demand remains relatively consistent before tapering off for the rest of the day from 9:00 PM. The weekend profile shows a similar load shape but a higher usage during midday, with peak demand of 472 kW around 3:00 PM.

Chart 9 – Aggregate Average Load Profile for TOU-EV-9 outside of Programs



44. Aggregate peak load of EV TOU rates outside of programs (kW)

The average peak load for all non-residential TOU-EV customers not participating in an EV program is: 1.9 kW on weekdays and 1.2 kW on weekends for TOU-EV-7, 38 kW on weekdays and 40 kW on weekends for TOU-EV-8, 387 kW on weekdays and 472 kW on weekends for TOU-EV-9. Residential customers on separately metered TOU-D-PRIME have an average peak load of 1.3 kW on weekdays and 1.1 kW on weekends.

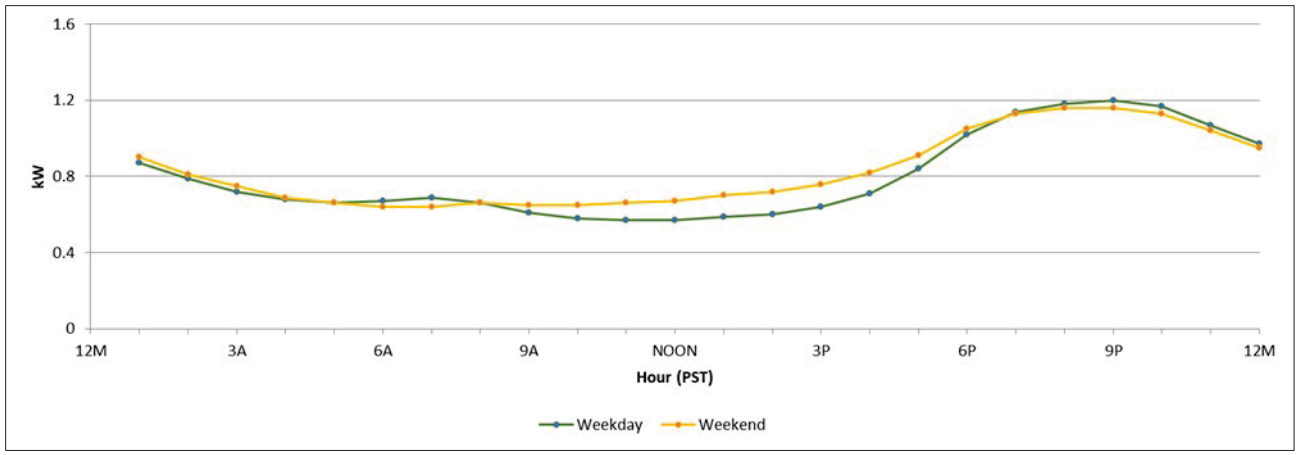
Appendix A - VGI Reporting Template

Program and Pilot Metrics

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	*The Program and Pilot Metrics tab includes metrics in the VGI Decision by programs or pilot.*																			
2	**Aggregated totals:**					**Totals:**	**286**	**99**	**191**	**3051**	**191**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**$ 871,931,140**	**$ 151,840,586**
3							Counts By Program or Pilot [2]								Cost By Program or Pilot					
4	**Program/Pilot**	**Market Segment - Residential or Commercial**	**Market Segment - Subcategory**	**ESJ subcategory**	**Launch Date**	**Implementation Status**	**Enrolled**	**Dropped out**	**Currently Participating**	**Number of ports participating in ALM**	**Number of sites participating in ALM**	**Number of sites participating in dynamic rates (if known)**	**Number of EV drivers participating in dynamic rates**	**Total number of V2G EVSE customers**	**Distribution-side cost savings**	**Customer-side cost savings (related to panel and similar equipment)**	**Sites with Upgrade avoided by ALM**	**Avoided utilty-side costs (where known) avoided by ALM**	**Authorized Budget**	**Budget expended(1)**
5	Charge Ready Pilot & Bridge	Commercial	Destination Center, Distribution Center Warehouse, Government facility, Multi-Unit Dwelling, Retail Business Center/Retail parking lot, School facility, and Transit	DAC/NonDAC	1/14/2016	Active	146	14	132	2297	132	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$44,000,000	$41,166,000
