Evaluation Plan for the Load Impact Evaluation of Statewide Base Interruptible Programs for Program Year 2023

for
Pacific Gas and Electric Company, Southern California Edison, and San Diego Gas & Electric

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800 University Bay Dr #400
Madison, WI 53705-2299

608.231.2266
www.CAEnergy.com

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by

Christensen Associates Energy Consulting, LLC

1. INTRODUCTION

This research plan describes how Christensen Associates Energy Consulting, LLC (CA Energy Consulting) plans to conduct a load impact evaluation of the statewide Base Interruptible Programs (BIP) for Program Year 2023. BIP is a voluntary program offered by each of the major investor-owned utilities in California. The programs provide monthly capacity bill credits to customers (or aggregators) in exchange for their commitment to reduce consumption to a pre-determined Firm Service Level (FSL) when notified of an emergency situation or test event. Event notification timing varies by utility: PG&E notifies participants 30 minutes prior to an event; SDG&E notifies participants 20 minutes prior to an event; and SCE allows participants to choose between 15- and 30-minute notice options.

The evaluation will be conducted under the guidance of the Demand Response Measurement & Evaluation Committee (DRMEC), which consists of representatives of the Joint Utilities (SCE, PG&E, and SDG&E), the California Public Utilities Commission (CPUC), and the California Energy Commission (CEC). The evaluation will conform to the Load Impact Protocols adopted by the CPUC in D-04-08-050.

The primary goals of this evaluation are the following:

1. Estimate ex-post load impacts for each program for 2023, as described below, using methods that conform to the Load Impact Protocols;

2. Develop ex-ante load impact forecasts for each program for the period 2024 through 2034, as described below; and

3. Provide transparency in the process of developing ex-ante load impacts from historical ex-post load impacts.

An additional objective includes supplemental analysis to produce Excel files containing aggregate ex-ante load impacts for the 1-in-2 weather-year August system peak, for each forecast year, disaggregated by Western Electricity Coordinating Council (WECC) transmission level busbar. This additional information is to be provided by November 1, 2024.

The ex-post objectives involve estimating hourly load impacts for each BIP event for SCE and PG&E. SDG&E did not have any customers enrolled in BIP during the program year. The objectives also involve reporting estimated load impacts for each hour of the average event day, for the average customer and at the program level. Load impacts are to be reported by utility and size group, as well as for the following subgroups: subLAP; NAICS-based industry groups; dual enrollment status; and local capacity area (LCA).

Developing ex-ante load impacts involves combining information drawn from current and (potentially) previous ex-post load impacts with enrollment forecasts provided by the utilities. An important component of the development of ex-ante load impacts involves clearly explaining the process by which ex-post load impacts are translated into ex-ante load impacts and discussing and quantifying factors that affect differences between per-customer ex-post and ex-ante load impacts. Ex-ante load impacts for the 2024 program year will also be compared to those of the previous BIP evaluation.

Section 2 discusses project requirements, including technical issues and our approach for conducting the study. Section 3 presents the detailed work plan and schedule. Section 4 describes our project management plan. Section 5 presents an outline of the final report. Section 6 describes our quality control processes. Section 7 addresses the requirements in Protocol 3.

2. APPROACH

This section discusses project objectives and technical issues that need to be addressed in this study, and our planned approach to addressing those issues. As summarized above, the primary objectives of the project are to estimate ex-post load impacts for each program for 2023, and to develop ex-ante load impacts for each program for the period 2024 through 2034. The ex-post objectives involve estimating hourly load impacts for each BIP event for the day types and subgroups described in Section 1.

Developing ex-ante load impacts involves combining information drawn from current and (potentially) previous ex-post load impacts with enrollment forecasts provided by the utilities. An important component of the development of ex-ante load impacts involves clearly explaining the process by which ex-post load impacts are translated into ex-ante load impacts and discussing and quantifying factors that affect differences between per-customer ex-post and ex-ante load impacts. Ex-ante load impacts developed for the PY2023 evaluation will also be compared to those in the two previous BIP evaluations.

We begin by discussing the ex-post load impact objectives and estimation methods, then turn to the ex-ante forecasts.

2.1 Ex-Post Load Impact Evaluation

2.1.1 Introduction

BIP differs from price-responsive DR programs in that incentive payments are provided regardless of whether events are called, and excess energy charges are assessed if customers fail to reduce consumption to their FSL. Non-performing customers may also have their FSL reset or be removed from the program.

