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BEFORE THE PUBLIC UTILITIES COMMISSION OF THE

STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue the Development of Rates and Infrastructure for Vehicle Electrification	Rulemaking 18.12-006

SOUTHERN CALIFORNIA EDISON COMPANY'S (U 338-E) VEHICLE-GRID INTEGRATION STRATEGIES ANNUAL REPORT FOR 2021

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Pursuant to Ordering Paragraph (OP) 1 of Decision (D.) 20-12-029 (Decision), Southern California Edison Company hereby submits its 2021 annual report on Vehicle-Grid Integration Strategies for 2021. The Report outlines SCE's VGI activities through December 31, 2021.

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March 15, 2022

Attachment A

Annual VGI Strategies Report

Southern California Edison

Annual

Vehicle-Grid Integration Strategies Report

Submitted on March 15, 2022

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Southern California Edison Company's Annual Report on Vehicle-Grid Integration Strategies, Programs and Pilots Metrics

March 15, 2022

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 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 on 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.

SCE submitted its first mid-term report on VGI Activities on September 15, 2021. The mid-term report covered the period of January 1 through June 30, 2021.

This annual report covers the period from January 1 through December 31, 2021. 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. While SCE is beginning to track these new data elements, some information may not be available for this report. Additionally, SCE's TE programs are in various stages of implementation. As a result, some programs may

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.

have limited data. SCE discusses these areas in the Narrative Questions section, response to question 28 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.
- 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.
  - Direct V1G features the utility taking an active role in controlling timing and amount of vehicle charging, for example throttling charging load during peak periods using a demand response mechanism.

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

- 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. V2B: 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 3 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. SCE's spreadsheet is provided as Attachment A.

Narrative - General Questions

The metrics reported below correspond to the row number in the VGI Reporting Template excel file, Narrative tab (starts with Row 3).

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5 D.20-12-029, p. 52.
6 Id.
7 Id., p. 60.

3. Customer program or pilot and incentives related to VGI

The Charge Ready DR Pilot sends control signals from the utility to the EV Service Provider (EVSP) that throttles charging capacity by 50%. Customers who reduce load from a calculated baseline during event hours receive incentives. When the pilot launched, an incentive of $0.10 per kWh reduced was provided. The incentive amount was later increased to $0.15 per kWh reduced.

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 credit for export—not simply rates that encourage VGI, which are covered elsewhere.

SCE does not currently have a rate available that provides EV customers with credit for export but will report on these efforts as they develop.

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

SCE is not currently involved in, nor is it aware of, any CAISO efforts to revise or reform its market design rules in order to facilitate VGI's participation in wholesale markets.

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

SCE has three 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 EPIC electric transportation focused projects are:

- Distributed Plug-In Electric Vehicle Resources (DPIEV Resources)
- Vehicle to Grid Integration with On-Board Inverter (V2G OBI)
- Service Center of the Future (SCOF)

DPIEV Resources: This project studies the integration of energy storage systems with high-power, high-impact EV charging systems, with a consideration of second-life EV batteries. This project demonstrates the use of energy storage systems to support customer bill management as well as several utility VGI use cases, including renewables integration, grid infrastructure deferrals, and energy market services.

V2G OBI: This project, though originally crafted with on-board inverter architecture in mind, has broadened to include off-board inverter systems with the added element of incorporation of SCE's Grid Management System. With four sets of partners, involving two light-duty original equipment manufacturers (OEM), automakers, an electric school bus, and a transit bus, all 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. This project demonstrates six VGI use cases with the partners and sets the stage for future field demonstrations and V2G interconnections and operations.

SCOF: The Service Center of the Future projects is a broad-scale project that brings microgrid control strategies together with facility modernization of a heavy-duty vehicle operations center. It involves building electrification and controls, energy storage, PV generation, EV charging controls, EV charging submetering, and utility operations, all managed through a utility operated microgrid control system. Multiple VGI use cases are demonstrated here, including power-off grid resiliency and local grid balancing and renewables integration.

7. Efforts to accelerate the use of VGI for resiliency

SCE is taking steps to accelerate 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.

On June 15, 2021, SCE filed AL-4518-E outlining its LCFS Holdback spending proposal. This proposal includes a School Bus V2G Project with Baldwin Park Unified School District focused on providing resiliency power for emergency energy backup.[8] SCE may consider utilizing additional LCFS holdback credit proceeds for appropriate VGI resiliency projects in the future.

Additionally, on July 15, 2021, SCE filed AL-4542-E outlining its VGI Pilots spending proposal in response to Decision (D.)20-12-029. SCE proposed three VGI pilots in this advice letter, two of which are beneficial for resiliency. First, the Medium-Duty and Heavy-Duty (MD/HD) VGI Pilot[9] explores options for behind the meter (BTM) storage services, in support of V2B functionality. Second, the Distributed Energy Resource

[8] AL-4518-E, Appendix A p. 64.
[9] AL-4542-E, Appendix B, p. 7.

(DER) VGI Pilot[10] explores integration with municipal fleets and provides nanogrid services.

8. Progress to reform interconnection rules to advance VGI

Under Rulemaking (R.) 17-07-007, the Commission issued Decision (D.) 20-09-035 on September 24, 2020. D.20-09-035 adopted the following proposals, of which 23a-e had consensus:

- 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 all 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.
- 23i. 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[11] held several workshops to present and discuss the proposed implementation steps for Proposals 23e and 23i. 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 23i). 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 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

[10] *Id.*, Appendix C, p. 8.
[11] Utilities are SCE, San Diego Gas & Electric (SDG&E) and Pacific Gas and Electric (PG&E).

from a Utility.[12] On November 4, 2021, the Joint Advice Letter was approved with modifications, in Resolution E-5165.

SCE's Rule 21 tariff and interconnection technical standards continue to evolve to support bi-directional VGI application. On September 24, 2020, the Commission issued D.20-09-035, which provides direction on how bi-directional VGI applications are to be addressed.

For certain type of systems (V2G-DC systems), the Decision 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.[13]

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.[14]

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.[15]

In addition to interconnection standards, there are several industry standards that have been updated or are in the process of being developed, to allow V2G-AC systems to meet modern requirements to be interconnected. These standards include the following:

- SAE- J3072 - *Interconnection Requirements for Onboard, Grid Support Inverter Systems*
- UL 1741 SC - *Standard for Interconnection System Equipment (ISE)/EVSE*
- *SunSpec J3072-2030.5 profile standard and certification*

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 continue participating in revision efforts today. SCE staff participate as an original member 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 standards for network-controlled EV charging energy management systems. This is supporting a critical need for a certifiable safety standard and

12 SDG&E AL 3774-E, SCE AL 4510-E, and PG&E AL 6209-E ("the Joint AL").
13 D.20-09-035, OP. 39, p. 218.
14 *Id.*, OP. 44. p. 220.
15 *Id.*, OP, 53 and 54, p. 225.

implementation process for Type II EVEMS. The CSA effort supports harmonization efforts with US standards bodies to create the first US/Canada standard on network-connected EV charging management systems. In addition, 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 are all standards and systems that 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 to demonstrate innovative utility-connected charging methods, 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 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 continues to work with partners and associations such as the Electric Power Research Institute and maintains membership in the National Infrastructure Working Council to support these objectives.

On June 15, 2021, pursuant to OP 19 of the Decision, SCE submitted Advice 4521-E, detailing its end-to-end 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 is pending Commission approval.