6	Charge Ready Transport	Commercial	TRU, Medium-Duty Vehicles, Heavy Duty - Vehicles, School Bus,	DAC/Non-DAC	5/31/2018	Active	N/A	N/A	1	36	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$356,362,471	$44,406,198
7	Charge Ready Light Duty[3]	Commercial	N/A	DAC/Non-DAC	7/8/2020	Active	118	76	42	621	42	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$436,343,669	$50,919,890
8	Charge Ready Schools	Commercial	Schools	DAC/Non-DAC	11/7/2019	Active	22	9	13	94	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$9,890,000	$5,643,357
9	Charge Ready Parks	Commercial	Parks	DAC/Non-DAC	11/7/2019	Active	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$9,890,000	$1,240,619
10	PRP-Charge Ready DCFC	Commercial	Transit agency	DAC/NonDAC	1/11/2018	Completed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$3,980,000	$1,665,064
11	PRP-Charge Ready Transit	Commercial	Transit agency	DAC/NonDAC	1/11/2018	Completed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$3,978,000	$2,019,310
12	PRP -Charge Ready Home Install Rebate	Residential	Residential	DAC/NonDAC	1/11/2018	Completed	N/A	N/A	3	3	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$3,999,000	$2,067,530
13	PRP -Charge Ready POLB - Gantry Crane	Commercial	Gantry Crane	DAC	1/11/2018	Completed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$3,038,000	$2,265,368
14	PRP -Charge Ready POLB - Yard Tractors	Commercial	Yard Tractors	DAC	1/11/2018	Completed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$450,000	$447,251
15																				
16	(1) Charge Ready Pilot & Bridge,Transport, Light Duty, Schools, Parks, PRPs, and Demand Response Pilot budget expended are deflated for price inflation.																			
17	(2) For Charge Ready programs, the Enrolled column is the # of completed projects with active contract # that were initially required to be enrolled. The Currently Participating column is the # of projects that are actively participating on a DR program as of the last day of this reporting period. The Dropped out column is the count difference between the two.																			
18	(3) Charge Ready Light Duty include all associated subprograms.																			
19																				

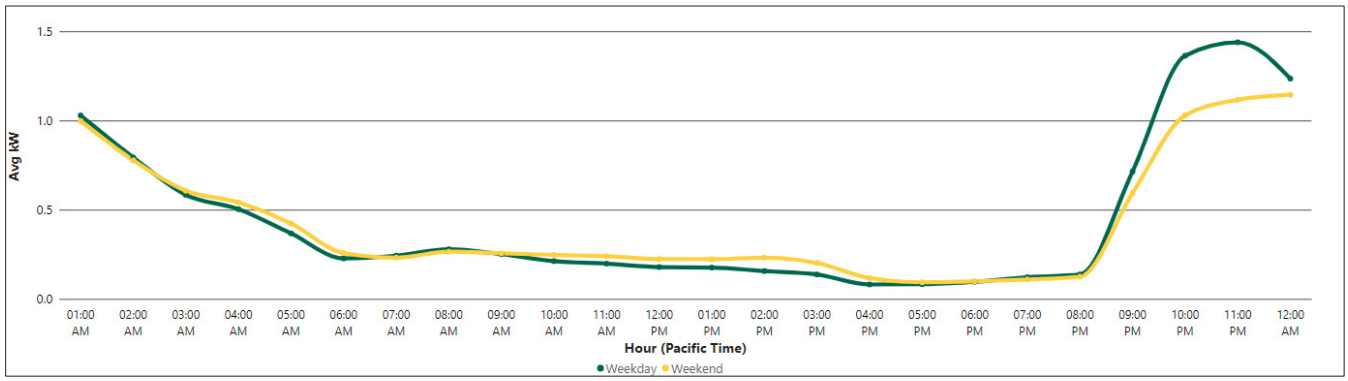
Appendix B - VGI Annual Report Chart Data