For BIP, two key factors are of interest in the ex-post load impact evaluations. One is the estimate of load reductions during events, which is important for assessing the resource value of the programs during emergencies. The other factor is the extent to which BIP customers successfully reduce load to their FSL during events. This factor is important for judging program performance and is also important as input for forecasting ex-ante load impacts.

2.1.2 Evaluation Methods

The nature of the BIP customers and the detailed requirements of the ex-post evaluation drive the selection of methods. Even more so than in other C&I DR programs, BIP customers are large and often unique. This characteristic limits the possibility of finding an appropriate control group of customers for comparing usage on BIP event days. In addition, the requirement to report load impact results by industry type and LCA implies the need for a flexible approach, such as analyzing each customer account separately, so that results may be aggregated along the desired dimensions.

As a result, our planned approach is to conduct the ex-post load impact analysis at the customer level, using each customer's available hourly interval load data for the relevant time period (e.g., October 2022 through September 2023). As in previous BIP evaluations, we will estimate customer-specific regression models applied to the hourly load data, where the models are designed to estimate hourly load impacts on event days by controlling for typical monthly, day-of-week, and hourly usage patterns, along with weather conditions and events for other DR programs in which the customers are enrolled. In this approach, we directly estimate the hourly load impacts for each event day. Each customer's reference load, which is the load that would have otherwise occurred on the BIP event days, is then created by adding the estimated load impacts to the observed event-day loads.

We will conduct a customer-specific regression specification search using a two-step model selection process. In the first step, we sort each customer into weather-sensitive and non-weather-sensitive categories. This step helps improve the accuracy of our ex-post load impact estimates and ensure that the ex-ante forecast does not reflect "wrong-signed" weather effects (e.g., higher load impacts on milder weather days).

In the second step, we test a range of specifications using loads averaged by industry group and weather sensitivity, with the goal of selecting the model specification that performs best at predicting the group's load on event-like non-event days. Model variations include alternative weather specifications (for weather-sensitive customers) and other time-based variations (e.g., whether to use distinct hourly load profiles by month or day of the week). The types of weather variables applied during summer months will include cooling degree days (CDDs) and cooling degree hours (CDHs) with varying temperature thresholds; along with temperature-humidity indices (THIs). In addition to current-hour (or current-day) values of these weather variables, we will examine lagged values (i.e., 24 hours prior) and moving averages. For non-summer months, we will test analogous weather variables such as heating degree days and hours (HDD and HDH).

The model variations will be evaluated according to their ability to predict usage on event-like non-event days. Specifically, we will identify a set of 5 to 10 days that are similar to BIP event days, typically based on weather or system load conditions, but were not called as event days (i.e., "test days"). The use of non-event test days allows us to test model performance against known "reference loads" that represent a customer's usage in the absence of an event. We will estimate the model excluding the test days and use the model's estimated coefficients to predict each customer's hourly loads on the out-of-sample test days. The model fit (i.e., the difference between the actual and predicted loads on the test days, during afternoon hours in which events are typically called) will be evaluated using metrics such as mean absolute percentage error (MAPE) and mean squared error (MSE) as accuracy measures and mean percentage error (MPE) as a measure of bias.

Using the selected model specifications, we will estimate regression models applied to hourly data at the individual service-account (SAID) level, for all BIP customer accounts enrolled at each of the utilities during PY2023. This approach allows us to summarize results across various characteristics that may be associated with a given SAID to address all the evaluation objectives listed above. For example, to produce total program-level impacts, we can add estimated load impacts across all SAIDs for a given utility. At a more detailed level, we can add estimated load impacts across all SAIDs by industry type, LCA, or busbar.

2.1.3 Load Impact Regression Equations

Each customer's regression model will include event variables for BIP and other relevant DR programs (to control for customers' loads on event days for other programs), which are interacted with hourly indicator variables to allow the direct estimation of hourly load impacts for each BIP event. Each customer's model will include a series of variables that account for factors that influence its hourly loads across the period of program operation, where the specific included variables will be determined using customer-specific specification searches. These factors may include local weather conditions, "shape" variables that account for typical load variations across hours of the day and days of the week, month indicator variables, and several interactive terms that, for example, allow hourly loads to vary by different weekdays (e.g., Monday and Friday distinguished from other weekdays). Regression models of this type effectively allow the estimation of a reference load under the conditions of the event day (e.g., a Wednesday with 20 cooling degree-days), such that the load impacts represent the difference between the reference load and the customer's observed load on that day. Separate models will be estimated for weekend event days, using the corresponding day-type and shape variables.

