

Beginning with the End in Mind: Integrating Evaluation in EV Managed Charging Program Design

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Introduction

In 2022, Connecticut launched an electric vehicle (EV) charging program to support the state's commitment to deploy more EVs on the road, integrate EVs into the electric grid, realize electric systems benefits and achieve an equitable transition to EV deployment across the state. The EV program comprises incentives to install EV charging equipment and a managed charging program to help optimize electric grid benefits. This poster presents lessons learned from evaluating the EV residential managed charging program in Eversource's territory in Connecticut, and the importance of integrating evaluation in the early stage of the program design to support program decision-making and implementation strategies.

Program Overview

Eversource residential managed charging program is composed of: 1.) Active demand response (ADR) that sends direct load control signals to the EV or EV charger during peak events. This program was offered starting Summer 2022. 2.) Off-Peak Program that rewards customers for shifting their charging to off-peak periods¹ by either maintaining at least 80% of the charging time each month during off peak hours or by allowing the program implementer to manage charging directly. This program was launched in April 2023.

Evaluation Approach

This section describes how Eversource integrated EM&V in the design to ensure evaluability of performance metrics and proper data collection methods are utilized. Eversource hired a third party evaluator and formed a stakeholder group to enable fast feedback to implementers and to support continuous enhancement of the program. Charging data from participating devices were collected to assess impacts from the managed charging program and a survey was conducted to gain a deeper understanding of participants' experience and charging behavior. Also, Eversource worked with the evaluator to run a randomized control trial to understand the effect of introducing the off-peak program among ADR participants.

Results and Findings

This section provides key findings based on a multi-year third party evaluation. The key results are summarized below.

¹ Off-peak is defined as any time outside 3pm to 9pm on weekdays.

The evaluator fielded participant surveys to investigate program satisfaction and charging behaviors. In the surveys, 81% of Eversource customers rated their overall program satisfaction as 'satisfied' or 'very satisfied.' Participants rated higher satisfaction regarding ease of charging and experiencing minimal disruption to meet charging needs. Participants rated lower satisfaction regarding the enrollment process and information and communication received. Nearly all participants (97%) reported charging their EVs at home and more than half (56%) the respondents reported setting a charging schedule. Participants reported plug-in times between late afternoon (4 PM) and late night (11 PM) while disconnection time is concentrated between 5 AM and 9 AM. This pattern is consistent with the load shapes developed from participant data.

The impact evaluation leveraged a linear regression using charging data, comparing charging behavior on event days and non-event days for ADR and control versus treatment group for off-peak charging. The ADR program encourages load reductions, but the impact decreased overtime with the introduction of the off-peak program. ADR average load reductions were 0.19 kW in Summer 2022, 0.17 kW in 2023, and 0.07 kW in 2024. The off-peak program encouraged large reductions in percent charging on peak – around a 7 to 9 percentage point reduction in charging kWh against the 22% charging on peak in the control group, resulting in a total load reduction of 0.1 kW.

Benchmarking

This section discusses the approaches and findings of other managed charging program evaluations, including the MA SmartCharge Evaluation, the RI Off-peak Rebate Pilot, and the National Grid EV and PHEV Demand Response Evaluation. The MA SmartCharge Evaluation found that the treatment group charged 5.6% more of their kWh and initiated 3.3% more of their charging sessions off-peak than the control group. This impact varied by vehicle type and was found to be greatest for non-Tesla BEVs, followed by Tesla BEVs and PHEVs. The RI Off-Peak Rebate Pilot found that a majority of the control group charging activity already takes place in the off-peak period. The control group initiated 53.4% of their charging sessions off-peak, across all vehicle types and months. The National Grid EV and PHEV Demand Response Evaluation found that demand impacts for all EVs averaged 0.09 kW across all events.