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 current Charge Ready Light-Duty, Charge Ready Transport and TE Advisory Services programs. SCE's Charge Ready programs offer quarterly 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 2020, SCE launched a simple, user-friendly, Fleet Fuel Calculator 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 emissions saved. Through the TE Advisory Services EV Readiness Services program, qualified customers are eligible to receive one-on-one consultation with a TE specialist, who will go over various topics, including but not limited to, managed charging, EV TOU rates, and recommended EVSE level charging.

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 (or 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 EVSP operator in place. Type I capable systems can be configured by the customer to reduce electricity 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 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 is present without some control. The deficit of capacity can occur on the customer's system, the utility's system, or both. The normal course in this situation is to design and construct the needed (Code based) electrical infrastructure to 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 economic and useful to all customers.

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 standing U.S. safety standard, nor associated NRTL certification, for network-controlled EV EMS or the configuration and commissioning of such systems. In anticipation of coming standards, in 2017, SCE developed procedures to evaluate and approve such systems in support of SCE's responsibilities to evaluate and qualify EVSE systems for its Charge Ready programs. SCE worked with two vendors in lab safety evaluations to approve and list their products on SCE's Approved Product List (APL) for its Charge Ready programs. For business reasons on the customer side, the two initial projects for Type II ALM requested by customers ultimately did not proceed.

Because the two projects did not proceed, SCE did not gain experience with the next part of 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 serves on the CSA (CSA Group, Canadian Standards) and Institute of Electrical and Electronics Engineers' (IEEE) boards working on EV controls and EMS.

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 140 sites and 2,667 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 program.

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 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.

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 are 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 is a utility run pilot, data has not been requested from third party providers.

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

SCE has not received approval for VGI Pilots or Emerging Markets and Technology program filed on July 15, 2021 and October 13, 2021, respectively. Following CPUC approval of Advice Letter 4542-E, Advice Letter 4610-E and implementation, SCE will begin to report on the implementation and lessons learned associated with its authorized VGI pilots.

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 and customers in Charge Ready Light Duty are also required to participate in a demand response program, which requires installation of charging equipment that can respond to demand response signals.

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 CRT via the customer-build path and has created internal reference guides to ensure SCE staff are aware and of the support and flexibility afforded to customers through customer ownership.

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 has become more relevant as SCE has begun development of the Emergency Load Reduction Program (ELRP).

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

SCE has multiple pilots underway, not including the VGI Pilots for which it requested approval in Advice Letter 4542-E, which was submitted on July 15, 2021. Below is an overview of the pilots underway:

- The Charge Ready DR Pilot began in 2018 and is still underway. Results have been generally positive through 2021 in reducing load between 4:00 pm and 9:00 pm by using a combination of control signals and incentives. Next steps include continuing in 2022 and submitting a transition plan as part of the DR Application. Costs for the Charge Ready DR Pilot are included in the Program and Pilot Metrics spreadsheet. Lessons learned include the difficulty in shifting EV charging to specific times and problems with using baselines to determine DR performance. To date, there has been minimal negative feedback from customers throughout the pilot relating to DR events.

- SCE's EPIC project, V2G Integration will use new interconnection requirements, V2G-related technologies (as well as smart charging or V1G) and standards, 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. The demonstrations will consist of both customer support and grid support use cases. Next steps are to complete the lab network environment, move the systems into the lab, and execute the test plans. This EPIC IOU administered project, including cost, schedule, and deliverables, is managed and reported out annually in the EPIC administrative process.

- SCE EPIC project, Service Center of the Future will demonstrate 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. The Project will assimilate with an existing Charge Ready Transport project site to inform 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. Next steps are to carry out the MCS design and production processes in anticipation of MCS testing, SCE lab testing, and field deployment. This EPIC IOU-administered project, including cost, schedule, and deliverables, is managed and reported out annually in the EPIC administrative process.

- SCE EPIC project, Distributed Plug-In Resources will demonstrate technology and techniques to leverage energy storage systems (ESS) in order to alleviate fast-charging impacts to the grid, address the potential to reduce customer demand charges, and explore the advantages and disadvantages of using new or used batteries for integrated energy storage applications. Next steps are to acquire the high-power charging system and assemble in the SCE microgrid test bed lab to integrate with a battery system and test use cases. This EPIC IOU-administered project, including cost, schedule, and deliverables, is managed and reported out annually in the EPIC administrative process.

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 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. The two initial truck charging pilot sites will apply to the Charge Ready Transport program. The program includes comprehensive studies of truck goods movement needs, electric energy fueling needs, and grid impact assessment.

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

SCE does not have metrics on interconnection reform for V2G to report for the time period between January 1- December 31, 2021, because V2G systems have not been interconnected on the system.

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

SCE currently does not have a mechanism to provide credit for export for EV customers but will report on these efforts as they develop.

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

SCE currently does not have a mechanism to provide credit for export for EV customers but will report on these efforts as they develop.

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

This metric is not applicable at this time. There are no customer program participants exporting energy to our grid.

22. Overall barriers removed in V2B

In SCE's V2G EPIC project, SCE is working with three major automakers or original equipment manufacturers (OEMs) and one medium-duty OEM to demonstrate V2G interconnection and controls. The focus is on V2G resiliency use cases, including V2G, backup power (or V2B). 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. With this project, SCE can work with OEMs to implement technical measures that will be successful and work to prevent unsafe an 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. In addition, in conjunction with this project the team works with stakeholders in the grid interconnections field who will work to better incorporate V2G, including V2B, in the web-based grid interconnection tools.

23. Number of EVs enrolled in DR programs

The Charge Ready DR Pilot does not enroll specific EVs, but rather it enrolls the EVSE through the EVSP. As noted above, all Charge Ready Pilot and Bridge customers are required to participate in the Charge Ready DR Pilot. The 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).

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

Since participation in the Charge Ready DR Pilot 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 throughout the Charge Ready DR Pilot, increased utilization of charging ports over time, and variability in when drivers choose to charge their EVs.

25. EV DR enrollment capacity (MW)

There have been 2,745 charging ports installed during the Charge Ready Pilot and Bridge phases with 2,667 charging ports currently active. Based on the active charging ports, 100% utilization at an average of 7.2 kW (previously 6.6 kW was used as the average, but more current data estimates an average of 7.2 kW) is almost 20 MW. The Charge Ready DR Pilot control signals reduce charging capacity by 50% during events, so the maximum DR potential capacity of the Charge Ready DR Pilot is approximately 10 MW.

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) would result in a maximum DR potential load shift of 50 MWh. However, the Charge Ready DR Pilot through 2021 averaged less than 1 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.

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.

SCE will have a more accurate accounting for VGI attributable GHG following the approval and implementation of its VGI Pilots, proposed in Advice Letter 4542-E, and the Emerging Markets and Technology Program, proposed Advice Letter 4610-E.

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 and Bridge sites participate in the Charge Ready DR Pilot, which began in 2018. A total of 146 EV charging sites have been installed as part of the Charge Ready Pilot and Bridge phases with 140 sites currently active. Lessons learned include the difficulty in shifting EV charging to specific times and problems with using baselines to determine DR performance. Since participation in DR was required for Charge Ready Pilot and Bridge 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.

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-R of the Program and Pilot Metrics tab in the Attachment 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. SCE is assessing how to collect, track and best present this data for future reporting.