A typical form for our ex-post evaluation model is the following:

$$
\begin{aligned}
Q_{i,t} = a &+ \sum_{Evt=1}^{E} \sum_{i=1}^{24} (b_{i,Evt} \times h_i \times BIP_t) + \sum_{i=1}^{24} (b_i^{Wth} \times h_i \times Wth_{i,t}) + \sum_{i=1}^{24} b_i^{MornLoad} \times MornLoad_t \\
&+ \sum_{i=2}^{24} (b_i^{MON} \times h_i \times MON_t) + \sum_{i=2}^{24} (b_i^{FRI} \times h_i \times FRI_t) + \sum_{i=2}^{24} (b_i^{h} \times h_i) + \sum_{i=2}^{5} (b_i^{DOW} \times DOW_{i,t}) \\
&+ \sum_{i=7}^{9} (b_i^{MONTH} \times MONTH_{i,t}) + \sum_{i=1}^{24} b_i^{OthDR} \times h_i \times OthDR_t + e_{i,t}
\end{aligned}
$$

The variables are explained in the table below.

Variable Name / Term	Variable / Term Description
$Q_{i,t}$	the customer's usage in hour *i* of day *t*
a and the various *b*'s	the estimated parameters
h_i	a dummy variable for hour *i*
BIP_t	an indicator variable for BIP event days
$Wth_{i,t}$	weather conditions during hour *i* and/or day *t* (e.g., measured by CDD, CDH, or THI)
E	the number of event days that occurred during the program year
$MornLoad_t$	a variable equal to the average of the day's load in hours-ending 1 through 10
MON_t	a dummy variable for Monday
FRI_t	a dummy variable for Friday
$DOW_{i,t}$	a series of dummy variables for each day of the week
$MONTH_{i,t}$	a series of dummy variables for each month
$OthDR_t$	a series of dummy variables representing event days for other DR programs in which the service account is enrolled[1]
$e_{i,t}$	the error term.

The "morning load" variable is used in the same spirit as the optional day-of adjustment to the 10-in-10 baseline method currently used in some DR programs (e.g., CBP). That is, it is intended to adjust the reference load (the regression-based estimate of the loads that would have occurred in the absence of the event day) for unobserved exogenous factors that may affect customers' loads on a given day. The use of the morning load variable assumes that variations in the morning load are related to variations in reference loads later in the day; but that the changes in the morning load are not part of the customer's response to the event itself (e.g., pre-cooling the building in anticipation of an event). In the case of BIP, the short notification of events essentially rules out customers shifting usage to morning hours prior to events, which might otherwise result in the presence of the morning load variable causing an upward bias in the load impact estimate.

The second term in the equation, containing the double summation signs is the component that allows estimation of hourly load impacts (the $b_{i,Evt}$ coefficients). It does so via the hourly indicator variables h_i interacted with the event variables (indicated by BIP_t). The remaining terms in the equation are designed to control for weather and other periodic factors (e.g., hours, days, and months) that determine customers' loads. The interaction of Monday and Friday indicators with the hourly indicators is designed to account for the typically different hourly load profiles of commercial and industrial customers on the first and last days of the workweek.

For weekend and holiday event days, we will use the same general equation but with adjusted day-type indicator variables. In addition, we understand that customers were asked to voluntarily reduce loads on and near the event days. To account for these reductions, we will

[1] A similar variable may be used to account for FlexAlert days or Public Safety Power Shutoffs (PSPS). We may also choose to simply exclude PSPS-affected data from the regression analysis.

include a set of hour-specific variables that indicate the dates for which the voluntary reductions were requested.[2]

2.1.4 Validity Assessments

The most important component of our validity assessment efforts is the customer-specific specification search described above, in which we estimate the model after withholding data for event-like non-event test days and use the resulting estimates to predict usage for the withheld days. Our report will describe these efforts in detail and summarize the results, including an explanation of our model selection criteria. We will also illustrate model performance by plotting predicted and actual loads on the test days in model validation.