Chart 1 – Aggregate Average Load Profile for Schedule D



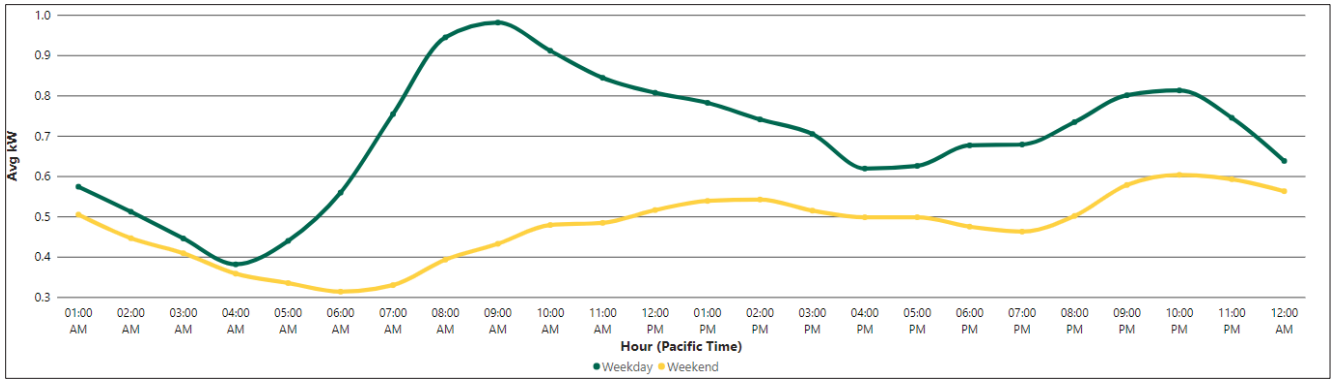
Hours	Weekday (kW)	Weekend (kW)
1	0.87	0.90
2	0.79	0.81
3	0.72	0.75
4	0.68	0.69
5	0.66	0.66
6	0.67	0.64
7	0.69	0.64
8	0.66	0.66
9	0.61	0.65
10	0.58	0.65
11	0.57	0.66
12	0.57	0.67
13	0.59	0.70
14	0.60	0.72
15	0.64	0.76
16	0.71	0.82
17	0.84	0.91
18	1.02	1.05
19	1.14	1.13
20	1.18	1.16
21	1.20	1.16
22	1.17	1.13
23	1.07	1.04
24	0.97	0.95

Chart 2 – Aggregate average hourly load profiles for TOU-D-Prime within programs



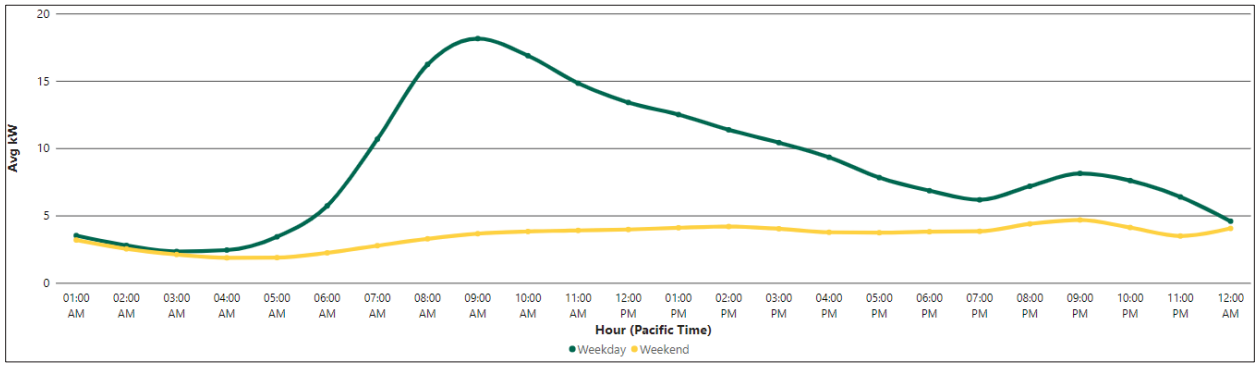
Hour	Weekday	Weekend
01:00 AM	1.03	1.00
02:00 AM	0.79	0.78
03:00 AM	0.58	0.61
04:00 AM	0.50	0.54
05:00 AM	0.37	0.42
06:00 AM	0.23	0.26
07:00 AM	0.24	0.23
08:00 AM	0.28	0.27
09:00 AM	0.25	0.26
10:00 AM	0.21	0.25
11:00 AM	0.20	0.24
12:00 PM	0.18	0.22
01:00 PM	0.18	0.22
02:00 PM	0.16	0.23
03:00 PM	0.14	0.20
04:00 PM	0.08	0.12
05:00 PM	0.08	0.09
06:00 PM	0.10	0.10
07:00 PM	0.12	0.11
08:00 PM	0.14	0.12
09:00 PM	0.71	0.59
10:00 PM	1.36	1.03
11:00 PM	1.44	1.12
12:00 AM	1.24	1.14