- **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 collects 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 have an electric vehicle or plug-in hybrid owners and lessees, customers with a residential battery, or customers with an electric heat pump system for water or space heating.[16]

SCE evaluated load impacts from customers enrolled in its TOU-D-Prime rate in 2019 and 2020. In 2019, non-Net Energy Metering (NEM) EV customers reduced their peak period (weekdays 4:00 to 9:00 PM) demand by 0.43 kW or 21.7% compared with customers not enrolled in the rate. In 2020, all customers reduced their peak period demand by approximately 0.33 kW or 14.0%. However, electricity consumption was high due to shelter-in-place during this time which partly reflects the reduced but still significant impacts. In addition, daily electricity consumption increased while customers were enrolled in the rate. Data from 2019 show that non-NEM customers increased their daily electricity usage by 3.61 kWh or 10.8%. This increase levelled off slightly to 7% in 2020. SCE's findings show that the TOU-D-PRIME rate option is effective in shifting peak period demand from 4:00 to 9:00 PM during weekdays to off-peak periods, when the rate is lowest. A follow-up study to measure 2021 load impacts of EV customers who are enrolled onto TOU-D-PRIME is expected to be available in Q3 2022.

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

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)

SCE does not currently have any EV tariffs that employ dynamic rates, which SCE interprets as real-time-rates. While customers on dynamic rates may still charge EVs, this load is not visible to SCE at the vehicle level and is not expected to be significant at this time.

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.

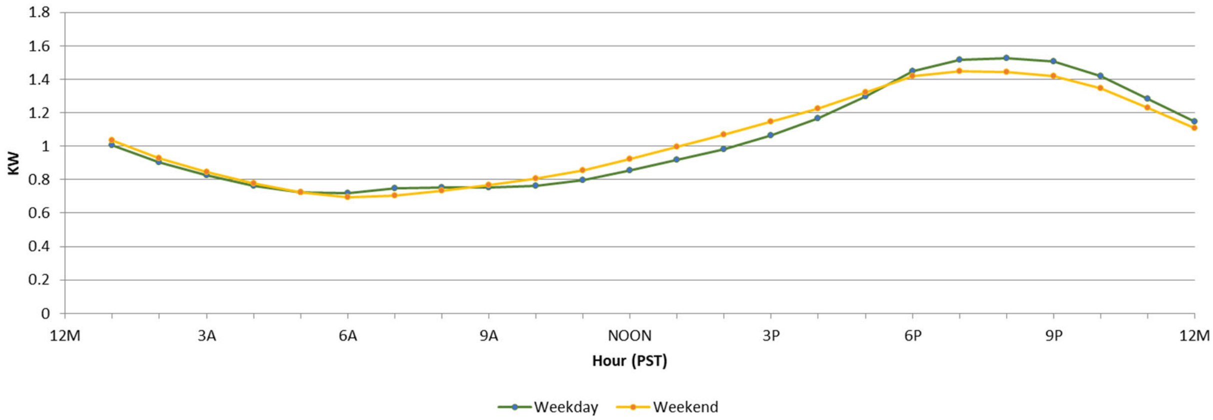
35. Aggregate unmanaged load profiles within programs (kW)

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 (kWh)



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

The peak load for these Schedule D customers is 1.5 kW on weekdays and 1.4 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)

Customers from TOU-EV-1 are identified through our Charge Ready Home Install Rebate program. Chart 2 provides average weekday/weekend hourly load profiles for residential program customers on separately metered TOU-EV-1 between January 1, 2021, and December 31, 2021. The average weekday demand begins to rise slowly around 4:00 PM where it is .03 kW and then rises sharply from 8:00 PM, starting at 0.08 kW and peaking at 1.16 kW at 11:00 PM. Charging demand noticeably dips starting at 12:00 AM and continues to decline until 6:00 AM.

The average weekend demand rises sharply from 8:00 PM, starting at 0.05 kW and peaking at 1.11 kW at 11:00 PM. Charging demand noticeably dips starting at 11:00 PM and continues to decline until 6:00 AM.

Chart 2: Aggregate Average hourly load profiles for TOU-EV-1 program sites (kWh)

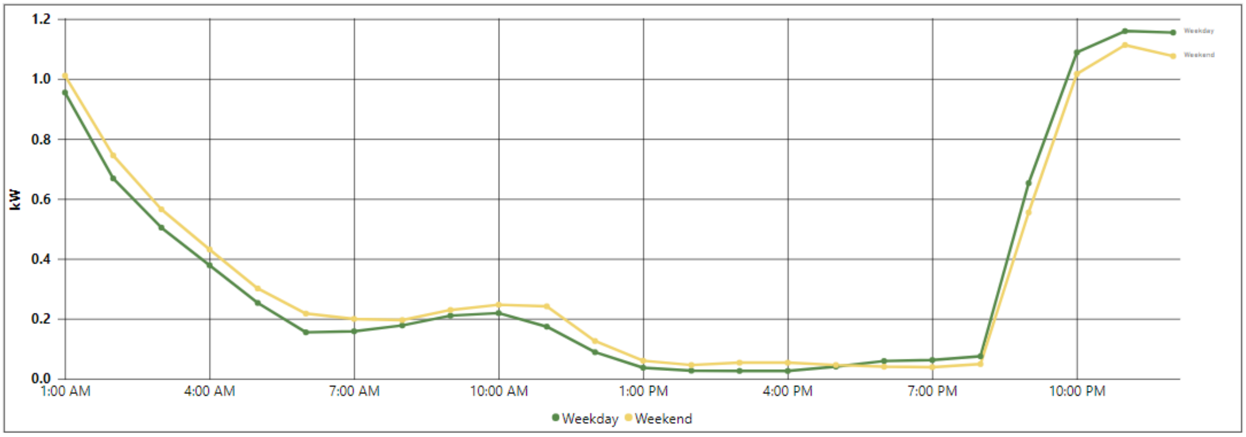


Chart 3 provides average weekday and weekend hourly load profiles for program customers on separately metered TOU-EV-7 between January 1, 2021, and December 31, 2021. The average weekday demand begins to rise around 5:00 AM where it is 0.32 kW and peaks around 9:00 AM with an average demand of 1.05 kW. For the rest of the day, charging among our program customers tapers off after the 9:00 AM peak. The weekend profile almost overlaps with the weekday profile between 8:00 PM and 5:00 AM. Weekend load gradually increases from 7:00 AM where it is 0.28 kW and peaks around 10:00 PM with an average demand of 0.55 kW.

Chart 3: Aggregate Average hourly load profiles for TOU-EV-7 program sites (kWh)