We will conduct additional validation screening of results by examining individual cases of unusually large load impacts or large "wrong-signed" load impacts (i.e., load *increases* during events). In those cases, we examine the regression coefficients and performance statistics, and compare plots of the event-day loads to those of non-event-day loads on similar days to determine whether the estimated load impacts appear reasonable. If they are, then the estimated impacts are included in the analysis. If they are not, then the models may be modified, or the anomalous load impacts may be excluded from the program results.

2.1.5 Load Impact Uncertainty

In addition to producing point estimates of the ex-post load impacts, we will produce *uncertainty-adjusted* program impacts for each event, which show the uncertainty around the estimated impacts, as required by the Protocols.[3] These methods use the estimated load-impact parameter values and the associated variances to derive scenarios of hourly load impacts.

2.1.6 Assessment of FSL Performance

Customers' performance in reducing load to their FSL during BIP events is important to the process of estimating ex-ante load impacts, as described above. Hence, for each BIP customer and event we will calculate the *FSL achievement rate*, which is equal to the customer's estimated load impact divided by the difference between its reference load and FSL, where this difference represents the amount of load reduction required for the customer to exactly meet its BIP obligation. An FSL achievement rate above 100 percent indicates that the customer's event-day load was below its FSL (over-performance); while an FSL achievement rate below 100 percent reflects an event load above its FSL (under-performance). We will summarize the results of this analysis in the form of distributions across customers, and average achievement rates at the program level, and by industry type and LCA. These findings will then be applied to estimating ex-ante load impacts, as described in the next sub-section.

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[2] Alternatively, we could remove non-event days with calls for voluntary reductions from the regression datasets, but that would prevent us from distinguishing BIP and voluntary load reductions on event days when both were in effect.

[3] We will also provide uncertainty-adjusted load impacts for the average event hour, which will be based on regressions that pool event hours into a single estimated coefficient and corresponding standard error.

2.2 Developing Ex-Ante Load Impacts

The objectives of the ex-ante portion of the evaluation are to develop ex-ante BIP load impacts for a typical event window for the period 2024 through 2034, where the forecasts are provided:

- For a typical event day and for the monthly system peak day for each month.[4]
- For the average customer and at the program level.
- By utility and size group, as well as for the following subgroups: subLAP; NAICS-based industry groups; dual enrollment status; and local capacity area (LCA).
- For 1-in-2 and 1-in-10 weather years under both utility-specific and CAISO-coincident peak conditions.

In the process for developing ex-ante load impact forecasts, reference loads for BIP event days are forecast under different weather conditions, as they are for price-responsive programs. However, the process for developing load impact forecasts logically differs from that for price-responsive DR programs. That is, rather than directly applying estimates of load reductions (in percentage or level form) obtained from ex-post evaluations, the ex-ante load impacts are based on customers' historical performance in achieving their FSLs. That is, customer-specific forecasts are developed by applying each customer's ex-post performance relative to its FSL to simulated ex-ante reference loads. Customers who leave BIP following PY2023 will be removed from the ex-ante forecast. For customers who join BIP following PY2023, we will assume their event-day performance matches that of the average BIP customer.

In this process, four elements are required to develop the ex-ante load impact forecasts for BIP:

1. Current BIP enrollments (i.e., a list of the currently enrolled SAIDs, accounting for customers who left and joined BIP since the end of the program year);
2. Enrollment forecasts (e.g., numbers of customer accounts by type);
3. SAID-level reference load profiles, to be averaged at the relevant level; and
4. Customer-specific FSL achievement rates from their most recent event day. These are calculated as described above as estimated load impact divided by the difference between the estimated reference load and the customer's FSL. The customer-specific values are then aggregated to the groups contained in the enrollment forecast (e.g., at PG&E, by LCA and size group).

Current enrollments and the enrollment forecasts will be provided by the utilities. The SAID-level reference load profiles will be based on simulations from regression models like those used in the ex-post load impact analyses. Reference loads will be simulated using the appropriate weather data (e.g., the 1-in-10 and 1-in-2 weather-year conditions for utility-specific and CAISO-coincident peak conditions to be provided by each utility) and event-day characteristics. These

[4] The utilities will determine whether we need to forecast an additional "worst day" day type. To include this day type, we need the ex-ante weather associated with the scenario. The development of the forecast for this day is otherwise identical to that of other day types.

profiles are aggregated across relevant groups of customers to obtain a reference load profile for every required aggregation (e.g., LCA) that is scaled to the appropriate level using the utility's enrollment forecast.