Chart 3 – Aggregate average hourly load profiles for TOU-EV-7 within programs



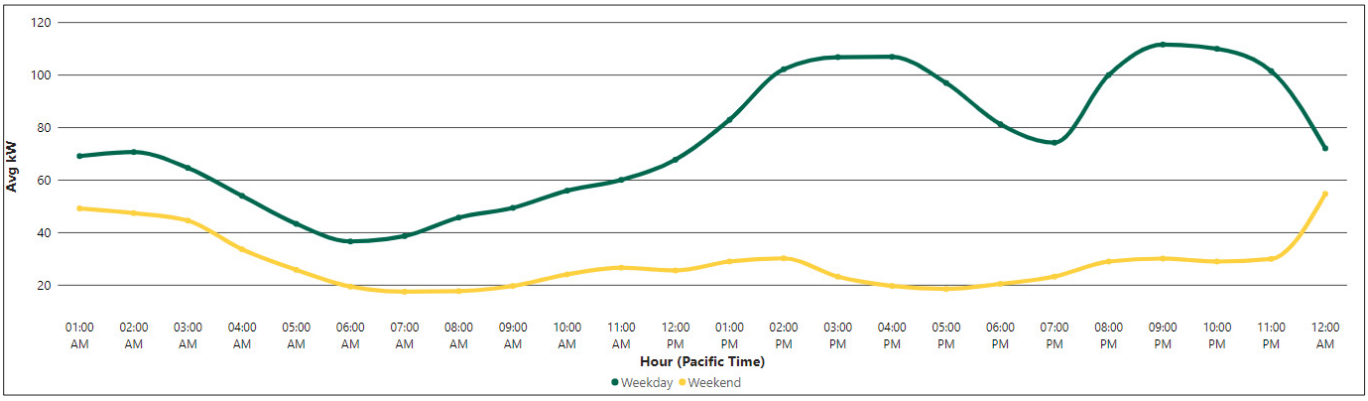
Hour	Weekday	Weekend
01:00 AM	0.57	0.50
02:00 AM	0.51	0.45
03:00 AM	0.45	0.41
04:00 AM	0.38	0.36
05:00 AM	0.44	0.33
06:00 AM	0.56	0.31
07:00 AM	0.75	0.33
08:00 AM	0.94	0.39
09:00 AM	0.98	0.43
10:00 AM	0.91	0.48
11:00 AM	0.84	0.48
12:00 PM	0.81	0.52
01:00 PM	0.78	0.54
02:00 PM	0.74	0.54
03:00 PM	0.70	0.51
04:00 PM	0.62	0.50
05:00 PM	0.63	0.50
06:00 PM	0.68	0.47
07:00 PM	0.68	0.46
08:00 PM	0.73	0.50
09:00 PM	0.80	0.58
10:00 PM	0.81	0.60
11:00 PM	0.74	0.59
12:00 AM	0.64	0.56