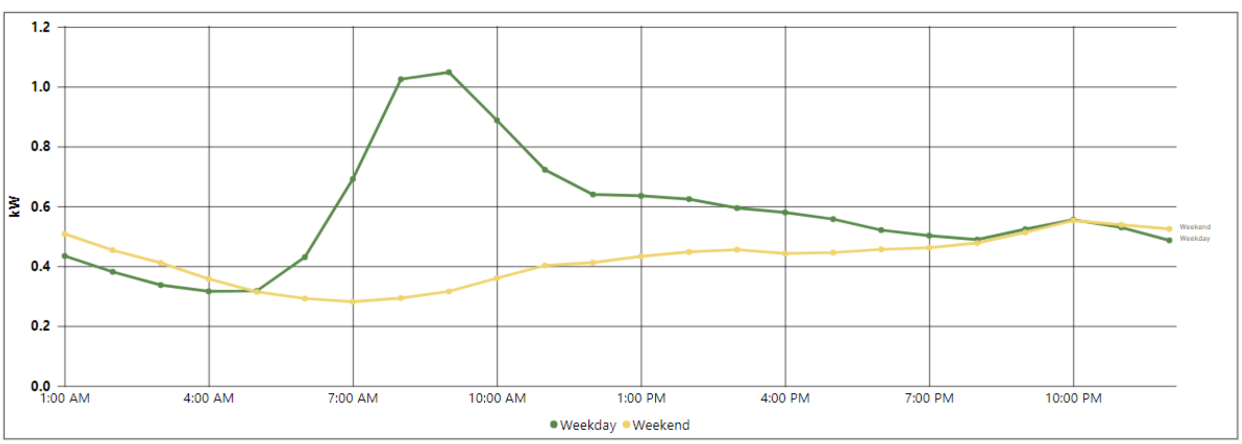
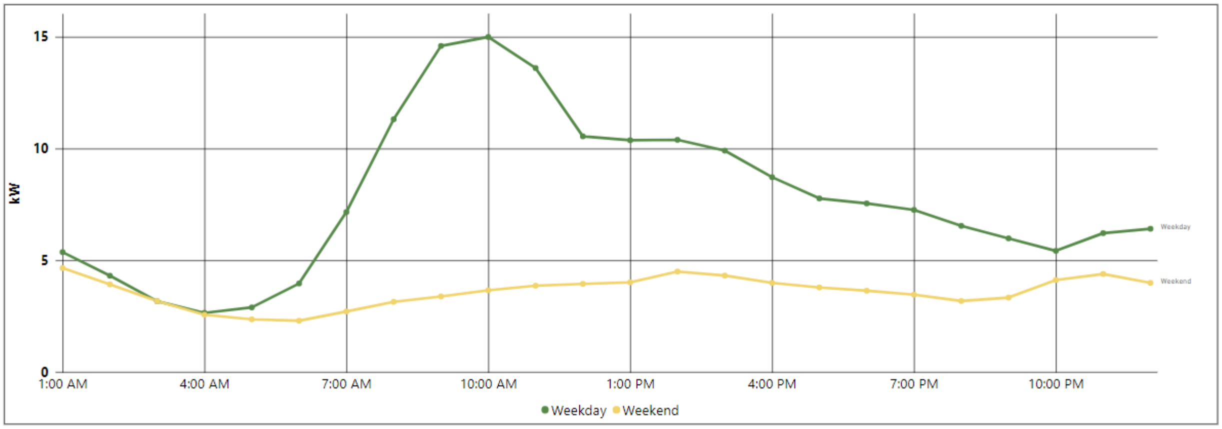


Chart 4 provides average weekday/weekend hourly load profiles for program customers on separately metered TOU-EV-8 between January 1, 2021, and December 31, 2021. Most of our program customers receive TOU-EV-8. The average weekday demand begins to rise around 4:00 AM where it is 2.6 kW and peaks around 10:00 AM with an average demand of 15 kW. Charging demand noticeably dips starting at 10:00 AM and begins to slowly taper off 12:00 PM. After this, the load shape tapers off before a slight rebound to 5.42 kW at 10PM. The weekend profile displays a slow increase starting at 6:00 AM and starts to taper off by 1:00 AM where it is 4.65 kW.

Chart 4: Aggregate Average hourly load profiles for TOU-EV-8 program sites (kWh)



As of December 31, 2021, there are only four program customers participating on TOU-EV-9, representing large commercial customers. The sample size is too small and the data is not representative of the broader trends on the rate. Therefore, we omit this small subset of data. SCE will not be providing an analysis or an aggregate hourly load profile for TOU-EV-9 within our programs.

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

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

Average weekday usage within the TOU-EV-1 rate category peaks at 1.16 kW and average weekend usage peaks at 1.11 kW.

Average weekday usage within the TOU-EV-7 rate category peaks at 1.05 kW and average weekend usage peaks at 0.55 kW.

Average weekday usage within the TOU-EV-8 rate category peaks at 15 kW and average weekend usage peaks at 4.65 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.

SCE charges site hosts one of three TOU-EV rates based on peak monthly usage. TOU-EV-7, TOU-EV-8, and TOU-EV-9 rates are applicable to commercial customers whose monthly max demand is 20 kW or less, greater than 20 kW to 500 kW, and above 500 kW, respectively. There is currently a demand charge holiday until 2024. Charging infrastructure must be separately metered to qualify for these rates.

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, 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. There is one residential TOU-EV rate, TOU-EV-1, which meters exclusively EV charging. EV owners are also eligible for TOU-D-PRIME which is also a TOU rate. However, all household load is metered under TOU-D-PRIME. As such, we will not be providing the profile for this rate. All average load profiles are for metered data between January 1, 2021 and December 31, 2021. The values for all average load profiles are provided in Appendix B.

Chart 5 provides average weekday and weekend hourly load profiles for customers outside of programs on separately metered TOU-EV-1. EVs commence charging promptly at the beginning of the off-peak period at 10:00 PM. After 12:00 AM, demands begin to taper off as vehicles reach full charge. The highest demand occurs on weekdays and has an average hourly demand of 1.2 kW. Weekend peak demand is around 1.0 kW. Charging during the day between 6:00 AM and 8:00 PM is very low.

Chart 5 – Aggregate Average Load Profile for TOU-EV-1 (kWh)

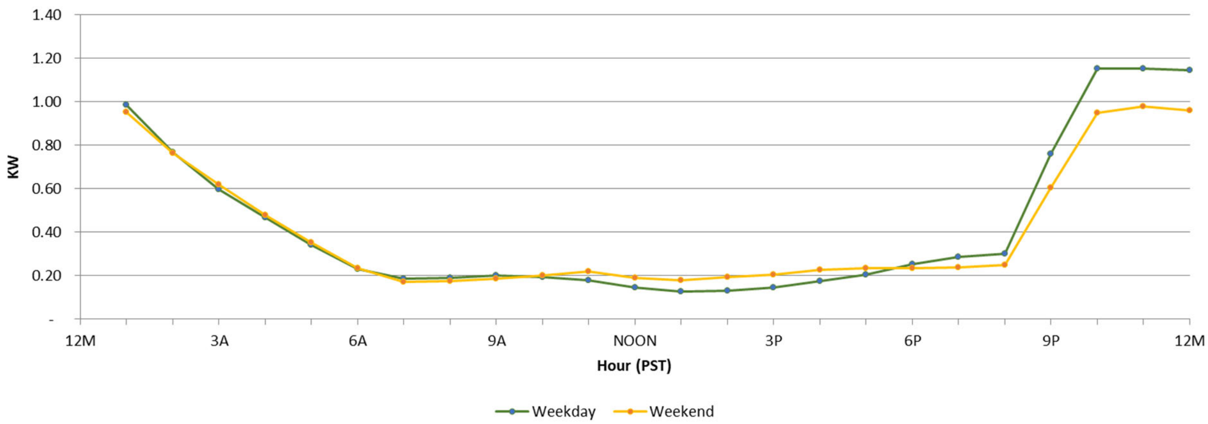


Chart 6 provides average weekday and weekend hourly load profiles for customers outside of programs on separately metered TOU-EV-7. The average weekday demand begins to rise around 5:00 AM where it is 0.3 kW and peaks around 10:00 AM with an average demand of 1.8 kW. Charging for customers not participating in EV programs begins tapering off for the rest of the day at 11:00 AM. 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 0.35 kW and peaks around noontime with an average demand of 1.4 kW.