The fourth element, customer-level load impacts, are derived from differences between the simulated reference loads and the contractual FSL levels, adjusted for each customer's estimated FSL achievement rate. For example, if a customer's reference load in a particular ex-ante scenario is 1,000 kW, the FSL is 200 kW, and the average performance in achieving the FSL during BIP events is 95 percent, then the average ex-ante load impact for that scenario would be 760 kW (i.e., 0.95 x (1,000 – 200) kW).

While we will examine information from as many as three years of ex-post evaluations when developing the ex-ante forecast, our proposed methodology emphasizes the most recent full BIP event for each customer, which best reflects each customer's performance under their current FSL.[5] For example, we do not want to include a prior event in which the customer failed to perform and subsequently had their FSL increased. If that customer has met its obligations under its current FSL, we do not want the forecast to consider its under-performance under its former (lower) FSL, because that FSL is no longer in effect. Still, it is useful to examine customer and program performance from prior years to ensure the reasonableness of the forecast.

When developing the reference loads, we will assume that any COVID effects have reached a "new normal." That is, we will develop ex-ante reference loads using each customer's most recent observed load data under the assumption that it is representative of usage levels in the forecast period.

The uncertainty-adjusted scenarios (e.g., 10th, 30th, 50th, 70th, and 90th percentiles) of load impacts are developed using the standard errors of the estimated load impacts. The methods match those used in the ex-post load impacts.

Our method of using SAID-level regressions to develop reference loads allows us the flexibility to adapt to changes in the mix of customer types during the forecast time period. That is, we can simply remove customers who have de-enrolled from the program and account for newly enrolled customers by including a reference load based on the new customer's interval data and assuming their FSL performance matches average program levels.

As requested, we will investigate and report the reasons underlying any substantial differences between the ex-post and ex-ante load impacts, and between ex-ante load impacts produced in the current evaluation and previous evaluations. Differences may result from a disparity between the per-customer ex-post and ex-ante load impacts, or between the historical and forecast enrollment levels. Differences in average per-customer load impacts may occur due to factors such as changes in the enrollment mix, changes in customer FSLs, differences between weather conditions for the ex-post events and the weather conditions used in the ex-ante forecasts, or other factors. We will attempt to explain the portions of any differences in ex-post and ex-ante load impacts that are contributed by each major factor.

PG&E requests that we prepare an ex-ante forecast for 2023 in addition to the usual 2024-2034 forecast timeframe. This is intended to serve as a "back-cast" that provides an indication of the accuracy of the forecasting methods. The 2023 forecast will therefore not omit subsequently de-

[5] Multiple utilities called events that were shorter than 1 hour in PY2023.

enrolled customers (as we do in our 2024-2034 forecasts), nor will it be scaled to forecast enrollments. Rather, the 2023 forecast will reflect the customers enrolled at the time of the event.

3. DETAILED WORK PLAN AND SCHEDULE

We will conduct the project in the following eight tasks.

Task 1: Project Kick-Off Meeting

The project initiation (PI) meeting occurred on September 25, 2023, via teleconference. A meeting agenda presentation was provided prior to the meeting, and a memorandum summarizing the meeting was provided on September 27.

Deliverables | Due Dates

Kick-off meeting agenda	September 22, 2023
Kick-off meeting	September 25, 2023
Results of meeting memo	September 27, 2023

Task 2: Revised Research Plan

CA Energy Consulting will draft an evaluation plan (this document), which takes account of discussions and decisions made at the PI meeting. The plan is organized around the following outline:

1. *Introduction and Key Issues*: Summarize objectives of the project, state the research requirements, and discuss any issues raised at the kick-off meeting.

2. *Description of Project Requirements*: Identify all planned project activities, including all data and information to be supplied by the utilities.

3. *Detailed Work Plan and Schedule*: Provide a work plan divided into appropriate tasks and subtasks for conducting the project and indicate expected hours of key personnel. Provide lists of deliverables and due dates for each major task.

4. *Project Management Plan*: Outline a reporting schedule, format, and process to ensure timely reporting, communication, and adherence to critical project milestones.