Chart 4 - Aggregate average hourly load profiles for TOU-EV-8 within programs



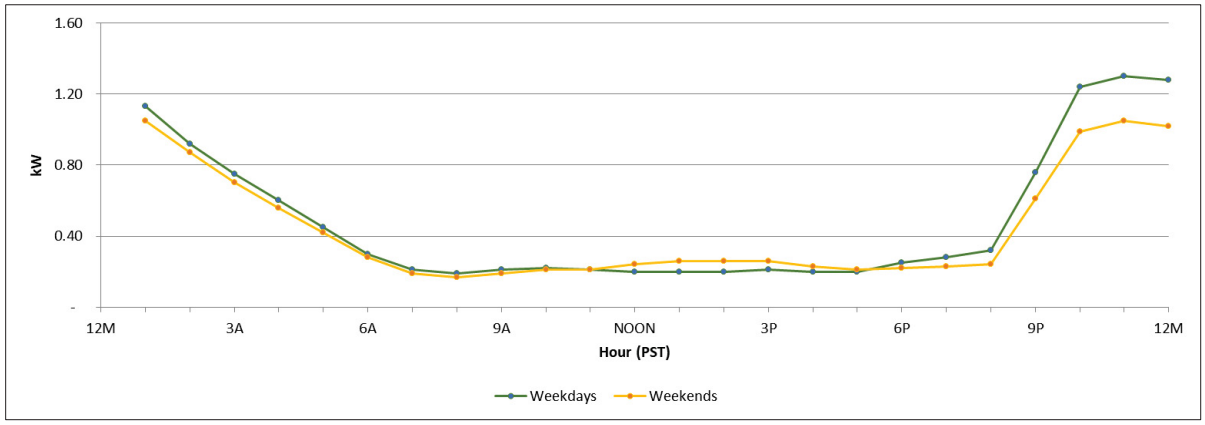
Hour	Weekday	Weekend
01:00 AM	3.52	3.19
02:00 AM	2.78	2.53
03:00 AM	2.34	2.11
04:00 AM	2.44	1.86
05:00 AM	3.42	1.88
06:00 AM	5.72	2.23
07:00 AM	10.68	2.77
08:00 AM	16.23	3.28
09:00 AM	18.15	3.66
10:00 AM	16.87	3.82
11:00 AM	14.83	3.90
12:00 PM	13.40	3.97
01:00 PM	12.50	4.09
02:00 PM	11.37	4.19
03:00 PM	10.42	4.02
04:00 PM	9.33	3.76
05:00 PM	7.82	3.73
06:00 PM	6.85	3.80
07:00 PM	6.17	3.83
08:00 PM	7.18	4.38
09:00 PM	8.14	4.67
10:00 PM	7.60	4.11
11:00 PM	6.38	3.48
12:00 AM	4.58	4.05