Chart 6 – Aggregate Average Load Profile for TOU-EV-7 (kWh)

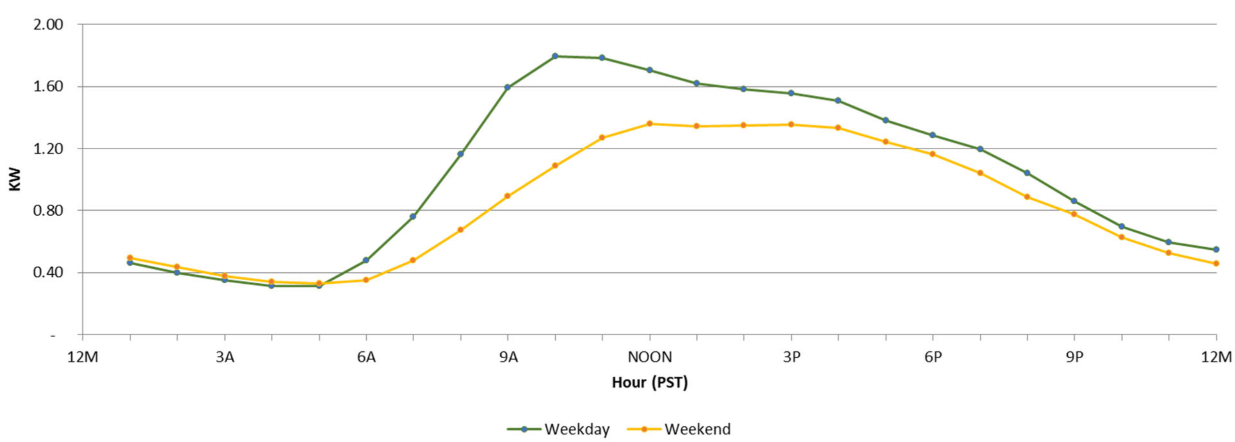


Chart 7 provides average weekday and weekend hourly load profiles for customers outside of programs on separately metered TOU-EV-8. The average weekday demand begins to rise around 5:00 AM where it is about 3 kW and peaks at 6:00 PM with an average demand of 14.5 kW before it tapers off for the rest of the day. The charging load profile for customers on TOU-EV-8 not participating in EV programs has a higher weekend usage during midday. It has a peak demand around 2:00 PM with an average demand of 15.3 kW.

Chart 7 – Aggregate Average Load Profile for TOU-EV-8 (kWh)

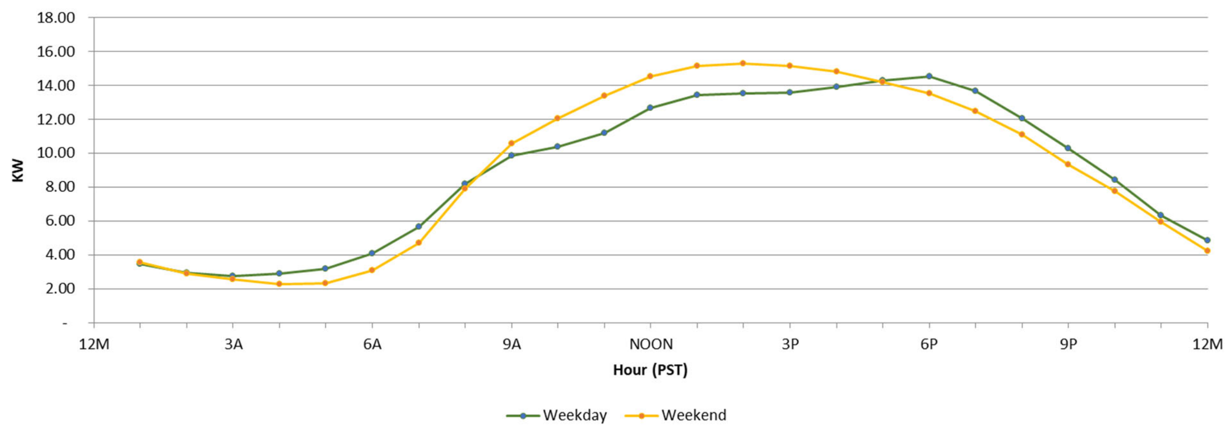
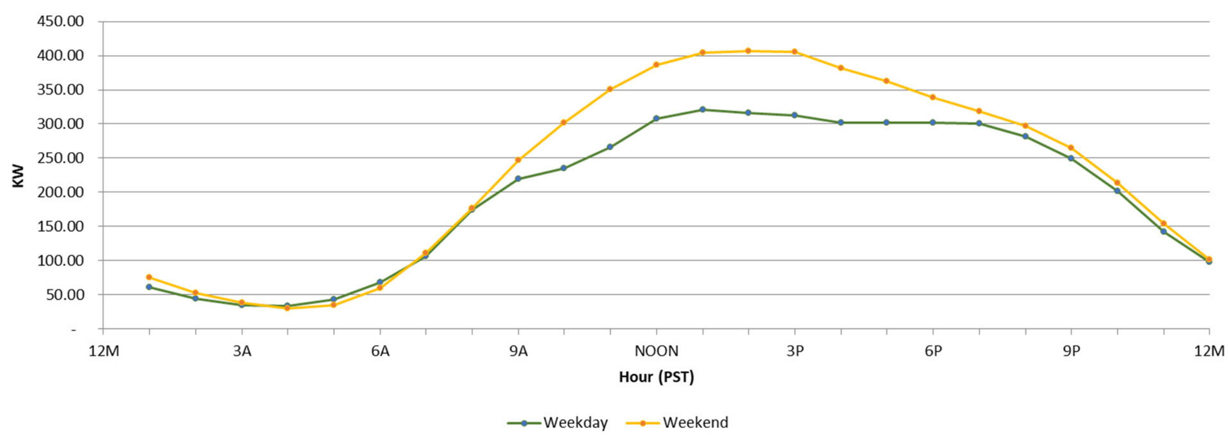


Chart 8 provides average weekday and weekend hourly load profiles for customers outside of programs on separately metered TOU-EV-9. The average weekday demand begins to rise around 5:00 AM where it is 43 kW and peaks around 1:00 PM with an average demand of 321 kW before tapering off for the rest of the day. The weekend profile shows a similar load shape but a higher peak demand of 407 kW around 2:00 PM.

Chart 8 – Aggregate Average Load Profile for TOU-EV-9 (kWh)



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: 1.8 kW on weekdays and 1.4kW on weekends for TOU-EV-7, 14.5 kW on weekdays and 15.3 on weekends for TOU-EV-8, 321 kW on weekdays and 407 kW on weekends for TOU-EV-9. Residential customers on TOU-EV-1 have an average peak load of 1.2 kW on weekdays and 1.0 kW on weekends.

Appendix A - VGI Reporting Template

Program and Pilot Metrics

The Program and Pilot Metrics tab includes metrics in the VGI Decision by program or pilot. This tab plans to list the utilities VGI programs and pilots and their associated aggregated metrics. Definitions of each metric are provided in the Descriptions tab. For draft purposes, illustrative program examples are provided.