5. *Detailed Outline of Final Project Report*: Provide an outline and format for the draft and final report, which will summarize the objectives, methods used, results obtained, and conclusions and recommendations.

6. *Quality Control Mechanisms and Processes*: This section will describe how we will ensure the accuracy of all report tables, figures and values, including the ex-post and ex-ante table generators.

7. *Addressing Protocol 3*: This section responds to each requirement contained in Protocol 3.

The plan describes in detail the steps that we will take to meet the research objectives of the project. We will modify the draft plan based on comments received and submit a Draft Final plan. Additional comments from the DRMEC and SCE Project Manager will be addressed in the final research plan.

Deliverables | Due Dates

Draft project research plan	October 12, 2023
Final project research plan	5 business days after receipt of comments
Submit data request	September 27, 2023

Task 3: Data Preparation and Validation

The required data that we will request include customer IDs, rate schedule, 12 months of interval load data and billing data, NAICS code, location variables (e.g., weather station, climate zone, LCA), hourly weather data by weather station, and program information (enrollment and de-enrollment dates, FSL, event performance data).

We will examine the data received to ensure that the customer information can be matched to hourly load data and other relevant databases (e.g., event databases); and to ensure that the hourly load data appear to be accurate. CA Energy Consulting will then prepare software programs to create the databases required to conduct the analyses.

Deliverables | Due Dates

Data collected and validated	No later than October 28, 2023.

Task 4: Data Analysis and Reporting

In this task, we will undertake the ex-post and ex-ante load impact analyses described in Section 2 above and will provide interim and final reports as described in Task 5. CA Energy Consulting will also work with the utilities to address several requirements of the Commission's Energy Division (ED) and the Long-Term Procurement Planning (LTPP) staff. This includes providing a subset of the results in "plain Excel format", summarizing 10 years of the forecast by Western Electricity Coordinating Council (WECC) transmission level busbar, and reporting load impacts for all operating hours of each program (for only the last forecast year). The first item will be provided along with the April filing. The latter two items will be delivered by November 1, 2024.

Deliverables | Due Dates

Draft ex-post LI estimates (table generators)	Late December 2023.
Final ex-post LI estimates (report/table generators)	Early January 2024.
Draft ex-ante LI estimates (report/table generators)	February 15, 2024.
Final ex-ante LI estimates (report/table generators)	March 1, 2024.
Report on ED, LTPP staff requested supplements	Prior to November 1, 2024.

Task 5: Final Reporting

CA Energy Consulting will prepare a report summarizing the ex-post and ex-ante load impact estimates, in a form that conforms to the Protocols. CA Energy Consulting is familiar with the Protocols from its prior work with the Joint Utilities and has produced numerous reports that meet its requirements. We have methods in place to estimate uncertainty-adjusted load impacts (as described in Section 2) and to produce tables in the required format. We will provide an initial draft report, followed by a final report that addresses DRMEC and SCE's comments. The report will also contain required Appendices in the form of ex-post and ex-ante load impact table generators.

A draft report will be provided during February 2024. CA Energy Consulting will present the report via teleconference to the project advisory committee, program administrators, and planners. By March 2024 we will produce a final report that addresses the comments that we receive. We will also prepare a two-page summary that describes the evaluation methodology, data and assumptions used, and results obtained.

Deliverables | Due Dates

First-draft report	February 15, 2024.
Final project report	March 1, 2024.
Executive summary write-up for April 1st reports	March 15, 2024.
Non-technical abstract for CALMAC website	April 10, 2024.

Task 6: Database and Documentation

A database of data received and produced in the project, listings of the models used to estimate load impacts, and documentation will be delivered.

Deliverable | Due Date

Project database	April 21, 2024

Task 7: Regulatory Support and Consultation

CA Energy Consulting will provide assistance with regulatory matters associated with this study as requested by the SCE project manager. If this assistance involves presenting the load impact results at a DRMEC workshop, we will travel to the workshop and present the load impact findings.

Deliverables | Due Dates

Additional analysis, support, and/or presentations	As requested

4. PROJECT MANAGEMENT PLAN

Dr. Michael Clark will manage all day-to-day details of the project. He will work closely with the SCE project manager to ensure smooth operation of the project. We will participate in bi-weekly calls with the SCE project manager, and in other conference calls as requested, and will provide monthly written status reports by the first Monday of each month.