Chart 5 - Aggregate average hourly load profiles for TOU-EV-9 within programs



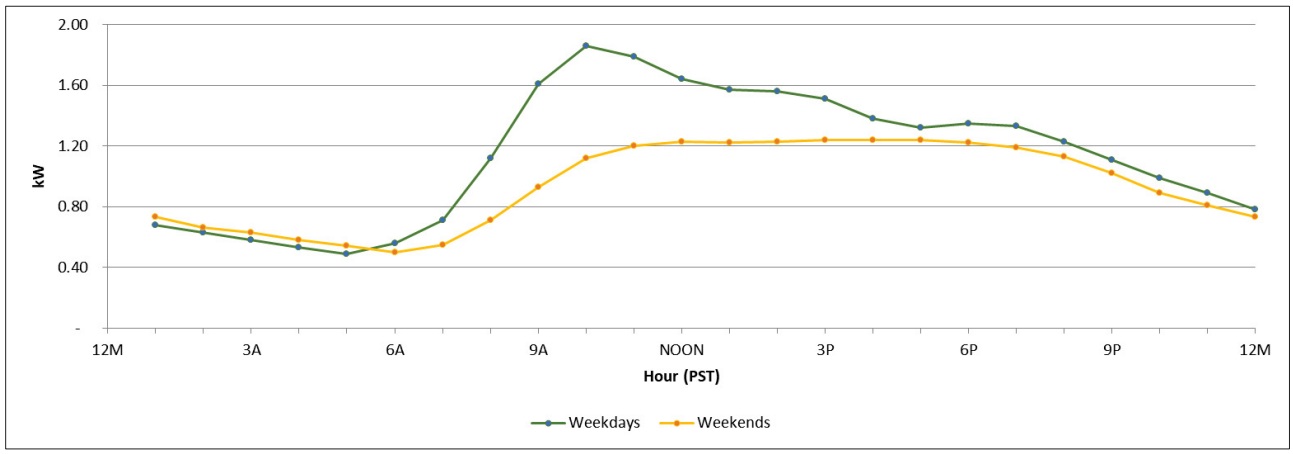
Hour	Weekday	Weekend
01:00 AM	69.02	49.10
02:00 AM	70.56	47.31
03:00 AM	64.51	44.47
04:00 AM	53.89	33.52
05:00 AM	43.23	25.72
06:00 AM	36.53	19.34
07:00 AM	38.56	17.39
08:00 AM	45.63	17.62
09:00 AM	49.31	19.58
10:00 AM	55.85	23.97
11:00 AM	59.97	26.53
12:00 PM	67.64	25.48
01:00 PM	82.82	28.92
02:00 PM	102.08	30.12
03:00 PM	106.69	23.13
04:00 PM	106.81	19.61
05:00 PM	96.84	18.44
06:00 PM	81.16	20.38
07:00 PM	74.12	23.16
08:00 PM	99.88	28.89
09:00 PM	111.48	30.02
10:00 PM	109.87	28.89
11:00 PM	101.40	29.87
12:00 AM	71.98	54.64

Chart 6 – Aggregate Average Load Profile for Separately-Metered TOU-D-PRIME outside of Programs



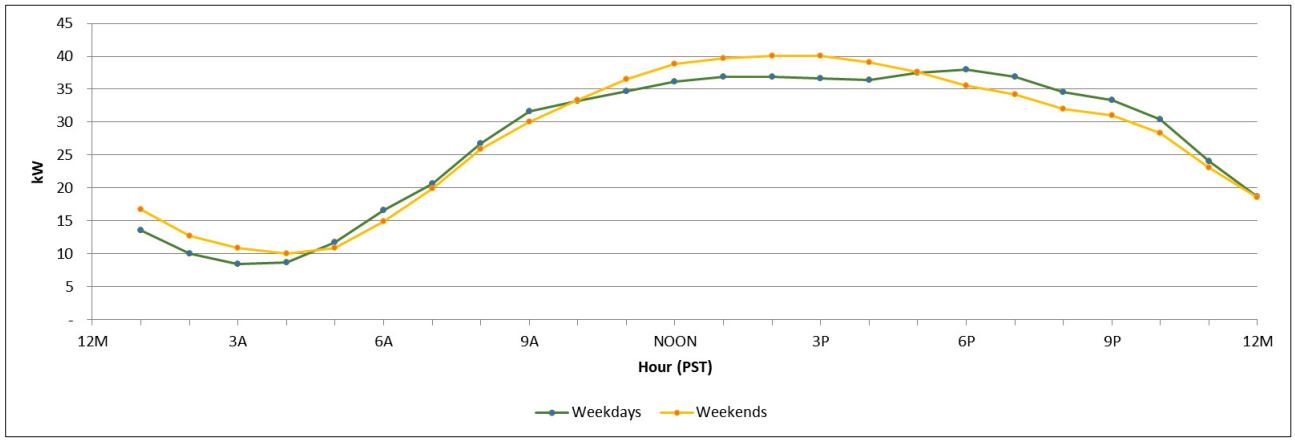
Hours	Weekday (kW)	Weekend (kW)
1	1.13	1.05
2	0.92	0.87
3	0.75	0.70
4	0.60	0.56
5	0.45	0.42
6	0.30	0.28
7	0.21	0.19
8	0.19	0.17
9	0.21	0.19
10	0.22	0.21
11	0.21	0.21
12	0.20	0.24
13	0.20	0.26
14	0.20	0.26
15	0.21	0.26
16	0.20	0.23
17	0.20	0.21
18	0.25	0.22
19	0.28	0.23
20	0.32	0.24
21	0.76	0.61
22	1.24	0.99
23	1.30	1.05
24	1.28	1.02