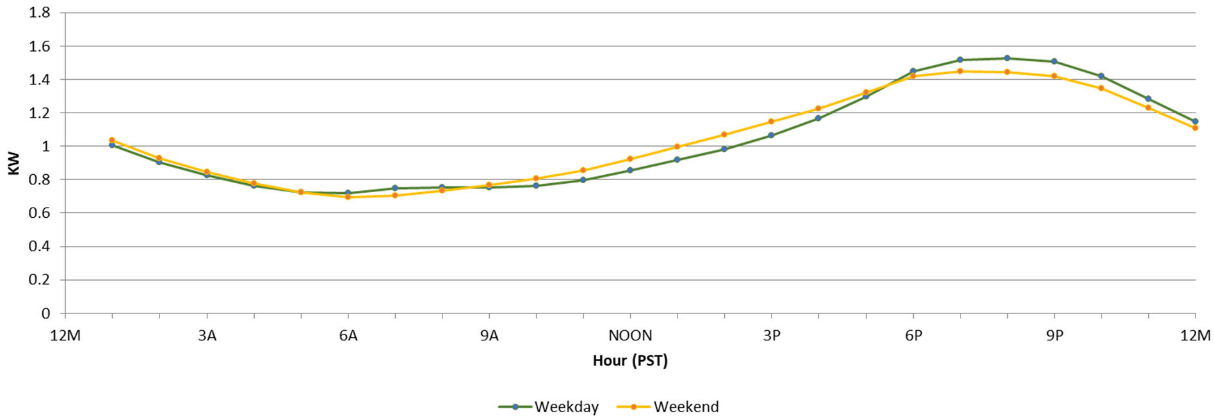
Aggregated totals:						**Totals(2):**	**140**	**0**	**140**	**2667**	**140**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**$871,504,765**	**$68,852,689**
							Counts By Program or Pilot								Cost By Program or Pilot					
Program/Pilot	**Market Segment - Residential or Commercial**	**Market Segment - 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)**
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 agency	DAC/NonDAC	5/27/2016	Active		140	0	140	2667	140	0	0	0	0	0	0	0	$43,855,000	$41,629,146
Charge Ready Demand Response Pilot	Commercial	Destination Center, Distribution Center Warehouse, Government facility, Multi-Unit Dwelling, Retail Business Center/Retail parking lot, School facility, and Transit agency	DAC/NonDAC	12/27/2017	Active		140	0	140	2667	140	0	0	0	0	0	0	0	$429,953	$238,703
Charge Ready Transport	Commercial	TRU, Medium-Duty Vehicles, Heavy Duty - Vehicles, School Bus, Transit Bus	DAC/Non-DAC	5/20/2018	Active		0	0	0	0	0	0	0	0	0	0	0	0	$356,362,471	$12,418,219
Charge Ready Light Duty	Commercial	N/A	DAC/Non-DAC	7/12/2021	Active		0	0	0	0	0	0	0	0	0	0	0	0	$436,343,669	$4,204,542
Charge Ready Schools	Commercial	Schools	DAC/Non-DAC	11/2/2020	Active		0	0	0	0	0	0	0	0	0	0	0	0	$9,890,000	$1,421,850
Charge Ready Parks	Commercial	Parks	DAC/Non-DAC	2/1/2021	Active		0	0	0	0	0	0	0	0	0	0	0	0	$9,890,000	$519,815
PRP-Charge Ready DCFC	Commercial	Transit agency	DAC/NonDAC	6/29/2018	Completed		0	0	0	0	0	0	0	0	0	0	0	0	$3,980,000	$1,651,624
PRP-Charge Ready Transit	Commercial	Transit agency	DAC/NonDAC	6/4/2018	Completed		0	0	0	0	0	0	0	0	0	0	0	0	$3,978,000	$2,009,498
PRP -Charge Ready Home Install Rebate	Residential	Residential	DAC/NonDAC	5/30/2018	Completed		0	0	0	0	0	0	0	0	0	0	0	0	$3,999,000	$2,065,330
PRP -Charge Ready POLB - Gantry Crane	Commercial	Gantry Crane	DAC	Q1 2018	Completed		0	0	0	0	0	0	0	0	0	0	0	0	$2,326,672	$2,253,996
PRP -Charge Ready POLB - Yard Tractors	Commercial	Yard Tractors	DAC	Q1 2018	Completed		0	0	0	0	0	0	0	0	0	0	0	0	$450,000	$439,966

(1) Charge Ready Pilot & Bridge,Transport, Light Duty, Schools, Parks, PRPs, and Demand Response Pilot budget expended are deflated for price inflation.

(2) Total number of ports and sites participating in ALM does not include Charge Ready Demand Response Pilot. Inclusion will duplicate total number of ports and sites in which all Charge Ready customers with installed level 2 electricle vehicle supply equipment (EVSE) are required to participate.

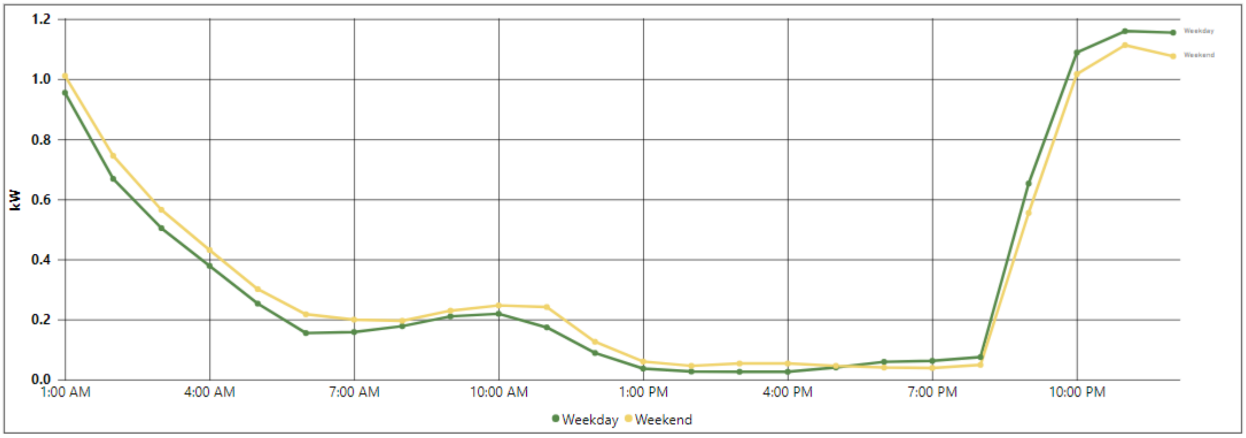
Appendix B - VGI Mid-Term Report Chart Data

Chart 1 – Aggregate Average Load Profile for Schedule D (kWh)



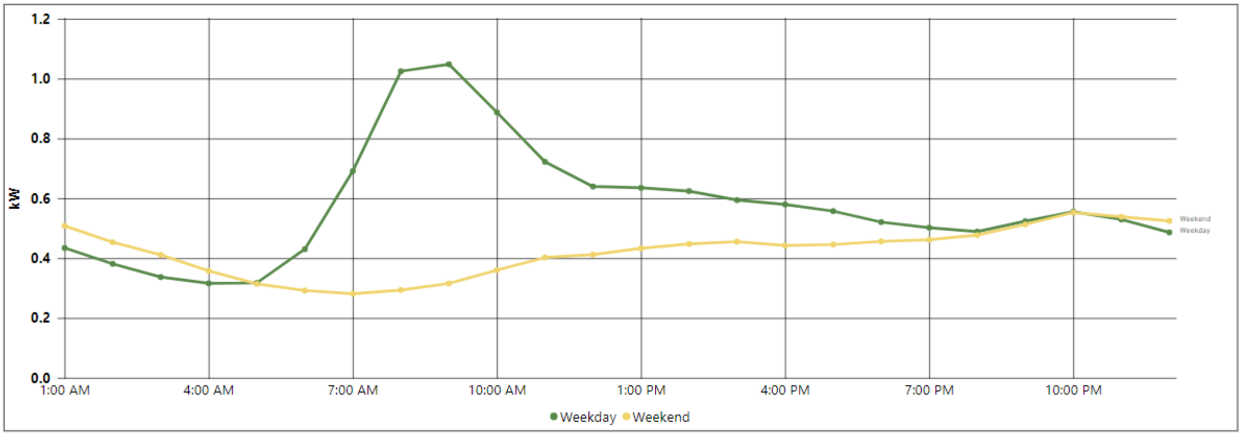
Hours	Weekday	Weekend
1	1.01	1.03
2	0.90	0.93
3	0.82	0.84
4	0.76	0.78
5	0.72	0.72
6	0.72	0.69
7	0.75	0.70
8	0.76	0.74
9	0.75	0.77
10	0.76	0.81
11	0.80	0.86
12	0.86	0.92
13	0.92	1.00
14	0.98	1.07
15	1.07	1.15
16	1.16	1.23
17	1.30	1.32
18	1.45	1.42
19	1.52	1.45
20	1.53	1.44
21	1.50	1.42
22	1.42	1.35
23	1.28	1.23
24	1.15	1.11