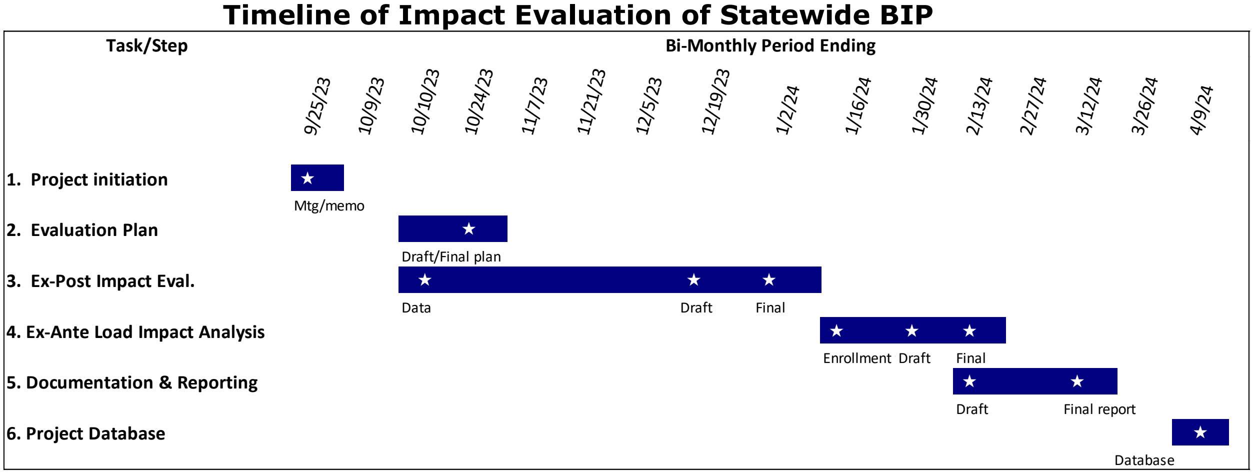
4.1 Deliverables and Due Dates

Deliverables and due dates are provided in the task descriptions in the Section 3 work plan.

4.2 Timeline

The following chart shows the timeline for completing the major tasks and deliverables for the program-year 2023 evaluation.

Timeline of Impact Evaluation of Statewide BIP



5. DETAILED OUTLINE OF FINAL PROJECT REPORT

The final report will be organized into the following sections:

1. An executive summary;
2. An introduction summarizing objectives and an overview of the project;
3. A methodology section describing the data used, and analysis techniques employed;
4. A results section presenting ex-post load impacts, by utility;
5. A results section presenting ex-ante load impacts, by utility;
6. A section that presents and discusses various comparisons between the following sets of results (by utility):

a. Prior ex-post and current ex-post load impacts;

b. Prior ex-ante and current ex-post load impacts;

c. Current ex-post and current ex-ante load impacts; and

d. Prior ex-ante and current ex-ante load impacts.

7. A validity assessment of the findings, including graphical comparisons of observed and predicted loads on a selection of day types, and discussing any threats to the reliability of the results; and

8. A conclusion section summarizing key findings and recommendations.

6. QUALITY CONTROL MECHANISMS AND PROCESSES

CA Energy Consulting will conduct a variety of quality assurance procedures, as described below.

- *Database review*. We will compare data across various sources to ensure that our study has produced valid results. For example, we will compare the load levels contained in the hourly interval data to summary statistics produced for each SAID. This will help identify any data problems or processing errors.

- *Evaluation of estimated reference loads*. We will compare our estimated load impacts to program-based estimates and results from an informal "day matching" method. In the latter case, we compare loads on event and comparable non-event days to develop a load impact estimate that we compare to the econometrically estimated load impacts. This method is useful for finding load impact estimates that do not accurately reflect customer behavior. For example, the customer may have reduced load levels for the entire week in which an event occurred (for reasons unrelated to the event, such as reduced demand for their product). Because our statistical model does not include variables that explain the load reduction, the coefficients on the event-day variables may appear as though the customer reduced load because of the event.

- *Comparison of simulated and observed load profiles*. As described above, we will use the model parameters to make out-of-sample predictions of loads for event-like non-event days and compare the resulting loads to the observed loads. This exercise will help us evaluate the ability of the models to accurately estimate implied reference loads (and hence load impacts).