Chart 7 – Aggregate Average Load Profile for TOU-EV-7 outside of Programs



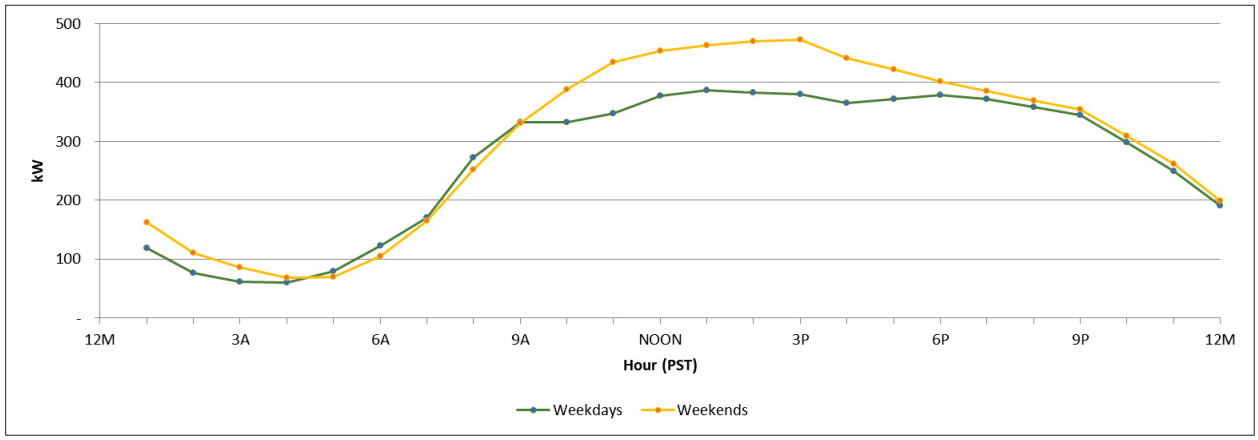
Hours	Weekday (kW)	Weekend (kW)
1	0.68	0.73
2	0.63	0.66
3	0.58	0.63
4	0.53	0.58
5	0.49	0.54
6	0.56	0.50
7	0.71	0.55
8	1.12	0.71
9	1.61	0.93
10	1.86	1.12
11	1.79	1.20
12	1.64	1.23
13	1.57	1.22
14	1.56	1.23
15	1.51	1.24
16	1.38	1.24
17	1.32	1.24
18	1.35	1.22
19	1.33	1.19
20	1.23	1.13
21	1.11	1.02
22	0.99	0.89
23	0.89	0.81
24	0.78	0.73

Chart 8 – Aggregate Average Load Profile for TOU-EV-8 outside of Programs



Hours	Weekday (kW)	Weekend (kW)
1	13.55	16.79
2	10.02	12.78
3	8.41	10.89
4	8.73	10.01
5	11.74	10.91
6	16.68	14.95
7	20.72	19.97
8	26.72	25.91
9	31.66	30.08
10	33.17	33.37
11	34.68	36.53
12	36.10	38.82
13	36.87	39.68
14	36.84	40.04
15	36.61	40.11
16	36.45	39.05
17	37.46	37.64
18	37.95	35.57
19	36.84	34.19
20	34.56	32.06
21	33.31	31.08
22	30.40	28.31
23	24.04	23.09
24	18.71	18.60

Chart 9 – Aggregate Average Load Profile for TOU-EV-9 outside of Programs



Hours	Weekday (kW)	Weekend (kW)
1	118	163
2	76	110
3	61	87
4	61	68
5	79	69
6	123	105
7	171	165
8	272	252
9	333	331
10	332	389
11	347	435
12	377	453
13	387	463
14	383	470
15	380	472
16	366	442
17	372	423
18	379	403
19	372	386
20	358	369
21	345	355
22	298	309
23	250	261
24	191	199