Chart 2 – Aggregate average hourly load profiles for TOU-EV-1 within programs (kWh)



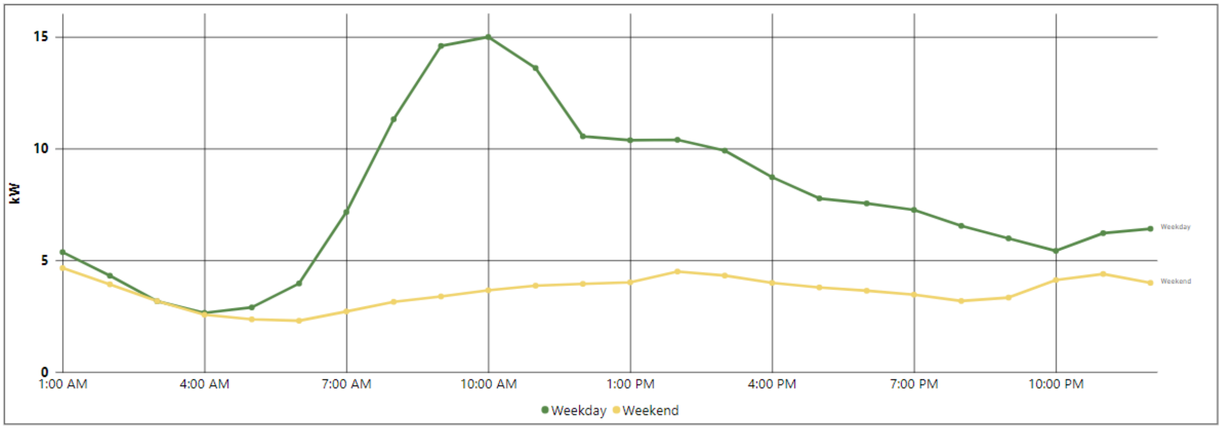
Hour	Weekday	Weekend
1:00 AM	0.95	1.01
2:00 AM	0.67	0.75
3:00 AM	0.50	0.57
4:00 AM	0.38	0.43
5:00 AM	0.25	0.30
6:00 AM	0.16	0.22
7:00 AM	0.16	0.20
8:00 AM	0.18	0.20
9:00 AM	0.21	0.23
10:00 AM	0.22	0.25
11:00 AM	0.17	0.24
12:00 PM	0.09	0.13
1:00 PM	0.04	0.06
2:00 PM	0.03	0.05
3:00 PM	0.03	0.05
4:00 PM	0.03	0.05
5:00 PM	0.04	0.05
6:00 PM	0.06	0.04
7:00 PM	0.06	0.04
8:00 PM	0.08	0.05
9:00 PM	0.65	0.55
10:00 PM	1.09	1.02
11:00 PM	1.16	1.11
12:00 AM	1.16	1.08

Chart 3 - Aggregate average hourly load profiles for TOU-EV-7 within programs (kWh)



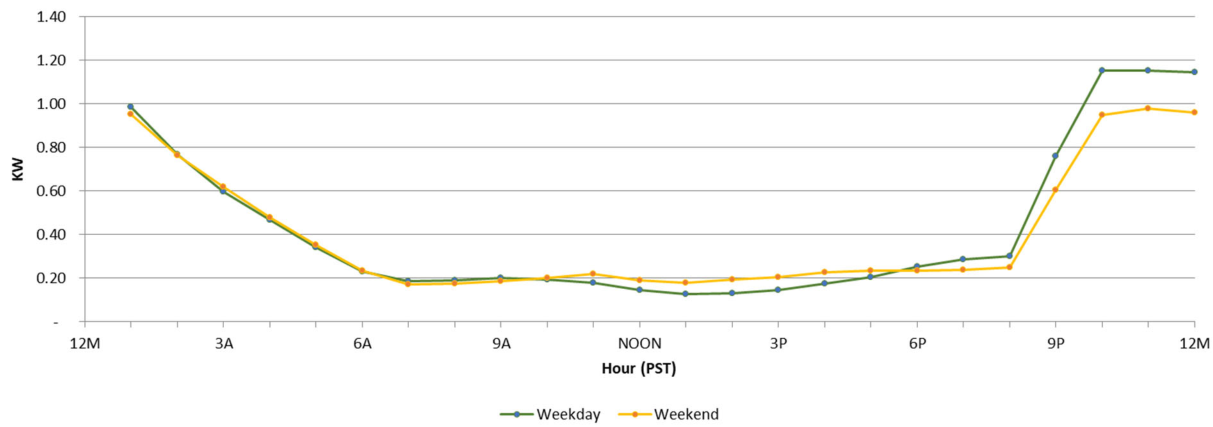
Hour	Weekday	Weekend
1:00 AM	0.43	0.51
2:00 AM	0.38	0.45
3:00 AM	0.34	0.41
4:00 AM	0.32	0.36
5:00 AM	0.32	0.31
6:00 AM	0.43	0.29
7:00 AM	0.69	0.28
8:00 AM	1.02	0.29
9:00 AM	1.05	0.32
10:00 AM	0.89	0.36
11:00 AM	0.72	0.40
12:00 PM	0.64	0.41
1:00 PM	0.64	0.43
2:00 PM	0.62	0.45
3:00 PM	0.59	0.46
4:00 PM	0.58	0.44
5:00 PM	0.56	0.45
6:00 PM	0.52	0.46
7:00 PM	0.50	0.46
8:00 PM	0.49	0.48
9:00 PM	0.52	0.51
10:00 PM	0.56	0.55
11:00 PM	0.53	0.54
12:00 AM	0.49	0.52

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



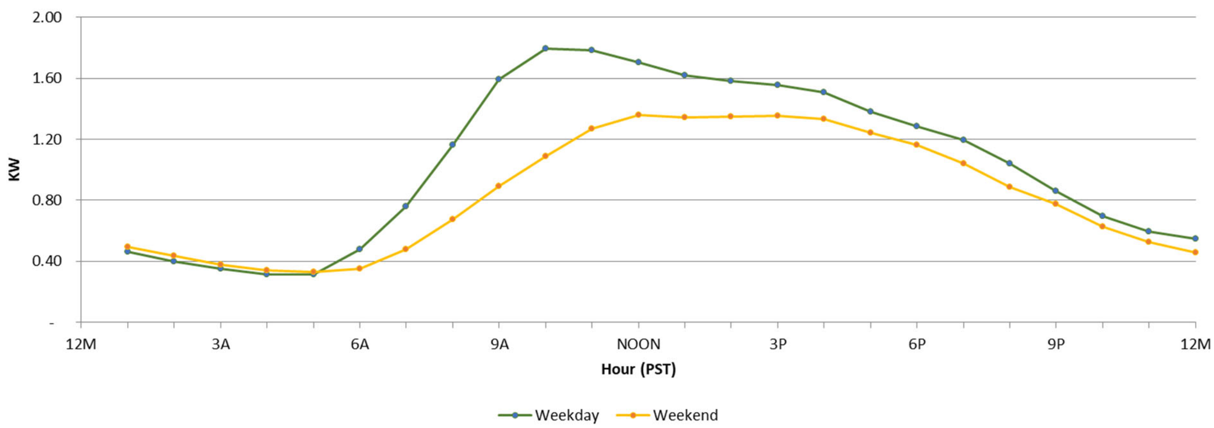
Hour	Weekday	Weekend
1:00 AM	5.36	4.65
2:00 AM	4.31	3.92
3:00 AM	3.17	3.17
4:00 AM	2.65	2.56
5:00 AM	2.89	2.36
6:00 AM	3.96	2.29
7:00 AM	7.16	2.71
8:00 AM	11.31	3.14
9:00 AM	14.60	3.38
10:00 AM	15.00	3.66
11:00 AM	13.61	3.86
12:00 PM	10.55	3.94
1:00 PM	10.37	4.01
2:00 PM	10.39	4.50
3:00 PM	9.91	4.31
4:00 PM	8.72	3.99
5:00 PM	7.77	3.78
6:00 PM	7.55	3.64
7:00 PM	7.25	3.46
8:00 PM	6.54	3.18
9:00 PM	5.98	3.33
10:00 PM	5.42	4.12
11:00 PM	6.21	4.39
12:00 AM	6.41	3.99