- *Reporting checklist*. We have developed a checklist that the project team will apply to each results table generator and to the evaluation report. It will help ensure that results are correct, complete, consistent, and properly labeled.

CA Energy Consulting will also carefully review the databases that must be provided to comply with the Protocols.

7. ADDRESSING PROTOCOL 3

Protocol 3 of the Load Impact Protocols adopted by the CPUC in D-04-08-050 contains a list of issues that must be addressed in a load impact evaluation, or by providing an explanation of why the issue is not addressed. The issues and a description of how we address it (or why we do not) follow.

Protocol 3: The evaluation plan must delineate whether the following issues are to be addressed during the impact estimation process and, if not, why not:

- *The target level of confidence and precision in the impact estimates that is being sought from the evaluation effort*

The precision of the impact estimates is dictated by program enrollment. That is, we cannot increase precision by adding customers to the analysis, as we already intend to study all enrolled customers.

- *Whether the evaluation activity is focused exclusively on producing ex post impact estimates or will also be used to produce ex ante estimates*

This evaluation will produce both ex-post and ex-ante estimates.

- *If ex ante estimates are needed, whether changes are anticipated to occur over the forecast horizon in the characteristics of the DRR offer or in the magnitude or characteristics of the participant population.*

No major program changes are anticipated. Our ex-ante forecast will account for known and expected changes in program enrollment.

- *Whether it is the intent to explicitly incorporate impact persistence into the analysis and, if so, the types of persistence that will be explicitly addressed (e.g., persistence beyond the funded life of the DR resource; changes in average impacts over time due to changes in customer behavior; changes in average impacts over time due to technology degradation, etc.).*

The forecast assumes that each customer's estimated ex-post FSL achievement rate will persist throughout the forecast (for as long as the customer is enrolled in BIP). This is a reasonable assumption given the consequences associated with non-compliance.

- *Whether it is the intent to develop impact estimates for geographic sub-regions and, if so, what those regions are.*

Ex-post and ex-ante load impacts will be developed on a customer-specific basis and can thus be reported for any geographic sub-region. We will provide the required summaries by LCA and busbar.

- *Whether it is the intent to develop impact estimates for sub-hourly intervals and, if so, what those intervals are.*

The study will be conducted at the hourly level.

- *Whether it is the intent to develop impact estimates for specific sub-segments of the participant population and, if so, what those sub-segments are.*

Ex-post and ex-ante load impacts will be developed on a customer-specific basis and can thus be reported for any sub-segment of customers. We will provide the required summaries by industry group, LCA, and other summaries as requested by utilities.

- *Whether it is the intent to develop impact estimates for event-based resources for specific days (e.g., the day before and/or day after an event) or day types (e.g., hotter or cooler days) in addition to the minimum day types delineated in protocols 8, 15 and 22.*

We will estimate the load impacts for each PY2023 event day and forecast load impacts for each required ex-ante scenario.

- *Whether it is the intent to determine not just what the DR resource impacts are, but to also investigate why the estimates are what they are and, if so, the extent to which Measurement and Verification activities will be used to inform this understanding.*

We will explore changes in year-over-year load impacts to determine which customers are driving the differences (e.g., new enrollment, de-enrollment, or changes in a customer's load impact across years). We do not have access to information that allows us to understand why a customer changes its load impacts across years, nor do we have enough event days to explore the variation in load impacts across day types, weather conditions, etc.

- *Whether free riders and/or structural benefiters are likely to be present among DR resource participants and, if so, whether it is the intent to estimate the number and/or percent of DR resource participants who are structural benefiters or free riders.*

This is not a component of the BIP study, as the program design limits the possibility for free ridership.

- *Whether a non-participant control group is appropriate for impact estimation and, if so, what steps will be taken to ensure that use of such a control group will not introduce bias into the impact estimates.*

We do not plan to use a control group for this analysis. The largest responders tend to be high-use customers for which we do not expect to have an extensive pool of eligible control-group customers.

- *Whether it is the intent to use a common methodology or to pool data across utilities when multiple utilities have implemented the same DR resource option.*

The high-level methodology will be the same across utilities, though the specific ex-post regression model will be selected on a customer-specific basis. In addition, the ex-ante methodology may differ somewhat due to the nature of the information provided by each utility.