Evaluation Influence in Program Design

This section highlights program decision points that were guided by the evaluation. Eversource worked closely with the evaluator to create a group of participants from the legacy managed charging program be withheld from joining the new program in order to create a randomized control trial. The control group only participated in ADR while treatment group participated in the new program with both ADR and off-peak charging components. This approach allowed Eversource to understand the incremental benefit between the programs. Additionally, the evaluation identified that the off-peak charging program led to substantially reduced impacts during ADR events, informing the latest program design to focus on off-peak charging rather than ADR.

Examples of Visuals

Figure 29: Reported Charging Pattern (Plug-in and Disconnection Times)

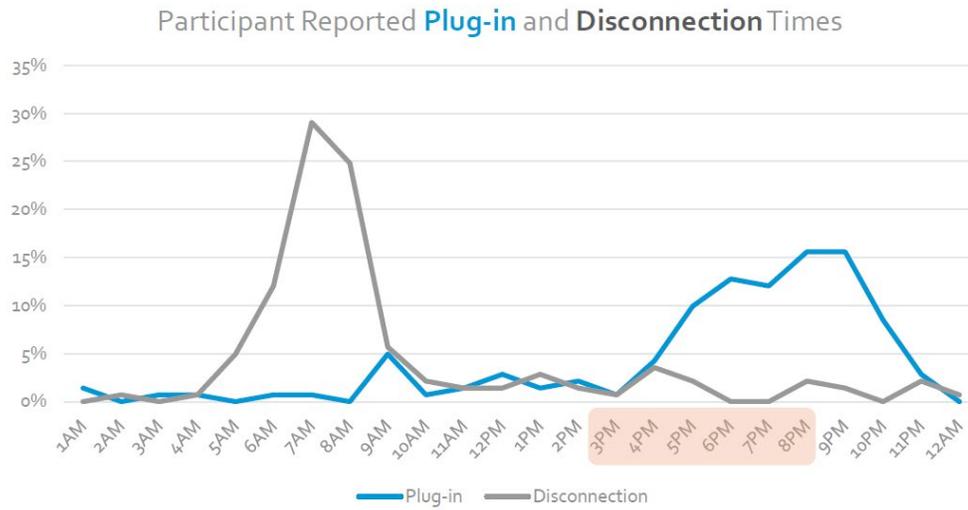
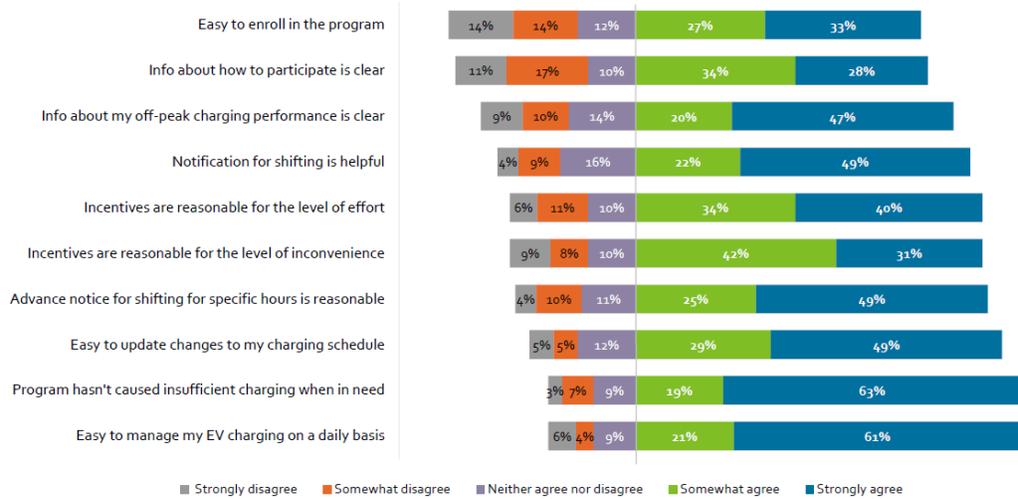


Figure 31: Participant Agreement with Core Statements about the CT EVCP



Source: Connecticut Statewide Electric Vehicle Charging Program Cycle 1 EM&V Report, DSA