Chart 5 – Aggregate Average Load Profile for TOU-EV-1 (kWh)



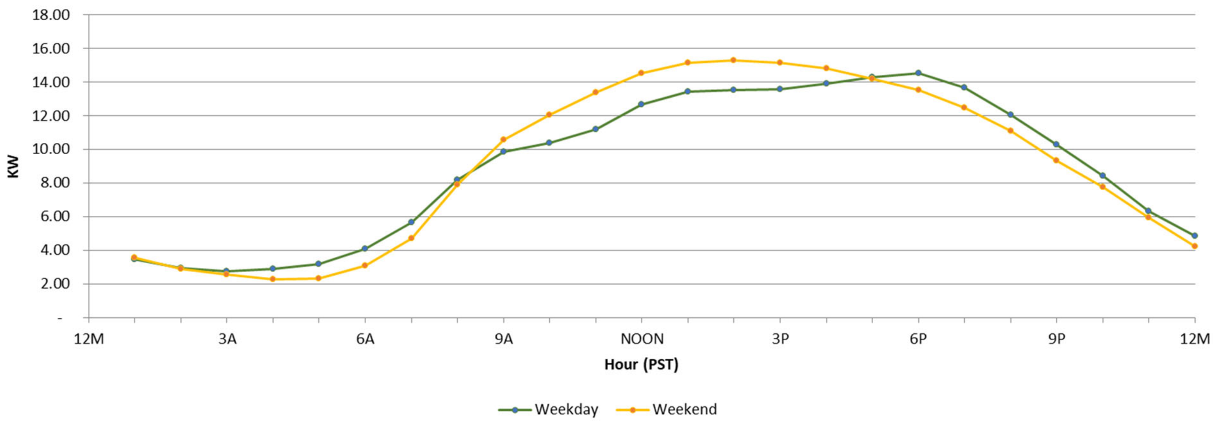
Hours	Weekday	Weekend
1	0.99	0.95
2	0.77	0.76
3	0.60	0.62
4	0.47	0.48
5	0.34	0.35
6	0.23	0.23
7	0.18	0.17
8	0.19	0.18
9	0.20	0.19
10	0.19	0.20
11	0.18	0.22
12	0.14	0.19
13	0.13	0.18
14	0.13	0.19
15	0.14	0.21
16	0.17	0.22
17	0.20	0.23
18	0.25	0.23
19	0.29	0.24
20	0.30	0.25
21	0.76	0.61
22	1.15	0.95
23	1.15	0.98
24	1.15	0.96

Chart 6 – Aggregate Average Load Profile for TOU-EV-7 (kWh)



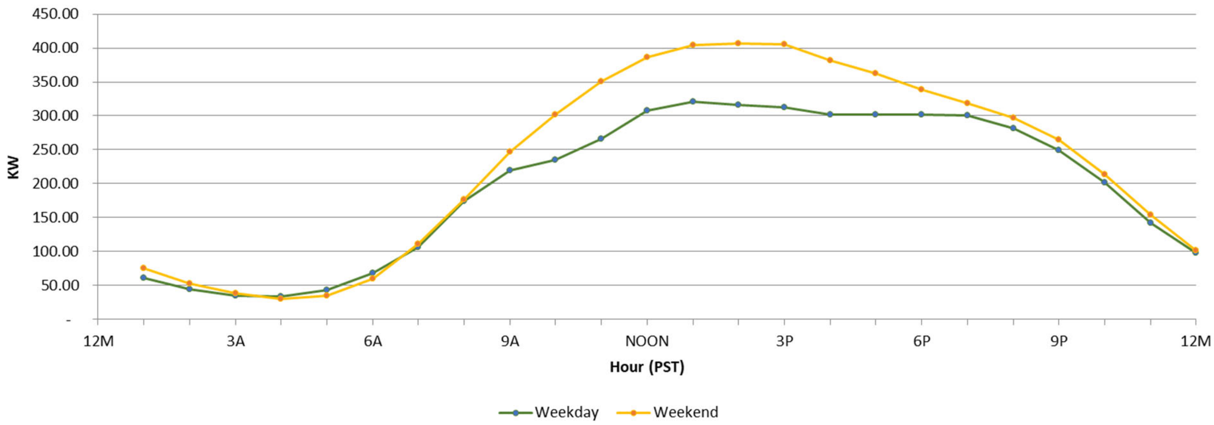
Hours	Weekday	Weekend
1	0.46	0.49
2	0.40	0.43
3	0.35	0.38
4	0.31	0.34
5	0.32	0.33
6	0.48	0.35
7	0.76	0.48
8	1.16	0.67
9	1.59	0.89
10	1.79	1.09
11	1.79	1.27
12	1.71	1.36
13	1.62	1.34
14	1.58	1.35
15	1.56	1.35
16	1.51	1.33
17	1.38	1.24
18	1.28	1.16
19	1.19	1.04
20	1.04	0.89
21	0.86	0.77
22	0.70	0.63
23	0.59	0.53
24	0.55	0.46

Chart 7 – Aggregate Average Load Profile for TOU-EV-8 (kWh)



Hours	Weekday	Weekend
1	3.46	3.54
2	2.93	2.87
3	2.76	2.57
4	2.88	2.29
5	3.17	2.31
6	4.10	3.06
7	5.65	4.72
8	8.18	7.91
9	9.87	10.54
10	10.39	12.05
11	11.17	13.39
12	12.64	14.51
13	13.40	15.15
14	13.51	15.28
15	13.56	15.16
16	13.91	14.81
17	14.30	14.20
18	14.54	13.51
19	13.64	12.47
20	12.03	11.08
21	10.29	9.31
22	8.41	7.74
23	6.33	5.92
24	4.82	4.21

Chart 8 – Aggregate Average Load Profile for TOU-EV-9 (kWh)



Hours	Weekday	Weekend
1	61.13	75.36
2	44.68	52.71
3	35.11	37.93
4	33.23	30.70
5	42.78	34.43
6	68.41	60.28
7	106.24	111.22
8	174.81	177.14
9	219.94	247.44
10	235.04	301.34
11	265.93	350.52
12	307.98	386.01
13	321.36	403.74
14	315.79	406.97
15	312.95	405.07
16	301.72	382.09
17	301.74	362.17
18	302.16	338.85
19	301.14	318.92
20	281.23	297.17
21	249.31	264.40
22	201.81	213.08
23	141.98	154.58
24	97.55	101.65